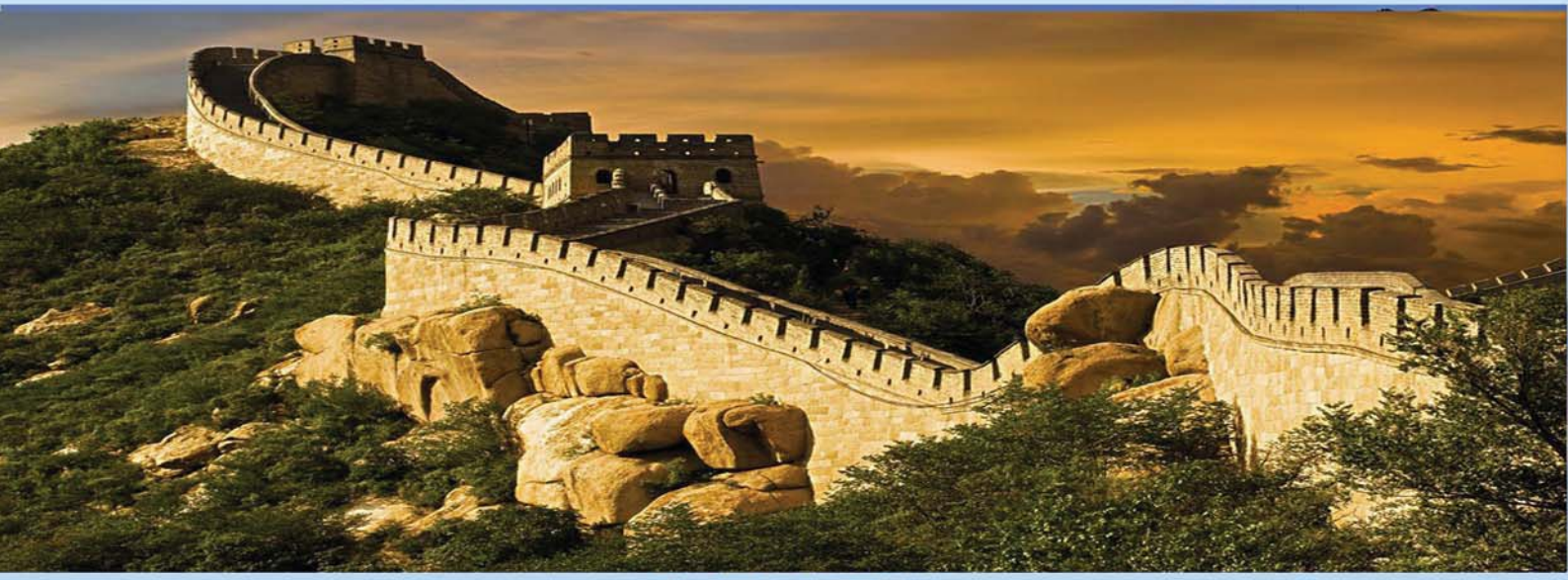
IEEE ICMA 2015

2015 IEEE International Conference on Mechatronics and Automation

AUGUST 2-5, 2015

BEIJING, CHINA

Conference Digest



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Foreword

On behalf of the IEEE ICMA 2015 Conference Organizing Committee, it is our great pleasure, an honor, and a privilege to welcome you to Beijing for the 2015 IEEE International Conference on Mechatronics and Automation. This conference reflects the growing interests in the broad research areas of mechatronics, robotics, sensors and automation.

ICMA 2015 marks the **12th** edition of the IEEE ICMA annual conference series. We are proud to announce that a high number of **715** papers were submitted from **31** countries and regions, including **679** contributed papers, **36** papers for organized sessions, and **461** papers were accepted for oral or poster presentation at the conference after a rigorous full-paper review process, achieving an acceptance rate of less than **65%**. Presentations at ICMA 2015 are organized in **7** parallel tracks, for a total of **64** sessions, including **1** poster session, taking place during the three conference days. We are fortunate to be able to invite three distinguished speakers to deliver plenary talks.

We are very pleased that you are joining us at IEEE ICMA 2015 in Beijing to take part in this unique experience. The main objective of IEEE ICMA 2015 is to provide a forum for researchers, educators, engineers, and government officials involved in the general areas of mechatronics, robotics, sensors and automation to disseminate their latest research results and exchange views on the future research directions of the related fields. IEEE ICMA 2015 promises to be a great experience for participants from all over the world, with an excellent technical program as well as social activities.

We would like to express our most sincere appreciation and thanks to all of our sponsoring societies and organizations and to all the individuals who have contributed to the organization of this conference. Our special thanks are extended to our colleagues in the Program Committee for their thorough review of all the submitted papers, which is vital to the success of this conference. We must also extend our thanks to our Organizing Committee and our volunteers who have dedicated their time toward ensuring the success of this conference. Last but not least, we thank all the contributors for their support and participation in making this conference a great success. Finally, we wish you a great conference and enjoyable stay in Beijing, China.

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Welcome Remarks

It is my honor to welcome you to attend the 2015 IEEE International Conference on Mechatronics and Automation (IEEE ICMA 2015) on behalf of Beijing Institute of Technology. We are delighted to host the Conference which marked as the 12th edition of the IEEE ICMA among the annual conference series. The Conference reflects the growing interests in the broad research areas of mechatronics, robotics, sensors and automation.

To begin with, I would like to make a brief introduction to Beijing Institute of Technology. Beijing Institute of Technology (BIT) is one of the national key universities in China, an open, public, research-oriented university with a focus on science and technology. The 10th university to enter the 985 Project, which started in order to develop 39 Chinese universities that would seek to become world renowned universities. One of the first 15 universities to join 211 Project which established roughly 100 universities to cope with the challenges of the 21st century. Annual research fund in 2014 amounts to over 2 billion RMB ranking in the top 10 in China. Our research on mechatronics and automation has become increasingly active.

It is sincerely hoped that IEEE ICMA 2015 will provide a forum for researchers, educators, engineers, and government officials involved in the general areas of mechatronics, robotics, sensors and automation to disseminate their latest research results and exchange views on the future research directions of the related fields.

Finally, on behalf of Beijing Institute of Technology, I would like to express my sincere gratitude to all of the sponsoring societies and organizations as well as all the individuals contributed to the organization of the Conference. Also, special thanks are owed to all the authors, session organizers, plenary speakers, exhibitors for contributing their research works and making IEEE ICMA 2015 a successful and fruitful event. To all participants, I extend my heartfelt welcome and thanks for attending this event, wish your stay here in Beijing, China, is very pleasant and enjoyable.

Changlu Zhao, Professor

Vice President of Beijing Institute of Technology

Advisory Council Chair of IEEE ICMA 2015

IEEE ICMA 2015 Conference Digest

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Wu, Gang
Wu, Jinglong
Wu, Lei
Wu, Shijing
Wu, Xiaofeng
Wu, Xiaojun
X.Yang, Simon
Xi, Jeff
Xi, Zhihong
Xiang, Zhengrong
Xiao, Jizhong
Xiao, Lan
Xiao, Nan
Xie, Lihua
Xie, Ming
Xie, Shane
Xie, Shaorong
Xin, Ming
Xiong, Caihua
Xu, Bo
Xu, Chunquan
Xu, De
Xu, Dingjie
Xu, Fen
Xu, Honghai
Xu, Jianan
Xu, Lixin
Xu, Mengguo
Xu, Qingsong
Xu, Shijie
Xu, Yaoqun
Xue, AnKe
Xue, Dingyu
Yakou, Takao
Yamada, Takayoshi
Yamaguchi, Tomomi
Yamamoto, Manabu
Yamamoto, Motoji
Yamamoto, Yoshio
Yamashita, Atsushi
Yamaura, Hiroshi
Yan, Shaoze
Yan, Shengyuan
Yanagihara, Mamoru
Yang, Enxia
Yang, Erfu
Yang, Fang
Yang, Guiliin
Yang, Hyun Suck
Yang, Jianwu
Yang, Jing
Yang, Kwangjin
Yang, Qingsheng
Yang, Wu
Yang, Xiukun
Yang, Yong
Yang, Yousheng
Yang, Zhaojun
Yano, Masafumi
Yao, Yiyu
Ye, Cang
Ye, Changlong
Ye, Shujiang
Ye, Xiufen
Yi, Byung-Ju
Yi, Chuanyun
Yi, Jianqiang
Yin, Guofu
Yin, Zhengsheng
Yin, Zhouping
Ying, Lixia
Ying, Xianghua
Yokokohji, Yasuyoshi
Yokota, Sho
Yoshida, Shunichi
You, Bo
Young, Nak
Yu, Dejie
Yu, Huadong
Yu, Jie
Yu, Junzhi
Yu, Qiang
Yu, Shui

Yu, Xiaoyang
Yu, Yong
Yu, Yueqing
Yuan, Jianjun
Yuan, Juntang
Yuan, Libo
Yuan, Xiaobu
Yue, Chunfeng
Yue, Dong
Yue, Yong
Yun, Chao
Yuta, Shinichu
Zeng, Chunnian
Zha, Hongbin
Zhang, Baida
Zhang, Chengjin
Zhang, Dan
Zhang, Dianlun
Zhang, Hong
Zhang, Jianpei
Zhang, Jianwei
Zhang, Jinxiu
Zhang, Lei
Zhang, Lijun
Zhang, Lixun
Zhang, Mingjun
Zhang, Rubo
Zhang, Songyuan
Zhang, Xianmin
Zhang, Xiaolong
Zhang, Xiaoyu
Zhang, Xinming
Zhang, Xuping
Zhang, Yanhua
Zhang, Yi
Zhang, Yimin
Zhang, Yong
Zhang, Yongde
Zhang, Yonggang
Zhang, Youmin
Zhang, Yunong
Zhang, Zhaohui
Zhang, Zhe
Zhao, Cangwen
Zhao, Chunhui
Zhao, Lin
Zhao, Qing
Zhao, Xin
Zhao, Xinhua
Zhao, Yuxin
Zhao, Zhijun
Zheng, Fei
Zheng, Guibin
Zheng, Jinyang
Zheng, Yuanfang
Zhong, Ning
Zhou, Xunyu
Zhu, Chi
Zhu, Chunbo
Zhu, George
Zhu, Jianguo
Zhu, Qidan
Zhu, Xiangyang
Zhu, Xiaorui
Zhu, Xilin
Zhu, Yu
Zu, Jean
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Chinese Mechanical Engineering Society

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Life Electronics Society, Chinese Institute of Electronics

General Information

Beijing

Beijing, which was founded 3000 years ago, is the capital of the People's Republic of China (PRC). It is also the nation's political and cultural hub. Additionally, it is the focal point for the country's transportation, scientific and technological development, education and communication. Its present-day population is over eleven million, thus, it is the second largest city in China. Previously known in English as Peking, the name was changed when the system for spelling Chinese words in English changed; the name in English means "northern capital". Beijing is one of the Great Ancient Capitals of China and has hosted the seat of government for much of China's history. It is the political, economic, academic, and cultural center of the country. Tradition and modern civilization are well integrated in this beautiful city.

The long history of Beijing endows the city with a rich cultural heritage. The Great Wall, one of the world's great wonders and one of the very few man-made structures that can be seen from space, extends several thousand miles, and passes relatively near to Beijing. The Forbidden City includes the most splendid group of imperial palaces in the world. The temple of heaven is the place of worship for emperors of various dynasties of China as well as a splendid representation of ancient Chinese architectural art. These sites have been selected by the United Nations Educational, Scientific and Cultural Organization as representing the world cultural heritage. Hutong (Chinese alleys) and compound courtyards (old Beijing residential quarters) are found throughout Beijing. These streets and buildings have witnessed the ups and downs of the city and the people in past centuries and are symbolic of the life of Beijing people. Few cities have the unique historical charm of Beijing. Its wide thoroughfares, magnificent gate tower and memorial arch, and grand palaces all speak to the extensive history of this city. It also stands as a symbol of China's grandeur, history, culture and mystery. Beijing is also an approachable and visitor-friendly city.

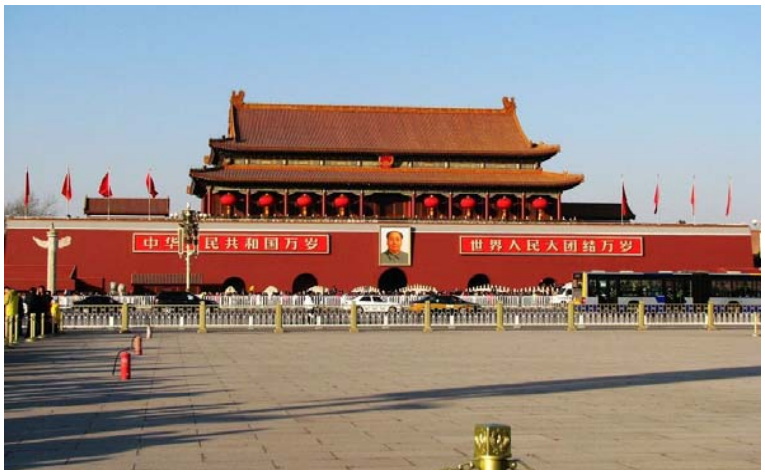
Changes have been taking place day-by-day in Beijing since China's reform and opening to the outside world. As summarized in a popular saying, Beijing is growing taller with more and more skyscrapers while growing younger with the improving living standards and more diversified life style. This is Beijing, old and young, full of attractions. It is our sincere wish that you will make the best of your time here and we believe you will bring home more than what you expect.

Attractions

- **Great Wall**

A Chinese saying goes that He who has never been to the Great Wall is not a true man. If we laid the bricks and rocks used in the Great Wall of Ming to form a wall one meter (1.1 yard) wide and five meters (16.4 feet) high, it could circle the earth at the equator with great ease. It is such a spectacular and formidable architectural feat that anyone who comes to China should not miss it under any circumstances. The Badaling Great Wall, constructed in 1502 (during the Ming Dynasty), once served as a crucial military fortification, and is now the most impressive and representative section of the striking Great Wall. It is about 70 kilometers (43.4 miles) from the downtown area of Beijing. As Badaling was once an important military strategy point, here the wall is comparatively high and firm. It has a length of 3,741 meters (2.3 miles) and it is equipped with dense watchtowers. The wall is about 8.5 meters (27.9 feet) high and slopes inward as it rises in height. The wall is 6.5 meters (21.3 feet) wide at its base, and its rim spans about 5.7 meters (18.7 feet) across.

- **Tiananmen Square**



Tiananmen Square is the geographical center of Beijing City. It is the largest city square in the world, occupying an area of 440,000 square meters (about 109 acres), and able to accommodate 10,000,000 people at one time. In the center of the Square stands the Monument to the People's Heroes, which commemorates the martyrs who devoted their lives to the Chinese people. It reaches 37.94 meters (124 feet) which makes it the biggest monument in Chinese history. The body is made of hardy granite and is surrounded by white balusters. Tiananmen Tower in the south was built in 1417 during the Ming Dynasty (1368-1644). During this dynasty and the following Qing Dynasty (1644-1911) it was where proclamations were issued to the whole nation. The common people were prohibited from entering the tower, but now tourists with tickets are permitted to climb it. It has five arched gates and nine principle hall columns. With the delicately carved white marbles on its base and yellow tiles on the roof, the tower

is quite resplendent. Under the tower flows the limpid Jinshui River, across which seven exquisite bridges are perched, named the Golden Water Bridges.

- **Beijing Lama Temple**

Beijing Lama Temple is one of the largest and most important Buddhist Tibetan monasteries in the world. Construction and works in the church to unite the Han Chinese and Tibetan styles. This story is as follows. Construction work at the Yong He Gong Lama Temple began in 1694 during the Qing Dynasty. Initially, he served as official residence for court eunuchs. It was then converted to a court Prince Yong (Yin Zhen), son of Emperor Kangxi and Emperor Yongzheng himself a future. After Yongzheng ascension to the throne in 1722, half of the building was converted into a monastery, a monastery for monks of Tibetan Buddhism. The other half was left of the Imperial Palace. After Yongzheng's death in 1735, his coffin was placed in the temple. Emperor Qianlong, Yongzheng's successor, gave the temple imperial status is indicated with its turquoise tiles replaced by yellow tiles, which were reserved for the emperor. Subsequently, the monastery became a residence for large numbers of Tibetan Buddhist monks from Mongolia and Tibet, and so Yonghe Monastery has become a national center of Lama administration. The temple is said to have survived the Cultural Revolution because of the intervention of Prime Minister Zhou Enlai. It was opened to the public in 1981.

- **Summer Palace**

The Summer Palace, Yiheyuan in Chinese, is the most celebrated imperial garden in China. The garden came into existence early in the 1750s and had once been a summer resort for the emperors. It is acclaimed as a museum of gardens in China, for a visit to this garden bestow on sightseers a glimpse of representative scenes all over China.

Weather

Beijing lies in the continental monsoon region in the warm temperature zone and its climate represents as hot and rainy in summer and cold and dry in winter. The four seasons in Beijing are distinct. It is dry, windy and sandy in spring and hot and rainy in summer. August and September are the end of summer and the beginning of autumn in Beijing. This is the best season of the year when the sky is blue and clear; the air is crisp, mild and humid.Beijing features a four season, monsoon-influenced climate, typical of East Asia, with cold, windy, very dry winters reflecting the influence of the vast Siberian anticyclone, and hot, humid summers, due to the monsoon.

Month	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
°F	25	30	43	57	68	75	79	77	68	55	41	28
°C	-4	-1	6	14	20	24	26	25	20	13	5	2

Transportation

All the registrants should make their own local transportation in the city. Travel by taxi is the most convenient and fastest option for the journey. Beijing is not only famous for charming natural scenery but also for large numbers of taxis and the cheapest taxis cost: RMB2.00 per km with base price RMB13.00! Please prepare some changes in advance for taxi fee or city bus cost in the staying in Beijing.

It takes about 40 minutes by taxi from the Beijing Capital Airport to Beijing Friendship Hotel, the taxi fare is about RMB 120 (approx. US$20), tollgate fee is RMB10. Whenever you arrive at the airport, there are always many taxis waiting at the airport to pick up passengers. We suggest you wait for taxi at the airport designated taxi station (Exit No. 7). Please ask for a receipt with the taxi.

Ps： Traffic information about the Beijing Capital International Airport (北京首都国际机场) and Beijing Friendship Hotle (北京友谊宾馆) can refer Appendix.

Transportations from/to Airport

- From/to Beijing Capital International Airport (北京首都国际机场) to/From Beijing Friendship Hotel (北京友谊宾馆)

Route 1: You will take the Subway Line 4 from/to Beijing Capital International Airport (北京首都国际机场) to/from RenMin University station (人民大学站) and you take the Exit D. Between Exit D of RenMin University station (人民大学站) and Beijing Friendship Hotel (北京友谊宾馆), you can walk to Beijing Friendship Hotel (北京友谊宾馆).

Route 2: You will take taxi. the distance is about 33 km and you need to pay about 120 RMB.

Route 3: You will take Shuttle Bus Line 4 from/to Captial International Airport (北京首都国际机场) to to/from Beijing Friendship Hotel station (友谊宾馆站). The fee is about RMB16.

- From/to Tian An Men Square (天安门广场) to/From Beijing Friendship Hotel (北京友谊宾馆)

Route 4: You take Subway Line 1 at Tian Tian An Men to Xi dan station (西单站) and change the Subway line 4 to the RenMin University station (人民大学站). You take the Exit D. Between Exit D of RenMin University station (人民大学站) and Beijing Friendship Hotel (北京友谊宾馆), you can walk to Beijing Friendship Hotel (北京友谊宾馆).

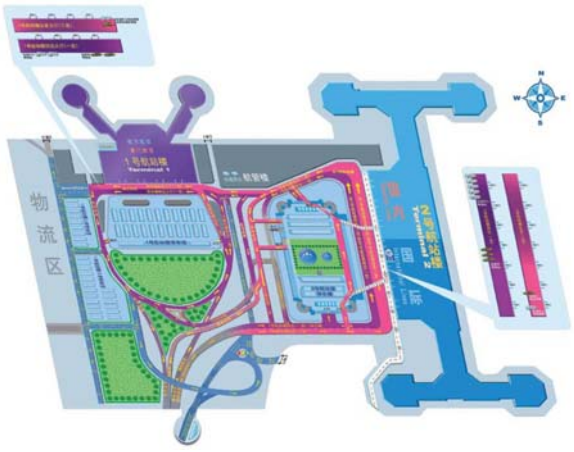
- From/to Wang Fu Jing (王府井) to/From Beijing Friendship Hotel (北京友谊宾馆)

Route 5: You take Subway Line 1 at Wang Fu Jing (王府井) to Xi dan station (西单站) and change the Subway line 4 to the RenMin University station (人民大学站). You take the Exit D. Between Exit D of RenMin University station (人民大学站) and Beijing Friendship Hotel (北京友谊宾馆), you can walk to Beijing Friendship Hotel (北京友谊宾馆).

- From/to Summer Palace (颐和园) to/From Beijing Friendship Hotel (北京友谊宾馆)

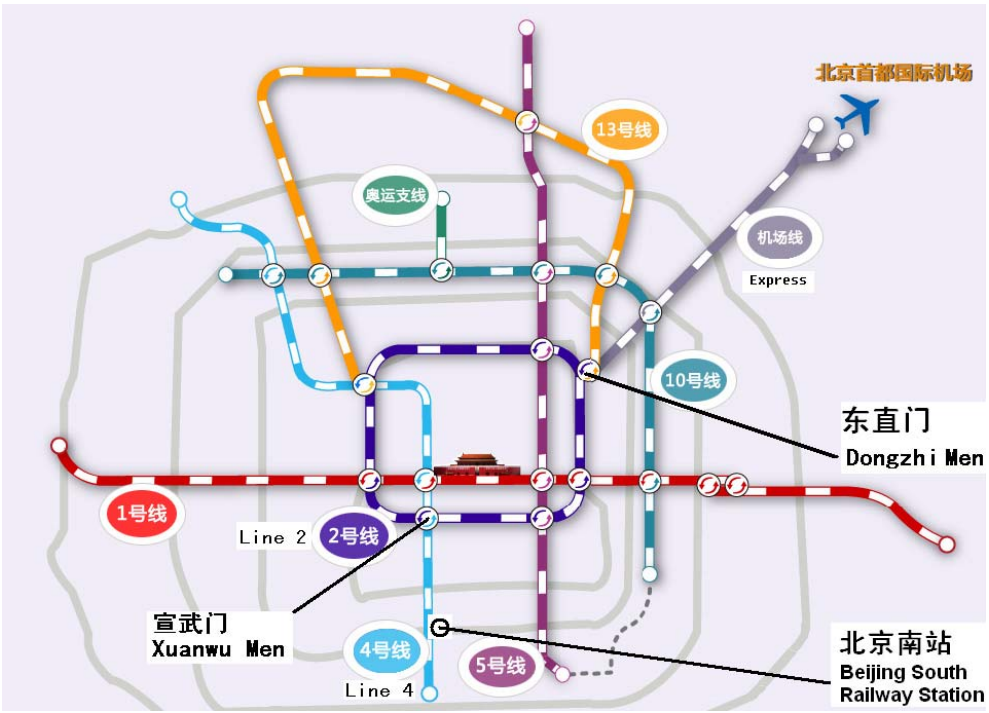
Route 6: You take Subway line 4 Bei Gong Men station at Summer Palace (颐和园) to RenMin University station (人民大学站). You take the Exit D. Between Exit D of RenMin University station (人民大学站) and Beijing Friendship Hotel (北京友谊宾馆), you can walk to Beijing Friendship Hotel (北京友谊宾馆).

Appendix: Capital international Airport Terminals



Terminal 1 and Termina 2

Terminal 3



Beijing Subway

Location of Beijing Freindship Hotle

Useful Information

- **Language:** Official language is Mandarin and most people also use their local dialect. The standard spoken Chinese is Putonghua. English can be understood by many young people and is used in hotels and big restaurants. In all tourist hotels, staff can speak in English, Japanese and other languages. They can also write down addresses or instructions in Chinese for taxi drivers or others. In addition, roads in major cities are signposted in Pinyin, the official Romanization system of the Chinese characters, which makes it quite easy to get around with the help of a map.

- **Currency:** Renminbi (RMB) is the only currency to be used in China. RMB is also called Chinese Yuan. The unit of Renminbi is yuan and with smaller denominations called jiao. The conversion among the two is : 1 yuan =10 jiao. Paper notes are issued in denominations Aof 1, 5, 10, 20, 50 and 100 yuan. Coins are issued in denominations of 1 yuan; 5 jiao; 1 jiao.

  Money exchanges by cash or travel's cheques can be made at the branches of Bank of China at Beijing Capital International Airport, hotels and tourist stores. Please remember to keep the receipt to exchange back to foreign currency when leaving China.

- **Credit Cards:** Visa, Master Card and American Express are the most commonly used in China. Cards can be used in most middle to top-range hotels, department stores, but they cannot be used to finance your transportation costs.

- **Time:** GMT + 8 hours (the whole of China is set to Beijing time)

- **Electricity:** Electricity is 220 Volts, 50 AC; plugs can be three-pronged angled, three-pronged round, two flat pins or two narrow round pins.

- **Water:** Bottled mineral water can easily be bought in all stores and street kiosks for RMB 3. And sometimes hotels provide it free of charge. Furthermore, potable water is only available in a few 4 to 5 star hotels, while water in thermos flasks in rooms is usually non-potable tap water.

- **Measurement:** In Metric system

- **Tipping:** Tipping is not customary outside of the foreign joint-venture hotels and is officially discouraged. But hotel bellboys usually expect RMB 2-5 per bag.

- **Attention:** Smoking is prohibited in public places in Beijing, such as hospitals, office buildings, theatres, cinemas, museums, planes, and trains.

- **Hotlines:** 110 - Police 119 – Fire 120 – Ambulance

Conference Information

Conference Venue

IEEE ICMA 2015 will be held in the city of Beijing, at Beijing Friendship Hotel, Beijing, which serves as both the official conference hotel and the venue for the technical program. Being a 5 star hotel, it is situated in the center of the prosperous business district of Beijing within easy access to the subway station. The stylish design reflects the perfect blend of art and architecture, where you with always feel at home thanks to the ambience and charm of personalized 5 star hotel service, where the word over make it their choice to conduct business.

Beijing Friendship Hotel

北京友谊宾馆

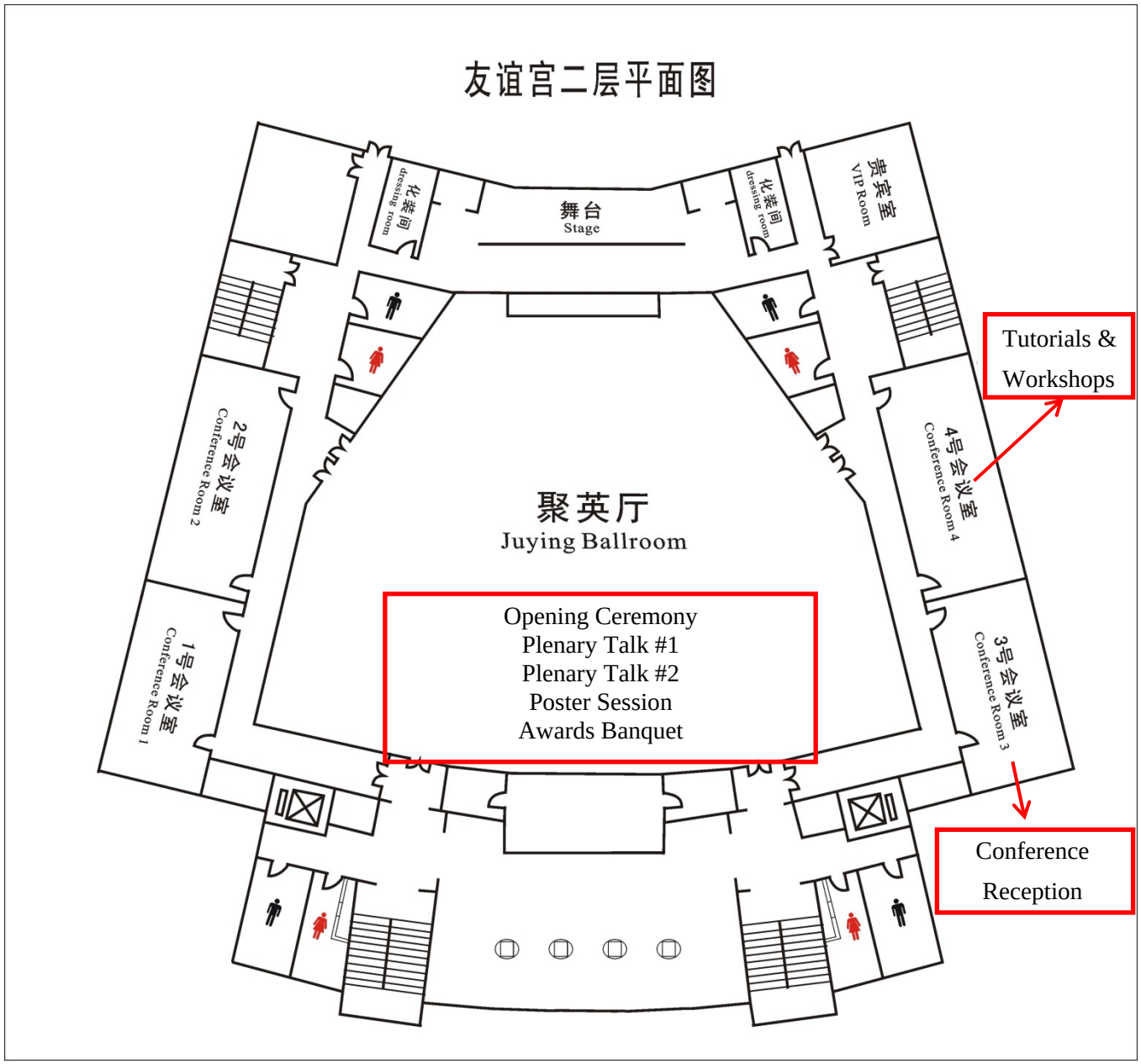
地址：中国北京中关村南大街一号 100873
Tel： 86-10 68498888
Fax： 86-10 68498866

The map of Beijing Friendship Hotel

Conference Registration

A conference registration desk will be set up and opened at the Freiendship Palace (友谊宫) and Building 8 (嘉宾楼) of Friendship Hotel from August 2 (15:00) to August 5 (16:45) as followings.

August 2, 2015: 15:00 ~ 18:30	1F, Friendship Palace, Beijing Friendship Hotel
August 3, 2015: 08:00 ~ 12:00	1F, Friendship Palace, Beijing Friendship Hotel
August 3, 2015: 12:00 ~ 18:30	1F, Building 8, Beijing Friendship Hotel
August 4, 2015: 08:30 ~ 16:45	1F, Building 8, Beijing Friendship Hotel
August 5, 2015: 08:30 ~ 16:45	1F, Building 8, Beijing Friendship Hotel



Layout of Juying Ballroom, 2F, Friendship Palace, Beijing Friendship Hotel

Social Events

The social events organized by the IEEE ICMA 2015 include the conference reception, the awards banquet, the conference registration, the farewell party, etc.

Conference Reception

The Conference Reception will be held from 17:30 to 18:30 on August 2, 2015 at Conference Room 3, 2F, Friendship Palace, Beijing Friendship Hotel. All the conference participants are welcome to join this event.

Tutorials & Workshops

The Tutorials & Workshops will be held from 13:30 to 17:30 on August 2, 2015 at Conference Room 4, 2F, Friendship Palace, Beijing Friendship Hotel. All the conference participants are welcome to join this event.

Awards Banquet

The Awards Banquet will be held from 18:30 to 21:00 on August 4, 2015 at Banquet Hall (Junying Ballroom), Friendship palace, Beijing Friendship Hotel. All the conference participants are welcome to join this event.

Farewell Party

The Farewell Party will be held from 17:00 to 18:00 on August 5, 2015 in Meeting Room 5, Building 8, Beijing Friendship Hotel. All the conference participants are welcome to join this event.

Lunch Place:

The IEEE ICMA 2015 Lunch will be held on from 11:30 to 13:30 August 3, 4, 5 at Restaurant Dining Hall, 1F， Friendship Palace. All the conference participants are welcome to join this event.

IEEE ICMA 2015 Conference

Plenary Talk 1

On Some Capacities to Enable Human Robot Interaction

Raja Chatila, Ph.D.

Director of Research CNRS

Director of the Institute of Intelligent Systems and Robotics

University Pierre and Marie Curie and CNRS, Paris – France

E-mail: Raja.Chatila@isir.upmc.fr

http://www.isir.upmc.fr

Abstract:

Robotics research has produced a wealth of new results in the recent years, which have increased robot abilities in perception, locomotion, control, navigation, action planning, and manipulation. Robots have thus reached a reasonable level of autonomous behaviour, even if this is still constrained by the complexity of the environment in which they operate and autonomy is possible only for given tasks in determined environments.A robot companion is expected to exhibit a sufficient level of cognition for interacting and cooperating naturally with people, which means it should be able to understand human behaviour and to be able to plan for its own actions while anticipating human actions. It appears then, that the abovementioned operational capacities have yet to be translated into this very specific context in order to achieve cognitive Human robot interaction (HRI). We shall overview a few of the cognitive the capacities involved in HRI such as perspective taking, space sharing and spatial reasoning, cooperative action planning and execution, and discuss a global framework to integrate them.

Dr. Chatila, IEEE Fellow, is senior scientist at the French National Center of Scientific Research CNRS. He is director of the Institute of Intelligent Systems and Robotics (ISIR) at University Pierre and Marie Curie (Paris). He has led or contributed to several projects in robotics along his career on autonomous and cognitive robotics, and made several contributions on motion planning, simultaneous localization and mapping (SLAM), planning, cognitive and control architectures, human-robot interaction, learning, and to applications in the areas of service, field and space robotics. He is author of over 140 international publications on these topics. He is president of the IEEE Robotics and Automation Society for the term 2014-2015.

IEEE ICMA 2015 Conference

Plenary Talk 2

Humanoid Robotics Research and Its Applications

Atsuo Takanishi

Professor and Director

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Waseda University, Japan

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http://www.takanishi.mech.waseda.ac.jp/

Abstract:

Even though the market size is still small at this moment, applicable fields of robots are gradually spreading from the manufacturing industry to others in recent years. One can now easily expect that applications of robots will expand into the first and the third industrial fields as one of the important components to support our society in the 21st century. There also raises strong anticipations in Japan that robots for the personal use will coexist with humans and provide supports such as the assistance for the housework, care of the aged and the physically handicapped, since Japan is one the fastest aging societies in the world. Consequently, humanoid/human-like robots have been treated as subjects of robotics researches in Japan such as a research tool for human science, an entertainment/mental-commit robot or an assistant/agent for humans in the human living environment. Over the last decade, some manufactures and telecommunication company including famous global companies started to develop prototypes or even to sell mass production robots for the purposes mentioned above, such as TOYOTA, HONDA, TMSUK, SoftBank, etc. On the other hand, Waseda University that I belong to has been one of the leading research sites on humanoid robot research since the late Prof. Ichiro Kato and his colleagues started the WABOT (WAseda roBOT) Projects and developed the historical humanoid robots that were WABOT-1 and WABOT-2 in the early 70s and 80s respectively. One of the most important aspects of our research philosophy is as follows: By constructing anthropomorphic/humanoid robots that functions and behaves like a human, we are attempting to develop the design method of humanoid robots to coexist with humans naturally and symbiotically, as well as to scientifically build not only the physical model of a human but also its mental model from the engineering view point. Based upon the philosophy, I and my colleagues have been developing bipedal walking robots and the running robots, emotion expression robots, wind instruments player robots, talking robots, etc. By using those robots, we are able to experimentally confirm the models of the human behavior/mind quantitatively. In my keynote speech, I will introduce the researches on those humanoid robots and their applications including commercialized ones both in mechatronics and medical education by showing examples. Please see our web page for more detailed information: http://www.takanishi.mech.waseda.ac.jp.

Dr. Atsuo Takanishi is a Professor of the Department of Modern Mechanical Engineering as well as the director of the Humanoid Robotics Institute, Waseda University. He received the B.S.E. degree in 1980, the M.S.E. degree in 1982 and the Ph.D. degree in 1988, all in Mechanical Engineering from Waseda University. His current researches are related to Humanoid Robotics and its applications in medicine and well-being, such as the biped walking/running humanoids, the emotion expression humanoids, the flute player humanoids, the ultrasound medical inspection robots, the airway management training humanoids, etc. He recently initiated a new mobile robot project for environmental monitoring.

He is currently the vice president of the Robotics Society of Japan (RSJ) and of the Japan IFToMM. He is a member of many robotics and medicine related academic societies such as IEEE, RSJ, and the Society of Mastication Systems, etc. He is a fellow of RSJ and the Japanese Society of Mechanical Engineers (JSME).

He received the RSJ Best Journal Paper Award (1998), RSJ/JSME ROBOMECH Award (1998), BusinessWeek Best of Asia Award (2001), IROS2003 Best Paper Award –Application (2004), JSME Best Journal Paper Award (2006), ROBIO2007 Best Conference Paper Award (2007) and many more domestic and international awards.

IEEE ICMA 2015 Conference

Plenary Talk 3

Small-Scale Mobile Robotics

Metin Sitti

Director, Max-Planck Institute for Intelligent Systems, Stuttgart

Germany

Professor, Department of Mechanical Engineering and Robotics Institute,

Carnegie Mellon University, Pittsburgh, USA

E-mail: Metin Sitti sitti@is.mpg.de

Abstract:

Small-scale mobile robots have the unique capability of accessing to small spaces and scales directly. Due to their small size and small-scale physics and dynamics, they could be agile and portable, and could be inexpensive and in large numbers if they are mass-produced. Miniature robots would have high impact applications in health-care, bioengineering, mobile sensor networks, desktop micro-manufacturing, and inspection. In this talk, design, fabrication, and control of different size scale miniature mobile robots leveraging advanced and soft materials are presented. First, as milli/centimeter scale mobile robots, novel climbing, flying, jumping-gliding, and water-walking robots inspired by insects, bats, and lizards are presented. Advanced soft gecko-inspired micro-fiber adhesives are shown to enable many new miniature robot and robotic manipulation applications. Pill-size untethered soft capsule robots are proposed to enable minimally invasive medical diagnosis and therapeutic operations inside stomach. Next, going down to sub-millimeter size mobile robots, the grand challenge is the limitation on scaling down on-board actuators and power sources. Two alternative approaches are proposed to solve this challenge. First, biological cells, e.g. bacteria, attached to the surface of a micro-robot are used as on-board micro-actuators and micro-sensors using the chemical energy. Bacteria-propelled randomly swimming micro-robots are steered using chemical and pH gradients in the environment and remote magnetic fields. As the second approach, external actuation of untethered magnetic micro-robots using remote magnetic fields in enclosed spaces is demonstrated. New magnetic micro-robot locomotion principles based on rotational stick-slip and rolling dynamics are proposed. Novel magnetic composite materials are used to address and control teams of micro-robots. Such untethered micro-robot teams are demonstrated to control microfluidic flow locally, trap live cells and transport them, and manipulate micro-gels with embedded cells with or without contact inside microfluidic channels for tissue engineering applications.

Dr. Metin Sitti received the BSc and MSc degrees in electrical and electronics engineering from Bogazici University, Istanbul, Turkey, in 1992 and 1994, respectively, and the PhD degree in electrical engineering from the University of Tokyo, Tokyo, Japan, in 1999. He was a research scientist at UC Berkeley during 1999-2002. He is currently a director in Max-Planck Institute for Intelligent Systems and a professor in Department of Mechanical Engineering and Robotics Institute at Carnegie Mellon University. His research interests include small-scale physical intelligence, mobile micro-robots, bio-inspired milli-robots, soft robots, novel micro/nano-materials, and micro/nano-manipulation. He has published peer-reviewed 135 journal and 126 conference papers (cited 9,013 times with h-index of 49 in Google Scholar), has 6 issued and 7 pending patents, has given 125 invited talks in universities, conferences, and industry, has raised around $14M research funding from NSF, NASA, NIH, industry, and DoD, has founded a start-up company to commercialize novel gecko-inspired adhesives, and has trained 34 PhD students and 17 post-doctoral researchers at CMU who are now professors in universities such as UIUC, Univ. of Toronto, WPI, Virgina Tech, etc., post-docs in MIT and Harvard, and senior researchers in industry such as BostonDynamics, Apple, Intel, etc. He is an IEEE Fellow. He received the IBM Smarter Planet Award in 2012, the SPIE Nanoengineering Pioneer Award in 2011, and NSF CAREER Award in 2005. He received the IEEE/ASME Best Mechatronics Paper Award in 2014, the Best Poster Award in the Adhesion Conference in 2014, the Best Paper Award in the IEEE/RSJ International Conference on Intelligent Robots and Systems in 2009 and 1998, the first prize in the World RoboCup Micro-Robotics Competition in 2012 and 2013, the Best Biomimetics Paper Award in the IEEE Robotics and Biomimetics Conference in 2004, and the Best Video Award in the IEEE Robotics and Automation Conference in 2002. He is the editor-in-chief of Journal of Micro-Bio Robotics.

IEEE ICMA 2015 Conference

Plenary Talk 4

Visual Servo Microscope for Optogenetic Manipulation and Neural Network Identification

Koichi Hashimoto, D.Eng.

Professor

Graduate School of Information Sciences/Department of Mechanical Engineering

Tohoku University, Sendai, Japan

E-mail: koichi@m.tohoku.ac.jp

http://www.ic.is.tohoku.ac.jp

Abstract:

The talk is on the visual servo microscope used with optogenetics and fluorescent observation. Recent developments in genetic science enable us to identify the functionalities of the neural network in brain. One of the technique is genome editing in which DNA is inserted, replaced or removed from a genome. This realizes fluorescent proteins developed in specified cells, e.g. neurons, muscles, or organs. It can also realize deformed animals in which specified neural channels are broken. Another technique is optogenetics, a combination of genetics and optics to control events within specific cells of living animals. These techniques allow us to optically “on and off” the neural activity of single or multiple neural cells in millisecond order. And also we can observe the activity of other neural cells by using fluorescent Ca2+ sensing protein. In other words, we can disturb and observe the activity of neural cells in a very complicated neural network, i.e. brain, of living animals simultaneously. One big challenge is how to track the neurons in the brain of moving animals. Another challenge is how to observe the fluorescent neurons and how to disturb the optogenetic neurons in the brain of moving animals. Our project is started to track a moving simple animal under a microscope. Infrared and fluorescent images are fed back to the PC and identify the position of the target cells. A motorized stage under the microscope is controlled to cancel the motion of the target. Also at a specified light pattern is projected onto the target optogenetic cells. This system is called visual servo microscope and extensively used in many research teams.

Dr. Hashimoto is a Professor in the Graduate School of Information Sciences and a Professor in the Department of Mechanical Engineering at the Tohoku University. He is also an affiliate Professor of Mechanical Engineering, National University of Science and Technology. His interest is on visual servo, image processing, high-speed camera system, 3D modeling, and microscope systems. He received his DE, ME, and DE from Osaka University, 1985, 1987 and 1990, respectively. (http://www.ic.is.tohoku.ac.jp/en/koichi/)

IEEE ICMA 2015 Conference Tutorials and Workshop

Robotics and its Real-world Applications: State of the Art

Venue: Conference Room 4, 2F, Friendship Palace, Beijing Friendship Hotel, Beijing
Date and Time: 13:30 - 17:30, Sunday, August 2, 2015

Organizers

Toshio Fukuda	Beijing Institute of Technology, Beijing, China
Kazuhiro Kosuge	Tohoku University, Sendai, Japan
Qiang Huang	Beijing Institute of Technology, Beijing, China
Marco Ceccarelli	University of Cassino and South Latium, Italy
Shuxiang Guo	Beijing Institute of Technology, Beijing, China

About the workshop:

The Robotics is significantly changing the way people live and work. Robots are being widely employed for personal assistance, healthcare, extreme environment applications, etc. In this workshop, we assembled a group of experts who have been pursuing cutting-edge research on robotics for universal manipulation, humanoid walking and health promotion. From their experience and discoveries, the state of the art in robotics and its application will be introduced and presented.

List of Speakers and Schedule

Time	Topics	Speaker List
13:30-13:40	Welcome speech	
13:40-14:40	Space robotics: past and future	Prof. Kazuya Yoshida Tohoku University Japan
14:40-15:10	Challenges for universal manipulation	Prof. Kazuhiro Kosuge, Tohoku University Japan
15:10-15:20	Coffee break	
15:20-15:50	Omnitask Humanoid Robotic Technology– Applications and Challenges	Dr. Abderrahmane Kheddar, CNRS-UM2 LIRMM IDH France
15:50-16:20	Asteriod exploration mission	Prof. Pingyuan Cui, Beijing Institute of Technology China
16:20-16:50	Robotics for health promotion	Prof. Zhiwei Luo, Kobe University Japan
16:50-17:20	Key technology review of the Chinese space station manipulator	Dr. Yaobin Wang, China Academy of Space Technology China
17:20-17:30	Panel Discussion	Moderators: All speakers

IEEE ICMA 2015 Conference

Tutorial Workshop Talk 1

Space Robotics: Past and Future

Kazuya Yoshida, Dr. Eng, Professor

Department of Aerospace Engineering, Tohoku University

E-mail: yoshida@astro.mech.tohoku.ac.jp

Abstract:

In this talk, past and recent activities on space robotics research, conducted by Prof. Kazuya Yoshida in Tohoku University, Japan are introduced. His research activities cover dynamics and control of space robotic systems ranging from orbital free-flying robots to planetary exploration rovers. The activities are extended to the development of university-based micro satellites and also the terrestrial applications of space technology, such as robotic remote exploration for search and rescue missions. His technical contribution is evidenced by many space flight and robotic missions, such as ETS-VII (orbital experiments of a free-flying space robot), HAYABUSA / HAYABUSA-2 (Japanese asteroid sample return probes), RISING / RISING-2 (50 kg microsatellites for science mission) and QUINCE (a mobile robot to aid in the Fukushima power plant incident.) Future of space robotics is discussed as a summary of the talk.

Kazuya Yoshida is a professor of Tohoku University, Japan. He received B. E., M. S. and Dr. Eng, degrees in Mechanical Engineering Science from Tokyo Institute of Technology, Japan, in 1984, 1986, and 1990, respectively. He served as Research Associate of Tokyo Institute of Technology from 1986 to 1994, and Visiting Scientist of Massachusetts Institute of Technology, U.S.A. in 1994. From 1995 to 2003 he was appointed as Associate Professor, and since 2003 he is Full Professor in Department of Aerospace Engineering, Tohoku University, Japan. He also serves as Director of Center of Robotics for Extreme and Uncertain Environments in Tohoku University since 2011. In addition, he has been contributing to space robotics education for international students at International Space University in Strasbourg, France (for Master of Space Studies) and various locations in the world (for Summer Study Programs). Member of IEEE since 1990, and a co-chair of the Robotics and Automation Society (RAS) Technical Committee (TC) on Space Robotics since 2007.

IEEE ICMA 2015 Conference

Tutorial Workshop Talk 2

Challenges for Universal Manipulation

Kazuhiro Kosuge, Ph. D, Professor

Department of Bioengineering and Robotics

Tohoku University

E-mail: kosuge@m.tohoku.ac.jp

Abstract:

The industrial robot was invented as “Programmed Article Transfer”, for the universal automation in 1954 by G. C. Devol. The first industrial robot was brought into the market by Unimation around 1961. Industrial robots today still use the concept created by G. C. Devol and are far from the “universal”. In this talk, we first review how the industrial robots have been used in assembly processes, and then discuss issues for making the industrial robot manipulators universal. Some of our recent research results of universal robot hands and new robot control systems for realizing the universal manipulation are introduced. Several examples of real tasks using the concept are also introduced.

Kazuhiro Kosuge is a Professor in the Department of Bioengineering and Robotics at Tohoku University, Japan. He received the B.S., M.S., and Ph.D. in Control Engineering from the Tokyo Institute of Technology, in 1978, 1980, and 1988 respectively. From 1980 through 1982, he was a Research Staff in the Production Engineering Department, Nippon Denso Co., Ltd. (DENSO Co., Ltd. at present). From 1982 through 1990, he was a Research Associate in the Department of Control Engineering at Tokyo Institute of Technology. From 1990 to 1995, he was an Associate Professor at Nagoya University. From 1995, he has been at Tohoku University. He received the JSME Awards for the best papers from the Japan Society of Mechanical Engineers in 2002 and 2005, the RSJ Award for the best papers from the Robotics Society of Japan in 2005. He is an IEEE Fellow, a JSME Fellow, a SICE Fellow, and a RSJ Fellow. He was President of IEEE Robotics and Automation Society for 2010-2011. He is Senior Past President of IEEE Robotics and Automation Society for 2014-2015 and IEEE Division X Director for 2015-2016.

IEEE ICMA 2015 Conference

Tutorial Workshop Talk 3

Omnitask Humanoid Robotic Technology– Applications and Challenges

Abderrahmane Kheddar, PhD, Director of Research

CNRS-AIST Joint Robotics Laboratory, UMI3218/RL, Tsukuba, Japan

CNRS-UM LIRMM, UMR5506, Montpellier, France

National Academy of Technologies of France (NATF), Paris, France

E-mail: kheddar@lirmm.fr

Abstract:

I will address some perspectives in humanoid robotics usage in three potential applications demanding a large variety of skills, which one expects to be fulfilled by humanoid robotics. First, humanoid robots are believed to be an advantageous solution in disaster situations such as that exemplified by the Fukushima nuclear catastrophe, which inspired the DARPA robotics challenge. Second, humanoids are envisioned to be home companion robots to assist frail and aging persons. Third, humanoid robot can serve as collaborative workers, I termed “comanoids”, that are partners in some large industrial assembly plants where wheeled and rail-ported robots are not possible to be used. These three applications have different business plans and also different requirements in terms of hardware, perception capabilities and human-centric constraints that are correlated with the large variety of task skills and dexterity that are required. I will present my vision and exemplify my talk with some video of the HRP humanoid robots with multi-contact technology.

Abderrahmane KHEDDAR received the BSCS degree from the Institut National d’Informatique (INI), Algiers, the MSc and PhD degrees in robotics from the University of Pierre and Marie Curie, Paris. He is presently Directeur de Recherche at CNRS. He is the Director of the CNRS-AIST Joint Robotic Laboratory (JRL), Tsukuba, Japan, and leads the Interactive Digital Humans (IDH) team at CNRS-UM LIRMM at Montpellier, France. His current research interests include humanoid robotics, haptics, and thought-based control using brain machine interfaces and embodiment. He is a founding member of the IEEE/RAS chapter on haptics, a founding member of the IEEE/RAS Technical committee on model-based optimization. He is presently Editor of the IEEE Transactions on Robotics; he is a founding member of the IEEE Transactions on Haptics and served in its editorial board during three years (2007-2010). In December 2014, he was elected a full member of the National Academy or Technologies of France (NATF). He is also an IEEE Senior Member.

IEEE ICMA 2015 Conference

Tutorial Workshop Talk 4

Asteroid Exploration Mission

Pingyuan Cui, Ph. D, Professor

Institute of Deep Space Exploration, Beijing Institute of Technology

E-mail: cuipy@bit.edu.cn

Abstract:

Asteroid exploration attracts many scientists' interest, because asteroids hold key clues to the understanding of the origin of our solar system and the formation of the planets. Another significant reason to explore asteroid deals with the fact that some asteroids have potential threats to impact the Earth. These objects, namely Potential Hazardous Asteroids (PHAs), may present a significant hazard to human civilization.

Our project aims at the development of asteroid exploration mission including the scientific target, mission profile, flight trajectory, spacecraft platform, GNC system et al. This presentation describes the basic mission concepts and some new results in our asteroid exploration mission.

Pingyuan Cui (Chief Scientist of the National 973 Program Project) is a professor of the Beijing Institute of Technology, Director of institute of deep space exploration at the Beijing Institute of Technology. His Ph.D. was obtained at the Harbin Institute of Technology, China (1990). His current research interests include trajectory design and optimization, Autonomous Navigation and control. He has published about 150 refereed journal papers. Prof. Cui's recent work is exploring new approaches to mission design for interplanetary mission, orbital dynamics at complex space environment, GNC system for landing asteroid and planetary mission, funded by Ministry of Science and Technology of China. He has been the recipient of national awards including the outstanding Youth Fund of Heilongjiang Province, Over the last ten years Prof. Cui's work has been funded by a diverse range of research councils (National Natural Science Foundation of China (NSFC), Ministry of Science and Technology of China (MSTC), et al). His recent professional activities: Member of Discipline Appraisal Group (Aerospace) of the Academic Degree Committee of the State Council, Vice chair of the committee on Deep Space Exploration Technology, Chinese Society of Astronautics; the Editor-in-Chief of Research of Deep Space Exploration (2003-2013), Deputy Editor-in-Chief of Journal of Deep Space Exploration (2014-), Member of Editorial board of Journal of Astronauticas, Member of Editorial board of ACTA Automatica Sinica, and America Mathematical Reviews.

IEEE ICMA 2015 Conference

Tutorial Workshop Talk 5

Robotics for Health Promotion

Zhiwei Luo, Ph. D, Professor

Graduate School of System Informatics, Kobe University

E-mail: luo@gold.kobe-u.ac.jp

Abstract:

From welfare support of healthy elderly people so as they communicate and contribute to the societies more easily and safely with happiness to training and health promotion as well as health prediction and prevention, human care support and rehabilitation of human motor functions and high order cognitive functions, novel sensing and information technologies, virtual reality and robotics play important rule in human health promotion. This presentation describes on how human's motor functions, such balance, walking and running, and cognitive functions change with the increase of age by using advanced measurement and computer simulation technologies, such as biofeedback, NIRS and immersion-type interactive dynamic simulation. It will also show some examples of our robotics researches related to above applications such as an up arms' rehabilitation robot system, a virtual shopping street to evaluate the elderly people's high order brain cognitive functions in their everyday life and so on.

Zhiwei Luo is a professor of Kobe University. His Ph.D. was obtained at the Nagoya University, Japan (1992). His current research interests include robotics for human health. He has published about 400 refereed journal and conference papers.Prof. Luo leaded basic researches in the field of bio-mimetic control systems and developed the world first human care robot RI-MAN, which was selected by TIME magazine as the Best Invention of 2006. After then, he is promoting wide researches on health engineering, such as robots for human rehabilitation and virtual reality technologies for evaluating human high order cognitive functions in everyday life. He also proposed the human adaptive walking/running training system as well as simulation and visualization of dynamic human movements. He proposes to use computer simulation technology to design and evaluate the human interactive robots and is now pushing new research field called computational robotics which will introduce supercomputer in studying super redundant biologic motor control functions and human-robot interface. He was an associate editor of IEEE Trans. on robotics, Program Chair of the 26th Annual Conference of The Robotics Society of Japan and General Chair of 2013 IEEE/SICE International Symposium on System Integration.

IEEE ICMA 2015 Conference

Tutorial Workshop Talk 6

Key Technology Review of the Chinese Space Station Manipulator

Yaobing Wang, Ph. D, Research Fellow

Institute of Spacecraft System Engineering

China Academy of Space Technology

E-mail: iamwyb@163.com

Abstract:

The Chinese Space Station Manipulator system (CSSM) is designed for the missions of relocking spacecraft sections, docking assistance, installing equipment, and maintaining the space station, it lays the foundation for the construction of Chinese Space Station (CSS). CSSM is consisting of two robotic arms, featured with a high degree of manipulation accuracy, reliability and load capability. The development of the Space Station faces many technical challenges and, therefore, the design and implementation of the robotic system is also difficult. The paper describes the research results of the robotic arm.

Yaobing Wang, Research Fellow, Beijing Institute of Space System Engineering, Director of Beijing Key Laboratory of Intelligent Space Robotic systems Technology and Applications. Yaobing Wang received his Ph. D degree from department of Precision Instrument, Tsinghua University in 2004, his primary research interests are space robotics, space structure and mechanism.

IEEE ICMA 2015 Program at a Glance

August 2-5, 2015

Beijing Friendship Hotel, Beijing, China

Sunday, August 2, 2015	
15:00 - 18:30	Registration Desk Open (1F, Friendship Palace)
13:30 - 17:30	Tutorials & Workshops (Conference Room 4, 2F, Friendship Palace)
17:30 - 18:30	Reception (Conference Room 3, 2F, Friendship Palace)
Monday, August 3, 2015	
8:30 - 9:00	Opening Ceremony
9:00 - 9:50	**Plenary Talk #1** (Dr. Raja Chatila) (2F, Juying Ballroom, Friendship Palace)
9:50 - 10:40	**Plenary Talk #2 (**Dr. Atsuo Takanishi) (2F, Juying Ballroom, Friendship Palace)
10:40 - 11:00	Morning Break
11:00 - 12:00	Technical Sessions MA1 (Poster Session) (2F, Juying Ballroom, Friendship Palace)
12:00 - 13:30	Lunch Break
13:30 - 15:00	Technical Sessions MP1 (Meeting Room, 2F Building 7 and 1F Building 8)
15:00 - 15:15	Afternoon Break
15:15 - 16:45	Technical Sessions MP2 (Meeting Room, 2F Building 7 and 1F Building 8)
17:00 - 18:30	Technical Sessions MP3 (Meeting Room, 2F Building 7 and 1F Building 8)
Tuesday, August 4, 2015	
9:00 - 10:00	**Plenary Talk #3 (**Dr. Metin Sitti) (Meeting Room 5, 1F, Building 8)
10:00 - 10:30	Morning Break
10:30 - 12:00	Technical Sessions TA1 (Meeting Room, 2F Building 7 and 1F Building 8)
12:00 - 13:30	Lunch Break
13:30 - 15:00	Technical Sessions TP1 (Meeting Room, 2F Building 7 and 1F Building 8)
15:00 - 15:15	Afternoon Break
15:15 - 16:45	Technical Sessions TP2 (Meeting Room, 2F Building 7 and 1F Building 8)
18:30 - 21:00	Award Banquet (2F, Juying Ballroom, Friendship Palace)
Wednesday, August 5, 2015	
9:00 - 10:00	**Plenary Talk #4** (Dr. Koichi Hashimoto) (Meeting Room 5, 1F, Building 8)
10:00 - 10:30	Morning Break
10:30 - 12:00	Technical Sessions WA1 (Meeting Room, 2F Building 7 and 1F Building 8)
12:00 - 13:30	Lunch Break
13:30 - 15:00	Technical Sessions WP1 (Meeting Room, 2F Building 7 and 1F Building 8)
15:00 - 15:15	Afternoon Break
15:15 - 16:45	Technical Sessions WP2 (Meeting Room, 2F Building 7 and 1F Building 8)
17:00 - 18:00	Farewell Party (Meeting Room 5, 1F Building 8)

* 15 minutes (Speech: 12 minutes, Q&A:3 minutes) are scheduled for oral presentation including discussions for each paper.

* 30 minutes (core time) are scheduled for poster presentation

IEEE ICMA 2015 Technical Program, Sunday, August 2, 2015

Room / Time	1 Conf. Room 1	2 Conf. Room 2	3 Conf. Room 3	4 Conf. Room 4	5 Conf. Room 5	6 Conf. Room 6	7 Conf.Room 7
15:00 - 18:30	**Registration Desk Open** Location: 1F, Friendship Palace						
13:30 - 17:30	**Tutorials & Workshops** Location: 2F, Conf. Room 4, Friendship Palace						
17:30 - 18:30	**Reception** Location: 2F, Conf. Room 3, Friendship Palace						

IEEE ICMA 2015 Technical Program, Monday, August 3, 2015

7:30 - 17:00	**Registration Desk Open** Location: August 3, 2015: 08:00 ~ 12:00 1F, Friendship Palace Location: August 3, 2015: 12:00 ~ 17:00 1F, Building 8						
8:30 - 9:00	**Opening Ceremony** Location: 2F, Juying Ballroom, Friendship Palace						
9:00 - 9:50	**Plenary Talk #1**	On Some Capacities to Enable Human Robot Interaction **Professor and Director Raja Chatila, University Pierre and Marie Curie and CNRS, Paris, France** Location: 2F, Juying Ballroom, Friendship Palace					
9:50 - 10:40	**Plenary Talk #2**	Humanoid Robotics Research and Its Applications **Professor and Director Atsuo Takanishi, Waseda University, Tokyo, Japan** Location: 2F, Juying Ballroom, Friendship Palace					
Morning Break							
11:00 - 12:00	**MA1-P** Poster Session (Intelligent Mechatronics and Automation) Location: 2F,Juying Ballroom, Friendship Palace						
Lunch Break							
13:30 - 15:00	**MP1-1** UAV	**MP1-2** Modeling and Simulation I	**MP1-3** Organized Session: Medical Robots for Minimal Invasive Surgery I	**MP1-4** Advanced Control Systems	**MP1-5** Organized Session: Cooperative Control and Multi-Agent Systems I	**MP1-6** Design and Analysis of NANO Systems I	**MP1-7** Organized Session: Biomimetic Underwater Robot
Afternoon Break							
15:15 - 16:45	**MP2-1** Intelligent Systems I	**MP2-2** Modeling and Simulation II	**MP2-3** Organized Session: Medical Robots for Minimal Invasive Surgery	**MP2-4** Control System Design	**MP2-5** Organized Session: Cooperative Control and Multi-Agent Systems II	**MP2-6** Design and Analysis of NANO Systems II	**MP2-7** Organized Session: Humanoid Robot I
17:00 - 18:30	**MP3-1** Intelligent Systems Ⅱ	**MP3-2** Modeling and Analysis	**MP3-3** Organized Session: Medical Robots for Minimal Invasive Surgery	**MP3-4** Biomedical Robotic System	**MP3-5** Biomimetic Systems	**MP3-6** Nano Sensor Design	**MP3-7** Humanoid Robot II

IEEE ICMA 2015 Technical Program, Tuseday, August 4, 2015

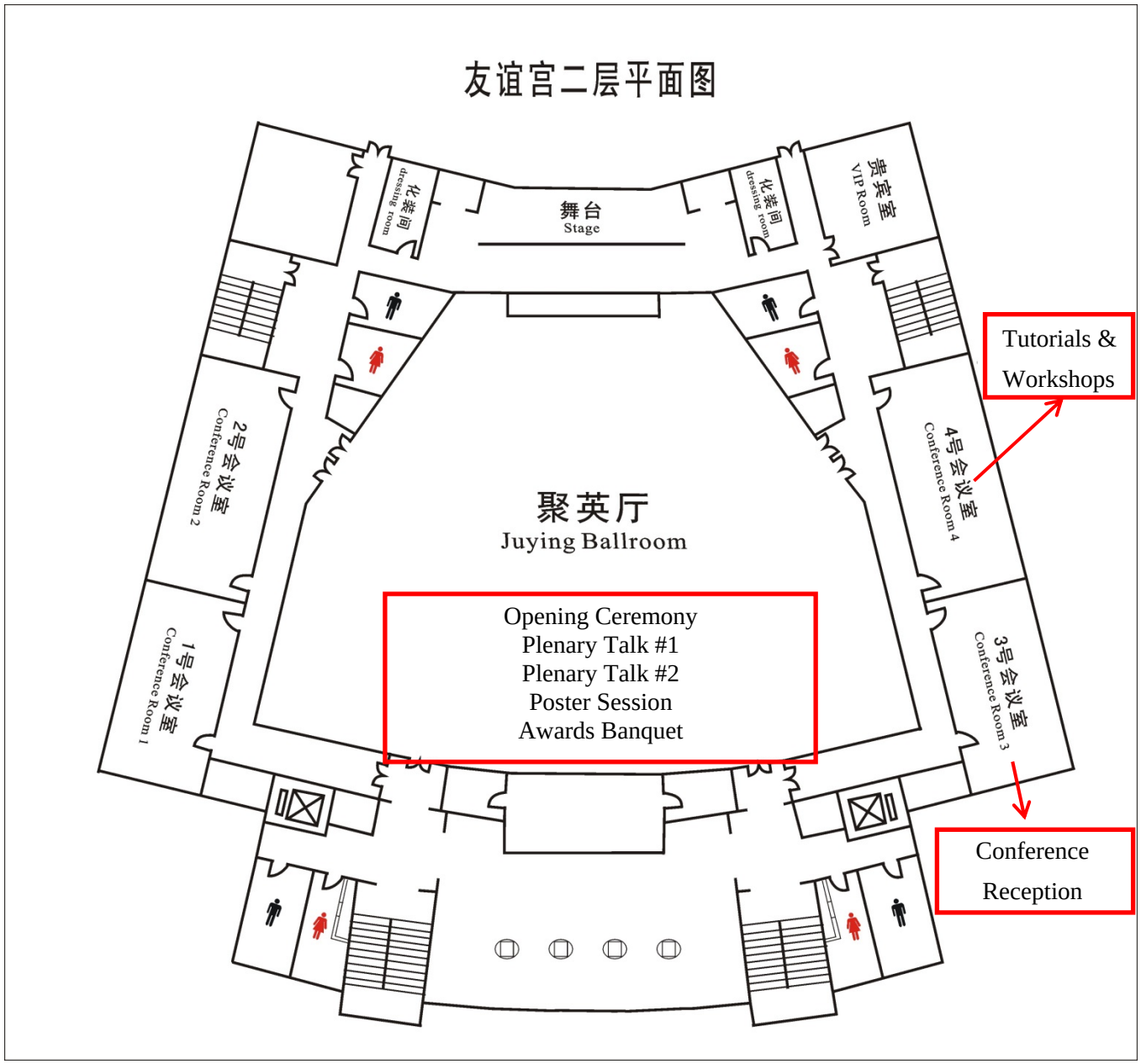
Room / Time	1 Conf. Room 1	2 Conf. Room 2	3 Conf. Room 3	4 Conf. Room 4	5 Conf. Room 5	6 Conf. Room 6	7 Conf.Room 7
7:30 - 17:00	**Registration Desk Open** Location: 1F, Building 8						
9:00 - 10:00	**Plenary Talk #3**		Small-Scale Mobile Robotics **Professor and Director Metin Sitti, Carnegie Mellon University, Pittsburgh, USA** Location: 1F, Meeting Room 5, Building 8				
Morning Break							
10:30 - 12:00	**TA1-1** Mobile Robot Design	**TA1-2** Modeling and Simulation Techniques	**TA1-3** Multi and Reconfigurable Robot Systems	**TA1-4** Manipulator control and Manipulation	**TA1-5** Complicated Systems	**TA1-6** Sensor Network & Fault Diagnosis	**TA1-7** Robotic Structure and Manipulator Control
Lunch Break							
13:30 - 15:00	**TP1-1** Intelligent Mechatronics and Application I	**TP1-2** Modeling, Simulation Techniques and Methodology I	**TP1-3** Medical and Rehabilitation	**TP1-4** Adaptive Intelligent Control System	**TP1-5** Signal and Image Processing I	**TP1-6** Sensor Network	**TP1-7** Organized Session: Robot Dynamics, Vibration Analysis and Vibration
Afternoon Break							
15:15 - 16:45	**TP2-1** Intelligent Mechatronics and Application II	**TP2-2** Modeling, Simulation Techniques and Methodology II	**TP2-3** Rehabilitation Systems	**TP2-4** Adaptive Control Applilcation	**TP2-5** Signal and Image Processing II	**TP2-6** Sensor Design	**TP2-7** Organized Session: Robot Dynamics, Vibration Analysis and Vibration
18:30 - 21:00	**Awards Banquet** Location: 2F,Juying Ballroom, Friendship Palace						

IEEE ICMA 2015 Technical Program, Wednesday, August 5, 2015

Time \ Room	1 Conf. Room 1	2 Conf. Room 2	3 Conf. Room 3	4 Conf. Room 4	5 Conf. Room 5	6 Conf. Room 6	7 Conf.Room 7
7:30 - 17:00	**Registration Desk Open** Location: 1F, Building 8						
9:00 - 10:00	**Plenary Talk #4**		Visual Servo Microscope for Optogenetic Manipulation and Neural Network Identification **Professor Koichi Hashimoto, Tohoku University, Sendai, Japan** Location: 1F, Meeting Room 5, Building 8				
Morning Break							
10:30 - 12:00	**WA1-1** Intelligent Mechatronics and Application III	**WA1-2** Modeling and Control of Mobile Robot	**WA1-3** Biomedical Technology	**WA1-4** Sliding Mode Control Based System	**WA1-5** Signal and Image Processing III	**WA1-6** Manufacturing	**WA1-7** Gripper, Legged and Wheeled Robots
Lunch Break							
13:30 - 15:00	**WP1-1** Intelligent Mechatronics and Application IV	**WP1-2** Underwater Robot	**WP1-3** Biomimetic Robot System	**WP1-4** Optimal Systems	**WP1-5** Image Processing and Application	**WP1-6** Industrial, Manufacturing Process and Automation I	**WP1-7** Computer Vision
Afternoon Break							
15:15 - 16:45	**WP2-1** Analysis of Mechatronic System	**WP2-2** Human-System Interaction and Interface	**WP2-3** Mobile Robot Navigation	**WP2-4** Design and Optimization of Systems	**WP2-5** Vision and Image Proceeding	**WP2-6** Industrial, Manufacturing Process and Automation II	**WP2-7** Robot Vision
17:00 - 18:00	**Farewell Party** Location: 1F, Building 8						

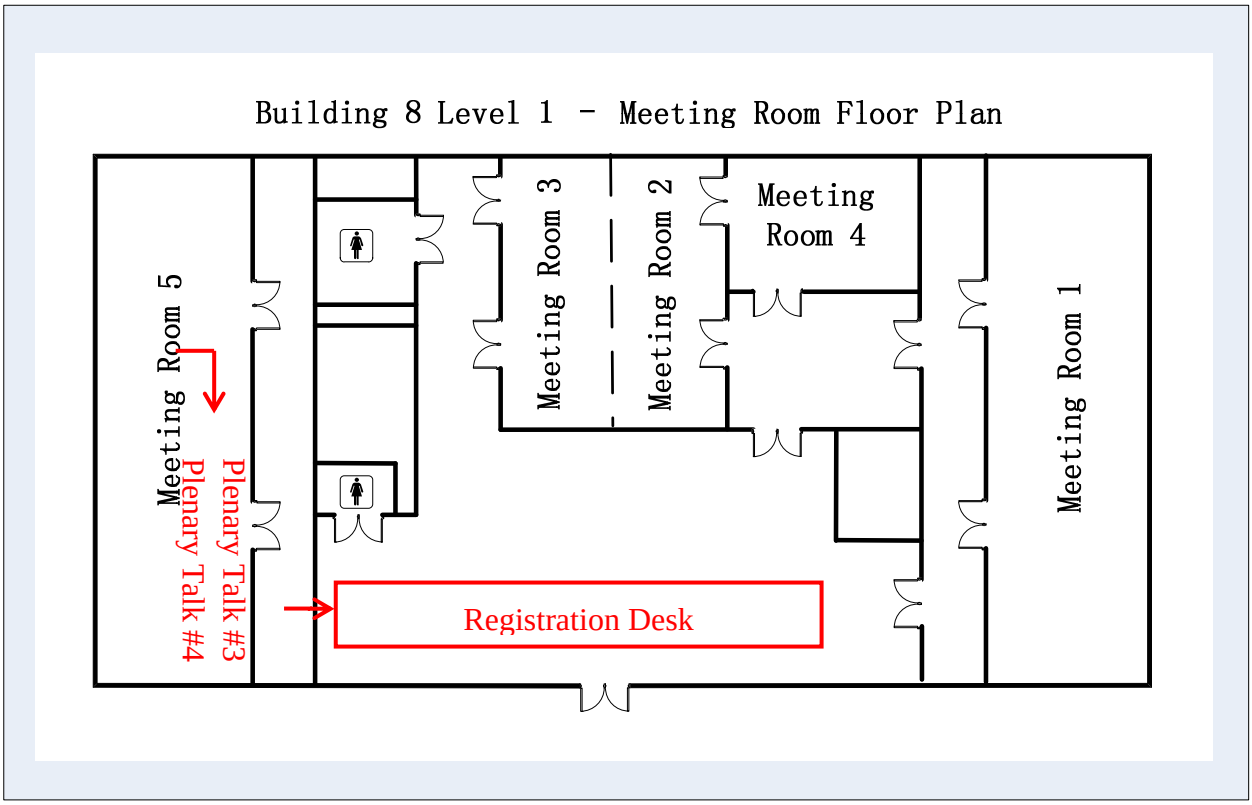
IEEE ICMA 2015
Floor Map of Conference Rooms

Plan of Beijing Friendship Hotel

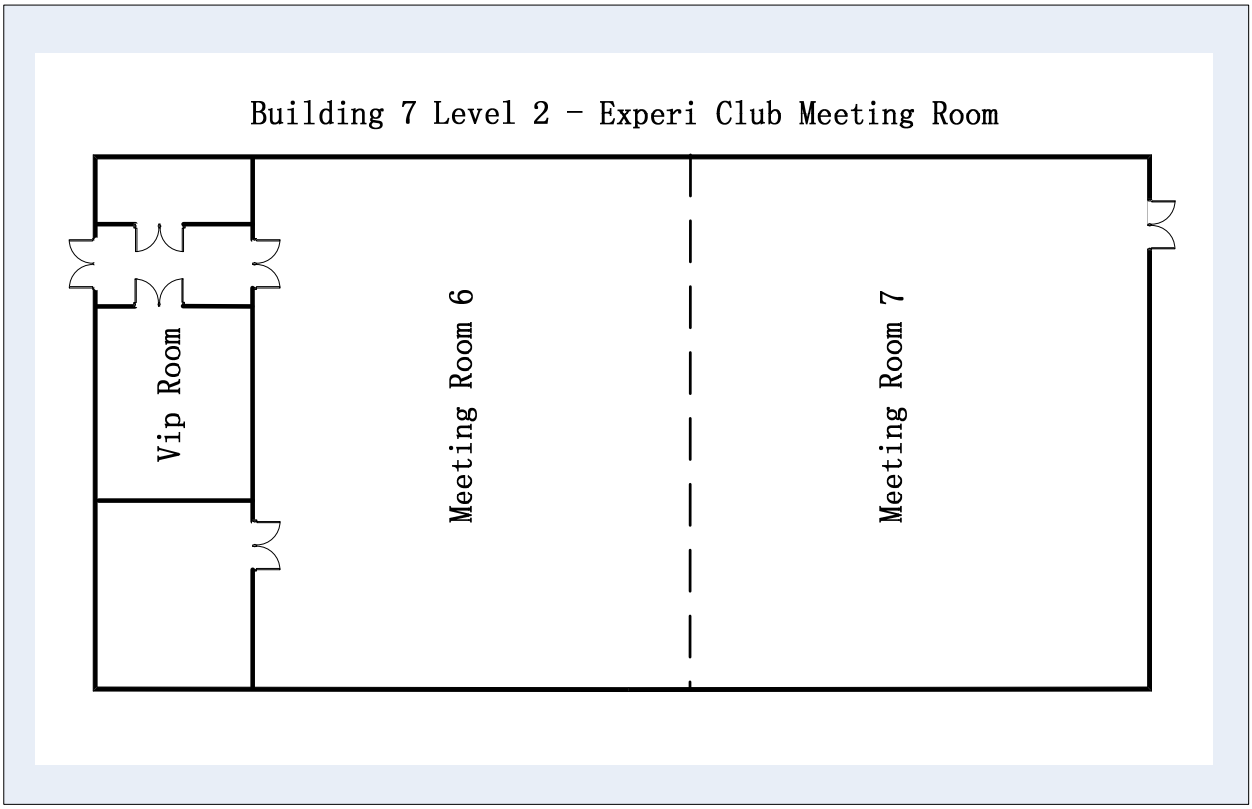


Layout of Juying Ballroom, 2F, Friendship Palace, Beijing Friendship Hotel

1F, Building 8, Meeting Room from 1 to 5



1F, Building 7, Meeting Room from 1 to 5



Monday
August 3, 2015

Morning Sessions

MA1-P Poster Session (Intelligent Mechatronics and Automation)

Monday
August 3, 2015

Afternoon Sessions

MP1-1	UAV
MP1-2	Modeling and Simulation I
MP1-3	OS30: Medical Robots for Minimal Invasive Surgery I
MP1-4	Advanced Control Systems
MP1-5	OS34: Cooperative Control and Multi-Agent Systems I
MP1-6	Design and Analysis of NANO Systems I
MP1-7	OS32: Biomimetic Underwater Robot
MP2-1	Intelligent Systems I
MP2-2	Modeling and Simulation II
MP2-3	OS30: Medical Robots for Minimal Invasive Surgery II
MP2-4	Control System Design
MP2-5	OS34: Cooperative Control and Multi-Agent Systems II
MP2-6	Design and Analysis of NANO Systems II
MP2-7	OS31: Humanoid Robot I
MP3-1	Intelligent Systems Ⅱ
MP3-2	Modeling and Analysis
MP3-3	OS30: Medical Robots for Minimal Invasive Surgery III
MP3-4	Biomedical Robotic System
MP3-5	Biomimetic Systems
MP3-6	Nano Sensor Design
MP3-7	Humanoid Robot II

MA1-P: Poster Session

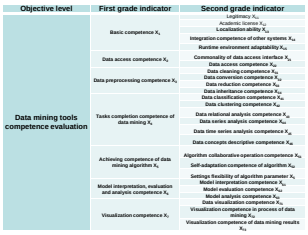
Session Chairs: Liwei Shi, Beijing Institute of Technology
Zhangguo Yu, Beijing Institute of Technology
Juying Ballroom, 11:00-12:00, Monday, 3 August 2015

MA1-P(1) 11:00-12:00

Research on Competence Evaluation System of Data Mining Tools

WANG Xiaohui, CHEN Changai
School of information technology
Henan University of Traditional Chinese Medicine
Zhengzhou, P.R.China

Data mining technology has been attached to great importance in level of government management and enterprise management, as it can provide foundation for the decision by predicting the development and change in future through the collection and analysis on existing data



MA1-P(2) 11:00-12:00

Application of fuzzy PID control in PMLSM servo drive system

Juan Wang, Di Li
South China University of Technology
Guangzhou, China

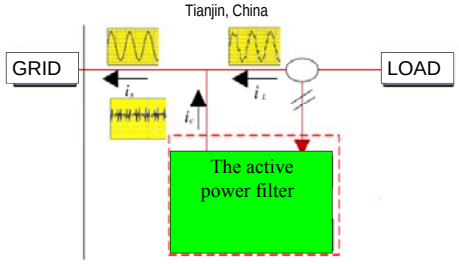
- A fuzzy PID control method is proposed to solve the effect of dynamic uncertainty and external load of PMLSM.
- The fuzzy PID control method possess the merits of both fuzzy logic and PID control, which can improve the performance of PMLSM servo drive system.
- Simulation results have verified the efficacy of the proposed method .

The PMLSM PLATFORM

MA1-P(3) 11:00-12:00

An Overview on Harmonic Elimination

Zhiqiang Gao,Yunzhi Qiu,Xuesong Zhou and Youjie Ma
Key Research Laboratory for Control Theory & Applications in Complicated Systems,Tianjin University of Technology
Tianjin, China



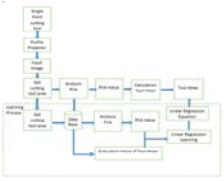
The harmonic elimination purpose :Grid current only contains fundamental wave,do not contain harmonic.

MA1-P(4) 11:00-12:00

Tool Wear and Tool Life Estimation Based on Linear Regression Learning

Naveen Senniappan Karupusamy, Hyun-Soon Lee, Pal Pandian P and Bo-Yeong Kang
Intelligent Robot Lab, Kyungpook National University, Daegu, South Korea.

- We proposed a system to recognize tool wear by capturing the image of flank area on cutting tool and predict the value of feed rate and depth of cut.
- The system uses machine learning technique and used the data from the image database and machine parameter database.
- Evolutionary development from Computer Numeric Control to Artificial Intelligent Controlled Machines.



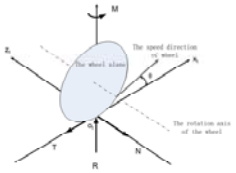
Overview of the Proposed Tool Wear Estimation

MA1-P(5) 11:00-12:00

Research on Motion Characteristics for UAV Ground Maneuvers

Yuxiu Hou, Yongliang Guan, Hongguang Jia
Changchun University of Science and Technology
Changchun Institute of Optics, Fine Mechanics and Physics, Chinese Academy of Sciences
Changchun, China

- A model of tricycle-undercarriage unmanned aerial vehicle (UAV) ground maneuvers with elastic tires was established.
- the model could describe the process of the UAV ground maneuvers exactly.
- The simulation model was based on a series of parameters of a real UAV and the constraints was put forward by analyzing some parameters of simulation result .



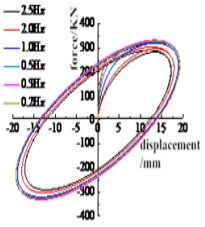
The stress figure of the tire during the process of UAV ground motion

MA1-P(6) 11:00-12:00

The Mechanical Properties of a New Type of Viscoelastic Damper

Jiujian Zheng,Haijiang Zhang,Xianlong Shen
Department of Civil Engineering and Mechanics,Yanshan University,HebeiProvince,China

- This paper introduces a new type of viscoelastic material damper..
- Experiments show that the shear storage modulus , loss shear modulus, loss factors of this kind of material have nothing to do with the excitation frequency and strain amplitude.
- This damper can be used to structure crack control and vibration control.
- The figure is the hysteresis curve of new viscoelastic dampers.



The hysteresis curve

MA1-P: Poster Session

Session Chairs: Liwei Shi, Beijing Institute of Technology
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Juying Ballroom, 11:00-12:00, Monday, 3 August 2015

MA1-P(7) 11:00-12:00

Rub-impact Fault Diagnosis of Rotating Machinery Based on Hilbert-Huang Transform

Yan Zhao1, Enshu Liu2, Junchao Zhu1, Baofeng Zhang1,Juan Wang1, Huan Tian
1.Tianjin Key Laboratory for Control Theory Applications in Complicated Systems
2. Research Institute of Physical and Chemical Engineering of Nuclear Industryand
Tianjin, China

- The HHT is used to analyze the time-frequency characteristic of the rub-impact fault signal of a rotor test rig.
- The Hilbert-Huang transform (HHT) is based on time-frequency signal processing technology, which is suitable for nonlinear and non-stationary signals.
- The experimental result shows that the vibration signal will consist of frequency-multiplier components when the rub-impact fault occurs.
- The Hilbert spectrum can offer more fault information than the frequency spectrum based on FFT transform.

MA1-P(8) 11:00-12:00

The Experiment and Analysis of Torsion Axle Stiffness

Xu Guoying Wang Chuang, Yao Ximin , Wang Tao
. The Academy of Armored Forces Engineering
Beijing, China

- Variation of tank torsion axle stiffness will appear along mileage increasing, and it will affect comfort and reliable durability of tanks. In this paper, the torsion axle stiffness is tested for two types of tank with various mileages, and the variation tendency of tank torsion axle stiffness is obtained..

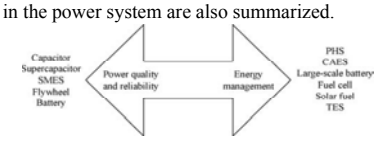
The suspension structure of modern tank torsion axle

MA1-P(9) 11:00-12:00

The Overview of Energy Storage Technology

Xuesong Zhou, Yitong Lin and Youjie Ma
Tianjin Key Laboratory for Control Theory & Applications in Complicated Systems
Tianjin University of Technology
Tianjin, China

●Power storage technology serves to cut the peak and fill valley, regulate the power frequency, improve the stability, in the power system.
●This paper introduces various types of storage technology such as superconducting magnetic energy storage, super capacitor energy storage, sodium sulfur battery, lithium ion, flow battery technology, and discusses their advantages and disadvantages.
●The development trend and the different applications of storage technology in the power system are also summarized.

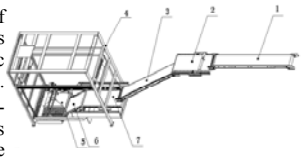


MA1-P(10) 11:00-12:00

Reconfigurable High-speed Palletizing and Loading System for Bagged Cement

Xu Ci-jun[1], Chen Chong-guang[2], Li Xin[3], and Huang Song-lin[1]
1. School of Mechanical and Electronic Engineering ,Hubei Polytechnic University, Huangshi
2. Hubei Hafu Cement Machine Co., Ltd, Huangshi, China
3. Office of Education Quality Management, Hubei Polytechnic University, Huangshi, China

- Reconfigurable idea was applied to the design of high-speed palletizing and loading machine for bagged cement, which can palletize different products by changing some devices.
- A reconfigurable design of row forming device was presented, including mechanic structure and control method.
- Control strategy of reconfigurable row forming device was studied to accumulate the interval time for some following operations.



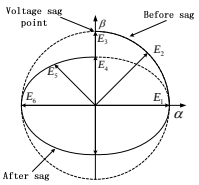
High-speed palletizing and loading machine

MA1-P(11) 11:00-12:00

A Rapid Voltage Detection Method for Low Voltage Ride Through Under Distorted Voltage Conditions

Liang Zhou, Shenghui Yan, Guangsen Wang, and Meina Wu
National Key Lab. for Vessel Integrated Power System Tech, Naval University of Engineering
Wuhan, China

- The detection accuracy and speed of tradition methods are influenced by the unbalanced voltage drop and the low-order harmonic distortions.
- The double vectors definite integral algorithm is proposed for voltage sag detection.
- The detection accuracy and speed is completely meet with the requirement.



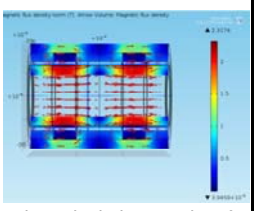
The Voltage Locus

MA1-P(12) 11:00-12:00

Magnetic Circuit Design and Computation of A Magnetorheological Damper with Exterior Coil

Hong huajie[1], Tang Shaode[2], Sheng Yaojie[1], Cui Qinglong[1]
1.College of Mechatronics and Automation, National University of Defense Technology, Changsha, Hunan Province, China;
2. Hengyang North Optical-electronics Information Technology Ltd, Hengyang, Hunan Province, China

- Study a kind of magnetorheological damper with exterior coils, which work at the mixed shear valve mode.
- Adopt two coils and three magnetic yokes in the magnetic design.
- Describe magnetic field theoretical computation processes, whose results are validated by COMSOL.
- Introduce the interior volume compensation design method.



The calculation results of magnetic flux density

MA1-P: Poster Session

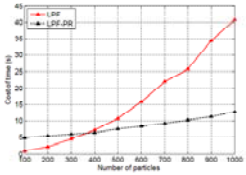
Session Chairs: Liwei Shi, Beijing Institute of Technology
Zhangguo Yu, Beijing Institute of Technology
Juying Ballroom, 11:00-12:00, Monday, 3 August 2015

MA1-P(13) 11:00-12:00

Filtering States with Partial Observations for the Logical Hidden Markov Model

Shiguang Yue, Kai Xu, Long Qin, and Quanjun Yin
College of Information System and Management,
National University of Defense Technology, Changsha, China

- Use a logical particle filtering algorithm to filter the states with partially missing observations in the Logical Hidden Markov Model
- Propose a logical particle filtering with parallel resampling to reduce the cost of time.
- Compare the cost of time of LPF and LPF-PR with different numbers of particles



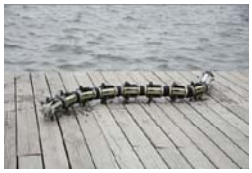
Cost of time of LPF and LPF-PR with different numbers of particles

MA1-P(14) 11:00-12:00

An Overview on Theory and Implementation of Snake-Like Robots

Lei Shao, Baozhu Guo, and Yi Wang
Tianjin Key Laboratory for Control Theory & Application in Complicated Systems, Tianjin University of Technology
Tianjin, China

- Snake-like robots theory is elaborated by biomechanical studies of snakes, kinematics and dynamics modelling, control system analysis.
- Classifications of typical snake-like robots are presented.
- The future development of snake-like robots is predicted.



Inspector-Ⅲ

MA1-P(15) 11:00-12:00

An Overview on Microgrid Technology

Xuesong Zhou, Tie Guo and Youjie Ma
Key Research Laboratory for Control Theory & Applications in Complicated Systems, Tianjin University of Technology
Tianjin, China

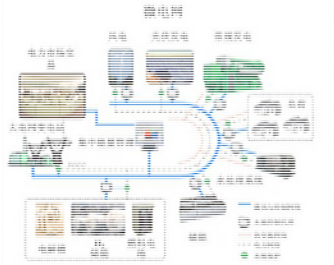
Microgrid

Distributed Generation

Wind Power

PV

Energy Storage



MA1-P(16) 11:00-12:00

The Measurement Method Based on The Block Adaptive Double Thresholds of Motion Target Detection

Wenkun Bian and Qidan Zhu
College of Automation ,Harbin Engineering University
Harbin, Heilongjiang Province, China

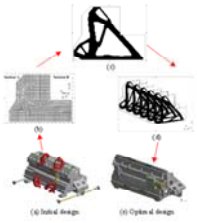
- finite difference method
- binarization
- morphological filtering
- regional connectivity analysis

MA1-P(17) 11:00-12:00

A review of structural optimization methods of machine tools

Guifei Wang, Ming Cong and Yongyao Li
School of Mechanical Engineering, Dalian University of Technology
Dalian, China

- Three types of optimization methods for machining tools are investigated.
- Take fuzzy multi-objective sizing optimization of the sliding rack as an example used to illustrate the optimization process.
- Take the shape optimization of a structural component as an example to illustrate the optimization process
- Take optimization of a beam as an example to illustrate the topology optimization process



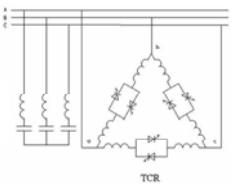
Optimization process of beam

MA1-P(18) 11:00-12:00

An Overview on Control Methods Used in Static Var Compensator

Youjie Ma , Tao Zhao and Xuesong Zhou
Key Research Laboratory for Control Theory & Applications in Complicated Systems
Tianjin University of Technology,China

- Research the theory and application status of nine control methods used in the SVC.
- Compare the control effects of different control methods used in SVC .
- From the angle of engineering application and development prospect, several feasible advanced SVC control methods are raised.



Working principle graph of static var compensator

MA1-P: Poster Session

Session Chairs: Liwei Shi, Beijing Institute of Technology
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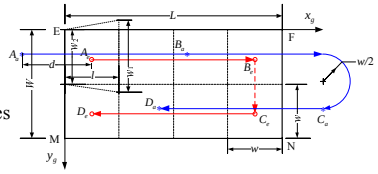
MA1-P(19) 11:00-12:00

U-Turn Optimization for Three-Dimensional Area Coverage of UAV

Hai Chen, KaiFeng He
China Aerodynamics Research and Development Center
Mianyang, China

- Study the relationship between UAV attitude angle and the camera footprint.
- Discuss the differences paths of UAV projection and camera footprint in line sweep coverage approach.



The paths of UAV projection and camera footprint center

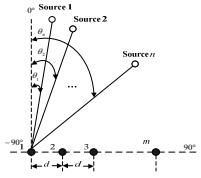
- Analyse the U-turn optimization of UAV which contains the distances and duration in three different cases.

MA1-P(20) 11:00-12:00

A Method of Dynamic DOA Estimation with an Unknown Number of Sources

Rongjie Wang and Yiju Zhan
Marine Engineering Institute, Jimei University, Xiamen, China

- An algorithm based on cross-validation technique was introduced to estimate dynamic number of sources.
- An adaptive DOA estimator is derived by using a blind source separation method.
- The effectiveness of the proposed methods was validated by simulation of time-invariant and time-varying numbers of complex source, and it has superior performance compared to other conventional algorithms.



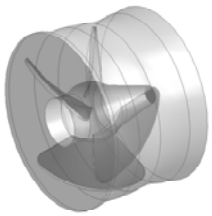
Uniform line-array and DOA

MA1-P(21) 11:00-12:00

Analysis of Turbine Fluid Dynamics Based on FSI

Yiming Li[1], Guiqiu Song[1], Xiaoyu Feng[1], Dengchen Li[2] and Gong Zhang[1]
1:School of Mechanical Engineering & Automation, Northeastern University, 110819, China
2:China Aerospace Science and Technology Corporation, Beijing, 100048, China

- Based on the fluid-structure coupling theory, the wheel of the bulb hydraulic turbine was done the transient dynamic analysis with the dynamic mesh technology
- The modal analysis was done with Lanczos Iteration algorithm to the bulb hydraulic turbine.
- The article got the dynamic characteristics of bulb tubular turbine under considering fluid-structure coupling.



Modal of the runner

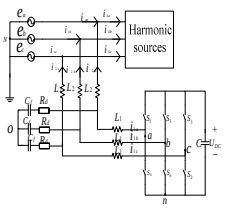
MA1-P(22) 11:00-12:00

Compensate the lag phase of active power filter with rapid convergence TD

Chao Wang,Xiju Zong and Xingong Cheng

School of Electrical Engineering,University of Jinan

- In the present paper, the analysis on a phase controlling for active power filter (APF) is proposed. It claims that a lag phase will be produced as a butterworth filter is used in the APF. A novel control strategy consisted of a rapid convergence tracking-differentiator is introduced to compensate the lag phase. Then, the stability of the system will be proved. Plus, simulation conforms to the correctness of the phase control and illustrates the advantages of the control strategy for improving the compensation precision.



structure of APF

MA1-P(23) 11:00-12:00

Structural Topology Optimization for Column Based on Variable Density Method

Yongyao Li, Ming Cong
School of Mechanical Engineering
Dalian University of Technology
Dalian, Liaoning Province, China
liyongyao1991@163.com

Zongsheng Sai, Desheng Wang
Dalian Machine Tool Group
Dalian, Liaoning Province, China
jamesdmtg@126.com

- Structure topology optimization based on the variable density method is executed according to the results.
- Optimal design of the column has been accomplished with the consideration of actual production and process.
- The optimized structure is more reasonable in the case of column performance guaranteed.

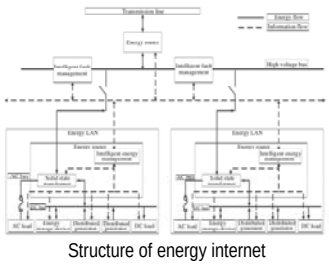
Optimization Result

MA1-P(24) 11:00-12:00

An Overview on Energy Internet

Xuesong Zhou, Fuzhi Wang and Youjie Ma
Key Research Laboratory for Control Theory & Applications in Complicated Systems
Tianjin University of Technology
Tianjin, China

·The structure of energy internet is similar with existing information Internet that consists of energy router, power generation equipment, energy storage and load.
·Energy internet is friendly to environment with communic -ating with the user in real time and achieving plug and play.



Structure of energy internet

MA1-P: Poster Session

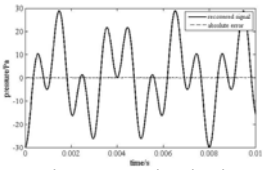
Session Chairs: Liwei Shi, Beijing Institute of Technology
Zhangguo Yu, Beijing Institute of Technology
Juying Ballroom, 11:00-12:00, Monday, 3 August 2015

MA1-P(25) 11:00-12:00

A New Type of Rocket Engine Ground Sensing and Test System Based on Compressive Sensing

Bo Dong,Xiaoyan Tong,Yu Liu and Yong Liao
Department of Aerospace Propulsion, University of Beihang
Beijing, China

- Under-sampling based on Compressive Sensing.
- Rocket engine.
- Numerical experiment.
- Hardware implementation.



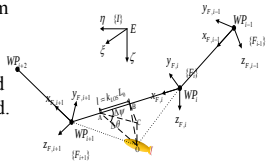
The reconstruction signal

MA1-P(26) 11:00-12:00

Spatial Linear Path-Following Control for an Underactuated UUV

Zheping Yan, Haomiao Yu, Jiajia Zhou, and Benyin Li
College of Automation, Harbin Engineering University
Harbin, Heilongjiang Province, China

- This paper investigates the spatial linear path-following control problem of an underactuated UUV under the parameter perturbation.
- The guidance law is developed based on LOS and "virtual vehicle" method.
- A nonlinear tracking differentiator is introduced into the loop of the surge velocity control to avoid setpoint jump.
- A globally exponentially controller is designed by using Lyapunov's direct method and backstepping technique



The schematic 3D path-following of an UUV

MA1-P(27) 11:00-12:00

Research on Delay-independent Stability for Discrete-time Interval Systems with Time-varying Delay

Fangxin Chen, Yahui Hu, Weijiang Wang and Jun Lei
No.4 Department, Air Force early warning Academy
Wuhan, China

- **The stability problems and robust analysis of a class of discrete-time interval systems with time-varying delays and uncertainties;**
- **A novel delay-independent stability criterion**
- **Gronwall's inequalities;**
- **Linear Matrix Inequalities ;**
- **The example simulation is performed for the comparison of the proposed delay-independent stability criterion to those in the corresponding literatures.**

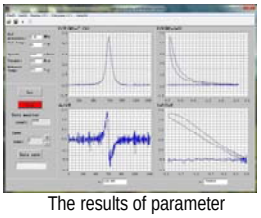
Maglev Control

MA1-P(28) 11:00-12:00

Development of Marine Diesel Engine Working Condition Acquisition and Analysis System

Defu Zhang[1], Shimin Han[2], Huichao Xiao[2], Xiangyi Wei[1]
(1.Maritime College, Tianjin University of Technology, Tianjin ,China;
2. School of Electrical Engnieering,Tianjin University of Technology, Tianjin , China)

•The exploration of operating parameters collection and analysis system for the marine diesel engine based on AC6111 high speed A/D acquisition card. Pressure sensor is used for the engine cylinder pressure signal creation.



The results of parameter acquisition and analysis

MA1-P(29) 11:00-12:00

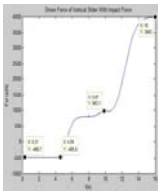
Dynamic Modeling of a Hybrid Assembly Robot for Blowout Preventing Based on the Blowout Environment Simulation

Jiangbo Qi, Ronglu sun, Song Wang, Junna Xiao
School of Mechanical Engineering, Tianjin Polytechnic University
Tianjin, China

• The kinematic and dynamic models of the robot were derived based on the analysis of the equivalent serial mechanism.

• Movement of the valve process under blowout condition was simulated by using dynamic mesh model in Fluent.

• The force-position functions of the valve moving under blowout condition has been derived by using least-squares approximation. And the amendatory dynamic model of the robot was got based on the functions.



Driving force curve of the slider

MA1-P(30) 11:00-12:00

A Review of STATCOM On The Electric Power System

Youjie Ma, Ahui Huang and Xuesong Zhou
Key Research Laboratory for Control Theory & Applications in Complicated Systems,Tianjin University of Technology
Tianjin, China

- Power electronic device in inverter use IGBT,IGCTor IGET.
- The main circuit develops to the multiple direction
- It use PWM pulse modulation technology
- The researchers continulally improve the traditional detection method of Ip-Iq

The basic structure of STATCOM

MA1-P: Poster Session

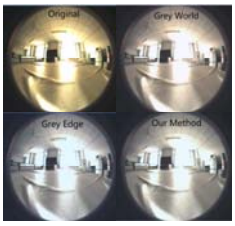
Session Chairs: Kazuhiro Kosuge, Tohoku University
Cheng-Ta Chiang, National ChiaYi University
Juying Ballroom, 11:00-12:00, Monday, 3 August 2015

MA1-P(31) 11:00-12:00

Design and Hardware Implement of Automatic White Balance Based on Chromaticity Difference

Baofeng Zhang, Zhaochao Wei, Huiyan Jia, Chunfang Lu, Junchao Zhu
Tianjin Key Laboratory of Control Theory & Application in Complicated System, Tianjin University of Technology
Tianjin, China

- Introduction of the automatic white balance algorithm which based on Chromatic difference.
- Comparing our approach with the other popular white balance algorithms.
- The hardware implementation of algorithm by applying DSP Builder and FPGA.
- Figures of the experiment and conclusion.



Figures of the experiment

MA1-P(32) 11:00-12:00

The Design and Implementation of Blood Analyzer Control System based on the Fluid Flow Aperture Device

Ling Tao, Liang Luo and Fugui Li
School of Information Engineering, Nanchang University, Nanchang, China

- Blood analyzer control system based on the fluid flow aperture device
- The design of special subdivided driving circuit according to the characteristics of the stepping motor ensure the accuracy of the motor, improve the machine performance.
- A unique signal amplifier circuit has effectively restrained various disturbance and has ensured accuracy and repeatability of testing results of instrument.

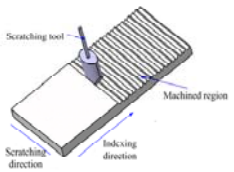
PCB photo

MA1-P(33) 11:00-12:00

Analysis and Experimental Study of Grooves in Ruling Process of Grating

DING Jiansheng, CAI Hongbin, ZHANG Baoqing, and SHI Guoquan
Department of Mechatronical Engineering, Changchun University of Science and Technology
Changchun, China

- Research background.
- Mechanically ruled grating groove control model.
- The simulation and experimental analysis of grating groove.
- Error analysis and control Strategy.
- Conclusion.



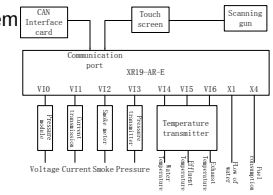
Schematic diagram of grating ruling

MA1-P(34) 11:00-12:00

Automatic Detection and Management System of Vehicle Heater Based on CAN Bus

Jifang Zhang , Shiwei Sun
Department of Electrical Automation
Hebei Engineering and Technical College
Cangzhou, Hebei Province,China

- The overall design of the system
- The remote server
- Local operating station



Block diagram of field control unit

MA1-P(35) 11:00-12:00

The Dynamics Research on the Composite Undercarriage of The Unmanned Aerial Vehicle

Yu-xiu Hou, Yong-liang Guan, Hong-guang Jia, Liu Bo, Wu-Yuan Ma
Changchun University of Science and Technology,
China Academy of Sciences Changchun Institute of Optics and fine mechanics and physics, Changchun, China

- The analysis results of dynamic deformation are 0.1205m, 0.1966m and 0.2089m. The results of dynamic tests are 0.1095m, 0.191m, 0.183m.
- the calculation analysis and the test results are almost the same.
- We check the strength using three kinds of materials, the carbon cloth, glass cloth and the glass prepreg, they all satisfy the intensity requirement.

The model of the composite Undercarriage

MA1-P(36) 11:00-12:00

Design and Application of Tunnel Kiln Temperature Control System

Yan Wang , Bin Liu
Tianjin Key Laboratory for Control Theory and Applications in Complicated System, Tianjin 300384,China;
School of Electrical Engineering, Tianjin University of Technology, Tianjin 300384,China

- Use Active Disturbance Rejection Controller (ADRC) to adjust the temperature of the Tunnel kiln.
- Document the variation of the Tunnel kiln parameter, the control building processes, and hardware platforms.
- Use PLC as a controller to complete the Tunnel kiln temperature control.
- Improve the energy efficiency and reduce operating costs of Tunnel kiln.

Tunnel Kiln

MA1-P: Poster Session

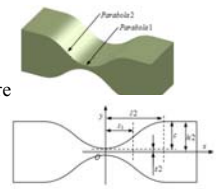
Session Chairs: Liwei Shi, Beijing Institute of Technology
Zhangguo Yu, Beijing Institute of Technology
Juying Ballroom, 11:00-12:00, Monday, 3 August 2015

MA1-P(37) 11:00-12:00

The Closed-form Compliance Equations for Combined-parabola-shaped Flexure Hinge Based on The Unit-load Method

Qiang Li, Dong Liu
Academy of Equipment
Beijing, China

- The closed-form compliance equations of the flexure hinge are derived.
- The numerical simulation is conducted to discuss the performance of the flexure hinge.
- the stiffness of the flexure hinge decreases as s_1 increases, increases as t increases.
- It possesses the ability to change its motion accuracy and its compliance.



The Combined-parabola -shaped Flexure Hinge

MA1-P(38) 11:00-12:00

Development of Switch Reliability Test Machine Based on Automobile Tail Gate

Zhiming Wang, Li Chen
School of Mechatronic Engineering and Automation, Shanghai University
Shanghai, China

- The switch reliability test of auto tail gate is a major trial for the safety of the car.
- Solve the problem of active duty tail gate flip tester can not be good at simulating human tailgate switch.
- The control system receives sensor data by a DAQ card, solves the problem of the database construction.
- This test machine is applicable for vehicles of all shapes and sizes, all test laws and regulations.

Switch Test Machine

MA1-P(39) 11:00-12:00

A Brief Survey on Networked Control Systems

Junbo Wang
School of Computer Science, Zhaoqing University
Zhaoqing, Guangdong Province, China

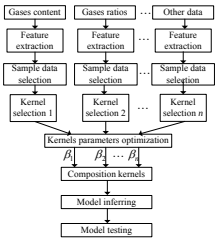
- Analyze the fundamental research of NCSs.
- Discuss the network-induced delay, data packet dropout, bandwidth constraints, network protocol, controller architecture
- Summarized the analysis methods of network-induced delays, network technology and control strategy
- Analyze the stabilization of networked control systems
- Present some future research areas
  - Modeling Systems with Network-Induced Delay
  - Network Technology and scheduling
  - Others

MA1-P(40) 11:00-12:00

Power Transformer Fault Diagnosis Based on Multi-class Multi-Kernel Learning Relevance Vector Machine

Jinliang Yin, Xuesong Zhou, Youjie Ma, Yanjuan WU and Xiaoning Xu
Tianjin University of Technology

- Fault diagnosis of power transformer based on MMKL-RVM is proposed.
- The method can provide probabilistic outputs and integrate the informative data indicating the fault existence.
- GA combined with K-CV is used to optimize the kernels parameters of MMKL-RVM.
- MMKL-RVM is capable of more excellent diagnosis accuracy to BP neural network and SVM.



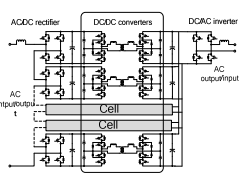
Flow chart of transformer fault diagnosis based on MMKL-RVM

MA1-P(41) 11:00-12:00

The Research of Coordination Control Strategy in Cascaded Multilevel Solid State Transformer

Hong Cheng, Yingcai Gong, and Qiaomei Gao
China University of Mining & Technology (Beijing)
Beijing, China

- The Solid State Transformer consists of a cascaded multilevel AC/DC rectifier, dual active bridge converters with high frequency transformers and a DC/AC inverter.
- Single Phase d–q Transformation.
- Modelling of Solid State Transformer.
- Voltage and Power Balance Control.



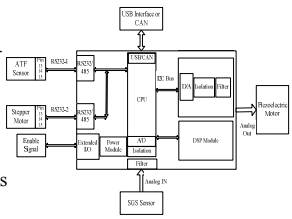
Solid State Transformer

MA1-P(42) 11:00-12:00

Design and Implementation of a Class of Autofocus Control Systems

Junbo Wang and Ping Shao
School of Computer Science, Zhaoqing University
Zhaoqing, Guangdong Province, China

- Present a class of autofocus system architecture is presented.
- Propose the mechanical components.
- Implement a detailed logical control decision.
- Show the test results of the focus image and response time



Hardware architecture

MA1-P: Poster Session

Session Chairs: Liwei Shi, Beijing Institute of Technology
Zhangguo Yu, Beijing Institute of Technology
Juying Ballroom, 11:00-12:00, Monday, 3 August 2015

MA1-P(43) 11:00-12:00

Elastic Deformation Error of the Spherical Gear Output Axis

Qiang Li, Dong Liu
Academy of Equipment
Beijing, China

- The analytic model of the elastic deformation error is established based on Castigliano second theorem.
- The analtic model of the elastic deformation error is verified through finite element.
- through decreasing the length of the output axis, increasing the outside circle radius, and increasing the inside circle radius, the elastic deformation error can be decreased.

The elastic deformation error of the spherical gear output axis

MA1-P(44) 11:00-12:00

Petrochemical Equipment Corrosion Prediction Based on BP Artificial Neural Network

Jiao Li, Gongqian Liang
School of Management Northwestern Polytechnical University
Xi'an, China

- In order to avoid the accident in refinery due to petrochemical equipment corrosion, this paper researched a BP neural network corrosion prediction model on petrochemical equipment.
- This model can better express the relationship of the corrosive medium factors (PH, CL−, H2S, NH3N) and the corrosion products(Fe2+ and Fe3+).
- Simulation results show that the predicted data are close to the monitored data, and the maximum relative prediction error is about 10%, so this model can be used to predict corrosion on petrochemical equipment.

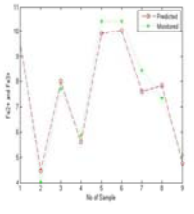


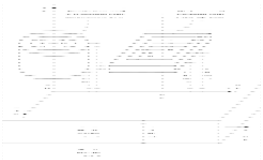
Fig.1 The result comparison of the predicted data and the monitored data

MA1-P(45) 11:00-12:00

Measurement Sensitivity Comparison between Cylindrical and Rectangular Coils above Conductive Plates

Siquan Zhang, Jiangfeng Tang and Weihua Wu
Department of Electrical Automation., Shanghai Maritime University
Shanghai, China

- Obtain the pick-up coil induced voltage using double Fourier transform method.
- Compare measurement sensitivity between cylindrical and rectangular pick-up coils.
- The influences of excitation frequency, conductor thickness and moving speed are discussed.



Cylindrical excitation and rectangular pick-up coils

MA1-P(46) 11:00-12:00

Pulse Signal Simulation Software Design

Jianyu Zhao， Xiaowei Li， Hai Shen
School of Electrical Engineering， University of Jinan
Jinan， China

- this article designed a computer simulation system to simulate the pulse wave of human body in different situations.
- Design of Man-machine Interface and PC Program.
- Pulse Waveform Modeling of Healthy Population.
- Bydesigning man-machine interface, a specific analog waveform shape is displayed well and the parameters of specific waveform is adjusted.

Interface homepage

MA1-P(47) 11:00-12:00

A New Bond Graph Model for Op amp

Mehrnaz Aghanouri Kupaei [1], Ali Esmaeili [1], and Saeed Behbahani [2]
[1] Faculty of Mechanical Engineering, K.N. Toosi University of Technology, Tehran, Iran
[2] Department of Mechanical Engineering, Isfahan University of Technology, Isfahan, Iran

- Bond graph is an integrated method of modeling which would be suitable for modeling mechatronic systems.
- The presented model, offer a new bond graph model for op amp to obtain the state space equations.
- This technique can model the op amp with finite and infinite gain and input impedance.

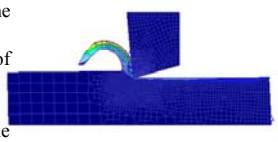
The proposed bond graph model for op amp

MA1-P(48) 11:00-12:00

An Online Approach to Monitor the Integrity of the High-speed Cutting Tool with Coatings

Yating Yu, Dejun Zhang, Lijuan Liu
School of Mechatronics Engineering
University of Electronic Science and Technology of China
Chengdu, China

•The temperature of the area above the defect of cutting tool with defect is obviously higher than the same area of cutting tool without defect.
•The investigation indicated that the infrared thermal imaging can show the condition of the integrity of the substrate material of cutting tool.



Temperature distribution of the cutting processing

MA1-P: Poster Session

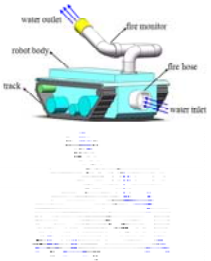
Session Chairs: Liwei Shi, Beijing Institute of Technology
Zhangguo Yu, Beijing Institute of Technology
Juying Ballroom, 11:00-12:00, Monday, 3 August 2015

MA1-P(49) 11:00-12:00

Kinematic Analysis of Fire-fighting Robot Under the Impact of Waterflow Recoil Force

Qin Zhang, Guangzhen Ke
School of Mechanical and Automotive Engineering, South China University of Technology, Guang zhou, Guangdong Province, China

- The impact of recoil force produced by the working fire monitor on the robot motion and stability is studied, with consideration of the effect of the fire monitor's jet velocity and orientation (pitch and tilt angles).
- This paper analyzes the critical conditions for slipping and tipping-over of the robot in fire-fighting.
- The effectiveness of the presented dynamic model and analysis is verified by simulations.
- The results are helpful in the design and control of tracked mobile fire-fighting robots.



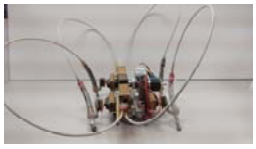
Crawler fire-fighting robot and mechanical model

MA1-P(50) 11:00-12:00

Design and Implementation of a Quadruped Robot Insect

Li-Chun Liao and Kun-Yen Huang and Bin-Chyi Tseng
Department of Computer Science and Information Engineering
Chaoyang University of Technology, Taichung, Taiwan

- A quadruped robot insect, robot-K, that can walk in rough and tilted terrain and imitate the gait of cockroaches.
- Users can remotely control the robot-K through the interface window to choose different walking speeds and directions.
- The maximum and minimum speeds of the robot-K are 2.8 m/s and 1.1 m/s, respectively.



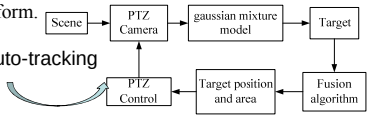
Robot-K

MA1-P(57) 11:00-12:00

Design and Implementation of a Moving Object Tracking System

Enzeng Dong, Shengxu Yan, Jigang Tong, Kuixiang Wei
Complex system control theory and application key laboratory, School of Electrical Engineering, Tianjin University of Technology (TUT) , Tianjin, China

- Propose an automatic detection and tracking algorithm on moving object.
- The GMM is applied to detect object, and Kalman filter and Camshift algorithm is utilized to track object.
- The Pan/Tile/Zoom (PTZ) control algorithm is designed to adjust the PTZ Camera parameters.
- The effective of algorithm proposed was verified by hardware experiment platform.



The diagram of auto-tracking system designed

MA1-P(52) 11:00-12:00

The overview on the Photo-voltaic System

Youjie Ma, Dong Liu and Xuesong Zhou
Key Research Laboratory for Control Theory & Applications in Complicated Systems,Tianjin University of Technology
Tianjin, China

- The concept of PV system.
- The necessity to develop PV system
- The key technologies of PV system
- MPPT Inverter and Islanding effect
- The future trend

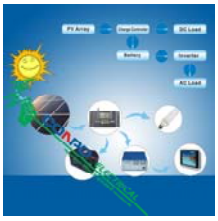


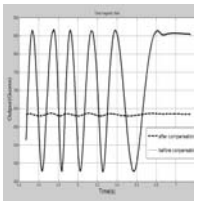
Photo-voltaic System

MA1-P(53) 11:00-12:00

One Compensating Method Of SMIE Based On Coupling Matrix

Guoxing Shi, Hai Li,Yanyan Yuan and Yingshu Chen*
Beijing Aerospace Automatic Control Institute,
*Beijing SinsTek.Co.Ltd,Beijing, China

- the errestrial magnetism measurement is easily corrupted by the environment magnetism
- This method employs optimal square triangular approximation method to make error compensating for the soft magnetic interference error(SMIE).
- The results show that the relative error of the total terrestrial magnetism falls from 57% to 1.6% after compensating.
- It can improve the comprehensive accuracy tremendously.



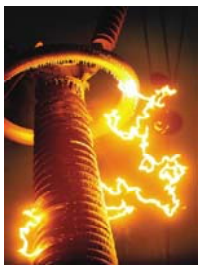
The total magnetic compensation data

MA1-P(54) 11:00-12:00

Strategy Research of Parallel Gap in EHV Overhead Transmission Lines

Jian-gang, LI Zhen-dong and WANG Tian-yi
State Grid Jibei Electricity Power Maintenance Company,
Beijing 102488, China

- Combining with the specific test, there are Lightning Proof EHV theoretical analysis and testing in different regions, diferent voltage levels and different levels of importance.
- Discusses the longitudinal and lateral reasonable distance between the insulator strings parallel gap and lower electrodes deeply.



Parallel Gap Test

MA1-P: Poster Session

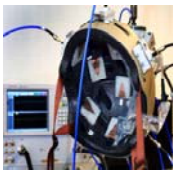
Session Chairs: Liwei Shi, Beijing Institute of Technology
Zhangguo Yu, Beijing Institute of Technology
Juying Ballroom, 11:00-12:00, Monday, 3 August 2015

MA1-P(55) 11:00-12:00

The latest research status and prospect on microwave technology for monitoring concerned brain activity

Xiang Wan, Daoguo Yang, Miao Cai, Shunfeng Han
Guilin University of Electronic Technology,China

- This paper mainly proposes and investigates the latest research status and prospect on microwave technology for monitoring concerned brain activity.
- The latest advances are illuminated via listing the main trendency from stroke, the body core temperature measurement and the dynamic dielectric at a brain functional site.
- The future development tendency is analyzed in rapid diseases diagnosis, portable medical devices development and combination with brain computer interface(BCI).



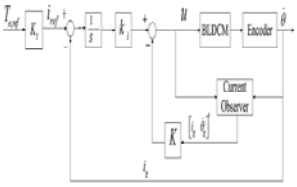
The antenna systems

MA1-P(56) 11:00-12:00

A TORQUE CONTROL STRATEGY OF BRUSHLESS DIRECT CURRENT MOTOR WITH CURRENT OBSERVER

Long Zhao, Xiaobin Zhang, Junhong Ji
State Key Laboratory of Robotics and Systems, Harbin Institute of Technology
Harbin,China

- a torque control strategy of brushless DC (BLDC) motor based on current observer and state feedback control algorithm.
- The capability and performance of the torque control algorithm of BLDC motor is verified.



MA1-P(57) 11:00-12:00

Research on Lateral Dynamics of Distributed Driving Vehicle with Torque Vectoring Steering

Zhongjie Luan, Zhicheng Wu
School of Mechanical Engineering, Beijing Institute of Technology
Beijing, China

- This paper discussed the lateral dynamics of Torque Vectoring steering vehicle and established a 2DOF model.
- This paper established a multi-body dynamic model of the Torque Vectoring steering vehicle based on ADAMS and the model was validated by simulation.
- Simulation results can be used to analyze the motor torque control system of Torque Vectoring steering vehicle.

Multi-body dynamic model

MA1-P(58) 11:00-12:00

An Overview on Smart Distribution Grid

Youjie Ma, Guidong Wang and Xuesong Zhou
Key Research Laboratory for Control Theory & Applications in Complicated Systems,
Tianjin University of Technology
Tianjin, China

- The concept of SDG.
- The necessity to develop SDG
- The key technologies to support SDG
- New technologies and tendency

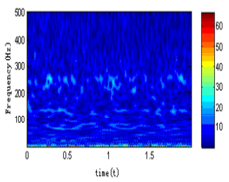
Smart Distribution Grid

MA1-P(59) 11:00-12:00

Identification of the electronic equipment's power-on characteristics based on the bus voltage ripple data

Xianhui Meng, Fusheng Zhang,Weiling Liu and Chao Tan
Institute of Manned Space System Engineering, China Academy of Space Technology
Beijing, China

- The identification of different equipment's power-on characteristics can be achieved through the analysis of the signals collected from bus ripple data during the running process of the equipment.
- There are two methods adopted which can we can basically realize the function of characteristic identification.



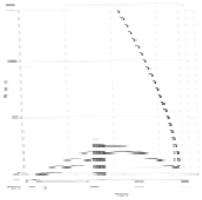
The Time-Frequency Diagram

MA1-P(60) 11:00-12:00

Autonomous Avoidance Technique Based on The Waypoint Optimization Algorithm

Guoxing Shi, Qinghai Gong, Zhengyu Song and Guoqiang Xu
Beijing Aerospace Automatic Control Institute, Beijing, China

- For autonomous obstacle avoidance requirements, an optimal feedback guidance algorithm based on multiple waypoints optimization algorithm is given in this paper.
- It is an improved optimal feedback guidance algorithm based on multiple waypoints optimization algorithm.
- Effectively avoid the obstacles and meet the flight height constraints and angle constraints to achieve a safe landing.



obstacle avoidance flight trajectory

MA1-P: Poster Session

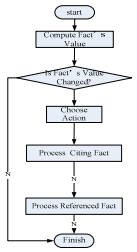
Session Chairs: Liwei Shi, Beijing Institute of Technology
Zhangguo Yu, Beijing Institute of Technology
Juying Ballroom, 11:00-12:00, Monday, 3 August 2015

MA1-P(61) 11:00-12:00

Rule-based Expert System for Large Scale Analytical Simulation

Lin Sun, Peng Jiao and Kai Xu
National University of Defense Technology
Changsha, Hunan Province, China

- A special expert system is designed for a large scale analytical simulation system which needs high running speed and flexible auto-decision models.
- The knowledge of the expert system is divided into three parts: fact, rule and action.
- Each agent has a special knowledgebase and a common inference engine.
- The reasoning direction is forward chain and the reasoning starts with fact's name.s



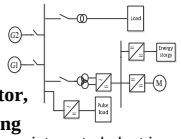
Main Process

MA1-P(62) 11:00-12:00

Restraining integrated electric propulsion system power fluctuation using Hybrid energy storage system

Jingnan Zhang, Qiang Li, Wang Cong and Lingzi Zhang
Department of Electrical Engineering Harbin Engineering University
Harbin, Heilongjiang

- **This paper studies the method about hybrid energy storage system(HESS) to stabilize the power fluctuation of integrated electric propulsion system(IEPS).**
- **Combined with the battery and super capacitor, HESS capacity configuration is optimized using PSO algorithm.**
- **The active parallel hybrid energy storage system is used to control energy storage.**



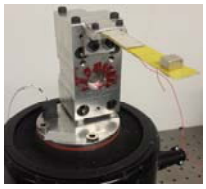
integrated electric propulsion system

MA1-P(63)11:00-12:00

Impedance Matching Circuit for Synchronous Switch Harvesting on Inductor Interface

Zhuo Xu[1], Zhengbao Yang[2], and Jean Zu[2]
[1]Department of Precision Instrument, Tsinghua University, Beijing, China
[2]Vibration, Design, and Mechatronics Lab., University of Toronto, Toronto, Canada

- This paper presents a power conditio-ning circuit intending to maximize the amount of power extracted from the synchronous switch harvesting on inductor (SSHI) circuit.
- The proposed circuit has the property of keeping the SSHI interface working at its optimal point.
- Experimental verified the improved efficiency of the proposed method compared to the standard energy harvesting circuit.



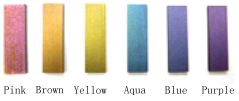
The experimental setup consisting of a PZT piezoelectric chip

MA1-P(64) 11:00-12:00

Micro Hardness Analysis of Colorful Oxide Film Formation on Titanium by Using WEDM-HS Process

Linshuai Zhang, Jinkai Xu,Bingyan Chen, Huadong Yu, Xinxin Zhang and Kui Xia
School of Mechatronical Engineering, Changchun University of Science and Technology
Changchun, China

- This paper describes the coloring technology on titanium alloy surfaces by WEDM-HS.
- We could get different colors on titanium alloy surfaces by adjusting the processing parameters.
- Micro hardness of titanium alloy after processing were higher than the matrix, and with the increase of coloring film thickness, the micro hardness will increase.



Actual colors of the workpiece by using WEDM-HS process

MA1-P(65) 11:00-12:00

Design of Communication System in Intelligent InstrumentBased on HART Protocol

Yusen Li, Ye Wang , Cong Ma
School of Electrical Engineering, Tianjin University of Technology(TJUT)
Tianjin, China

- Application technology of HART protocol in intelligent instruments.
- The system design of hardware and software.
- software anti-interference introduced.
- System debug experiment

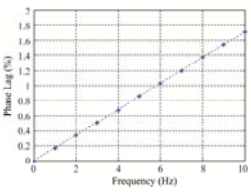
HART communication module

MA1-P(66) 11:00-12:00

Design and Analysis of a GMM Actuator for Active Vibration Isolation

Yunlu Pan and Xuezeng Zhao
School of Mechatronics Engineering, Harbin Institute of Technology
Harbin, China

- The structure and magnetic circuit of a giant magnetostriction actuator is designed and a method to load bias magnetic field by the bias coil is developed.
- A hysteresis characteristics model is established for super magnetostriction actuator.
- The giant magnetostrictive actuator designed has high precision.
- The designed giant magnetostriction actuator exhibits a sound feature in bass response.



Relative value of phase lag of coil current with different frequency

MA1-P: Poster Session

Session Chairs: Kazuhiro Kosuge, Tohoku University
Cheng-Ta Chiang, National ChiaYi University
Juying Ballroom, 11:00-12:00, Monday, 3 August 2015

MA1-P(67) 11:00-12:00

A Novel On-line Alumina Concentration Measurement System

Sen Zhang, Qiang Yang, Yixin Yin, Bin Cao
School of Automation and Electrical Engineering
University of Science and Technology Beijing

- Online Alumina Concentration Measurement System is based on ELM for the estimation
- The hardware design and development is based on the Chongqing Qineng Alumina factory
- Experimental data are obtained for the online measurement system.
- The alumina concentration measurement error is about 6% which is satisfactory.

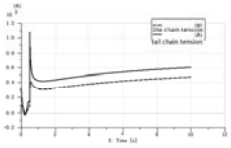
The system hardware of the Alumina Concentration Measurement System

MA1-P(68) 11:00-12:00

Dynamic simulation of startup-characteristics of scraper conveyor based AMEsim

YANG Jianjian[1], Wang Dong[2] and Fu Shichen[1]
1.School of Mechanical, Electrical & Information Engineering China University of Mining and Technology (Beijing), Beijing 100083, China
2. YANGQUAN COAL INDUSTRY(GROUP)CO.,LTD .Shanxi Province, China

- Calculation of load characteristics of scraper conveyor
  - A.calculation of scraper mechanism and transport capacity
  - B.calculation of scraper conveyor motor ability
  - C.The structure and characteristics of scraper conveyor
- Simulation of dynamic characteristics of start



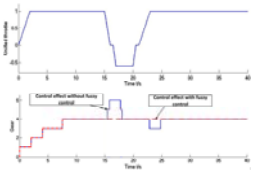
drawing of start of the chain tension curve

MA1-P(69) 11:00-12:00

Study on Fuzzy Shift Control Strategy of Multi-axles Independent Driving HEVs Based on Curve Recognition

Xu Mingrui, Peng Zengxiong, and Wei Chao
School of Mechanical Engineering, Beijing Institute of Technology
Beijing, China

- When driving across curve roads, the traditional shift strategy of the automatic transmission may cause unexpected gearshift.
- A fuzzy shift control based on curve recognition was studied to solve the problem above,
- Fuzzy shift control method proposed could effectively recognize curve roads and avoid unexpected gearshift.



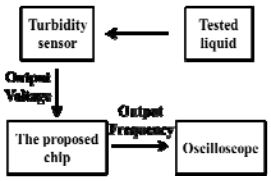
Control Effect of Fuzzy Gearshift When Driving across the Curved Road

MA1-P(70) 11:00-12:00

A CMOS Turbidity to Frequency Converter with Calibration Circuits for Detecting Turbidity Applications

Cheng-Ta Chiang and Shih-Ming Huang
Department of Electrical Engineering National Chia Yi University
Chia Yi, Taiwan

- Easy to send over a wide range of transmission media
- Reduce the non-linear effect by the proposed calibration circuits
- Being a general-purpose turbidity sensor transducer, it can be combined with various turbidity sensors



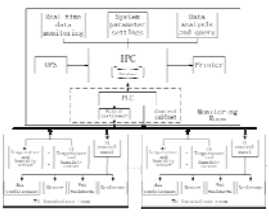
Block diagram of the proposed chip

MA1-P(71) 11:00-12:00

The Design of Temperature and Humidity Control System for Incubation based on Data Fusion and Fuzzy Decoupling

Wei Long, Fugui Li, Liang Luo and Xingyuan Zhang
School of Information Engineering, Nanchang University, Nanchang, China

- To solve the problems of low reliability of sensor and temperature & humidity coupling in the temperature and humidity Control System for Incubation.
- Used Adaptive weighted fusion algorithm for multi-sensor data.
- The fuzzy decoupling control rule is used to compensate the starting and stopping time of the temperature and humidity adjusting equipment



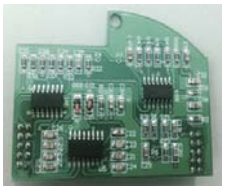
Structure diagram of temperature and humidity control system

MA1-P(72) 11:00-12:00

Design of Gas Turbine Flowmeter Based on TheTechnology of Automatic Gain Control

Yusen Li, Liying Cao, Ye Wang
School of Electrical Engineering, Tianjin University of Technology(TJUT)
Tianjin, China

- The gas turbine flowmeter and the technology of automatic gain control(AGC).
- Overall system design.
- Control method described.
- Experiment results validate conclusion.



The physical map of system

MA1-P: Poster Session

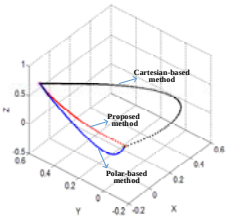
Session Chairs: Liwei Shi, Beijing Institute of Technology
Zhangguo Yu, Beijing Institute of Technology
Juying Ballroom, 11:00-12:00, Monday, 3 August 2015

MA1-P(73) 11:00-12:00

Novel Two-stage Hybrid IBVS Controller Combining Cartesian and Polar based Methods

Guoqiang Ye, Weiguang Li, Hao Wan, Huidong Lou
School of Mechanical and Automotive Engineering, South China University of Technology
Guangzhou, Guangdong Province, China

- Further study on polar-based IBVS controller, exploit several efficient choices of related combination matrix.
- Based on homography task decomposition, a novel two-stage IBVS controller Combining Cartesian and Polar based Methods, is proposed to decouple robotics motion for obtaining more improved performancee



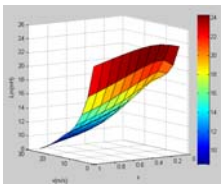
3D task space trajectories

MA1-P(74) 11:00-12:00

Development of HIL Simulation Platform for Metro Vehicle Linear Induction Motor Driving System

Ke'an Liu1,2, Hongqi Tian1, and Yu Zhang2
1.School of Traffic and Transportation Engineering Central South University Changsha, Hunan, China;
2. CSR Zhuzhou Institute Co., Ltd. Zhuzhou, Hunan, China

- Aiming at hardness and risk of metro vehicles LIM(Linear induction motor) driving system field debugging and test, a HIL (Hardware-in-loop) platform based on FPGA modeling was developed.



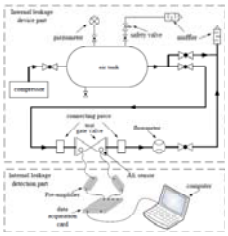
Mutual inductance varied with speed and slip rate

MA1-P(75) 11:00-12:00

Research on Gate Valve Gas Internal Leakage AE Characteristics under Variety Operating Conditions

Liang Zhu, Bing Zou, Shaohua Gao, Qiong Wang and Zhaodi Jia
Safety Engineering Institute, China Petroleum & Chemical Corporation
Qingdao, China

- Gate valve internal leakage can be represented by AE signal amplitude, ASL and energy.
- The three parameters may have linear variation or index movement under different operating conditions.
- The internal leakage AE parameters change slowly while internal leakage size is greater than a threshold value.



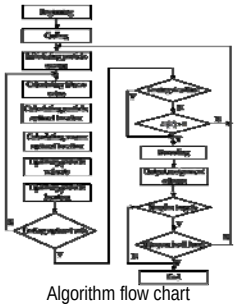
Experimental System

MA1-P(76) 11:00-12:00

Weapon Target Assignment of Key Points Air-defense under Dynamic Fire Alliance

Jing-shu Liu, Wen-zhi Jiang, Jin-jin Dai, Tao Liu
Department of Armament Science and Technology, Naval Aeronautical and Astronautical University
Yantai, China

- We stated the target assignment under dynamic fire alliance as guidance-launch-target assignment optimization problem.
- We defined the launch-ready zone and deadline to give the space and time constraint condition.
- We presented anytime-DPSO algorithm that can interrupt to output the results at any time to optimally assign guidance-launch pair to targets .



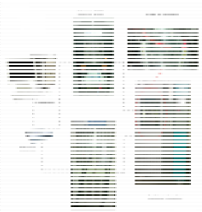
Algorithm flow chart

MA1-P(77) 11:00-12:00

Determination of The SOH Estimation Indicator and the Temperature Influence on the Lithium-ion Battery in the EV/PHEV Applications

Hengwei Zhang, Zechang Sun and Weijun Gu
School of Automotive Engineering, Tongji University
Shanghai, China

- Define SOH as a combination of the internal resistance and the capacity.
- The external impact factors, especially the temperature, have some influence on the measured capacity and the internal resistance.
- The external impact factors and testing protocol are all based on the application-driven, and considering both the EV and PHEV Applications.



The testing platform of the cycle life testing

MA1-P(78) 11:00-12:00

Research on the Detection and Tracking Technology of Moving Object in Video Images

Qingchang Guo and Bing qiao
Yichang Testing Technology Research Institute
Ychang, Hubei Province, China

For accurately detecting and tracking the moving object in the fixed scene, a new algorithm is proposed. The moving region is detected by the frame difference. The accurate moving object is segmented using the background difference. The tracking features are extracted based on the segmented object. The moving object is tracked by the mean-shift. And for accurately tracking the moving object, the background image is real-timely rebuilt and tracking feature is real-timely corrected. The effectiveness of the algorithm is verified through the experiment.

MA1-P: Poster Session

Session Chairs: Liwei Shi, Beijing Institute of Technology
Zhangguo Yu, Beijing Institute of Technology
Juying Ballroom, 11:00-12:00, Monday, 3 August 2015

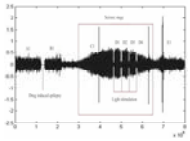
MA1-P(79) 11:00-12:00

The Research of Rat's Epileptic Waves Based on Optogenetics

Weifeng Liu, Xuyang Hao, Kuibin Sun, Xiaoying Tang, and Hanjun Li*
School of Life Science, Beijing Institute of Technology, Haidian District, Beijing, China

- Epilepsy is a kind of brain disease caused by the disorder of large number of brain neuron discharge.
- Use optogenetic animal model of epilepsy to research the changes of brain signals during blue light stimulation.
- The results demonstrate that optogenetics may provide us a useful tool to control the seizure and possibly other excitability disorders.

Schematic of fiber-electrode



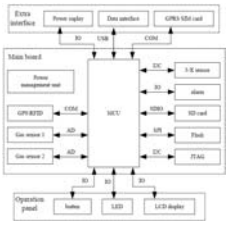
Epilepsy EEG signal of channel with light stimulation

MA1-P(80) 11:00-12:00

Design of Multi-sensor Wireless Monitoring System and its Application in Natural Gas Purification Plant

Liang Zhu, Bing Zou, He Zhang, Zhen Wang and Ming Jiang
Safety Engineering Institute, China Petroleum & Chemical Corporation
Qingdao, China

- The multi-sensor wireless monitoring system can receive monitoring data in time, send remote instruction, detect the gas concentration reliably and set the position accurately.
- The system can solve the field safety monitoring problem for natural gas purification plant commissioning test efficiently.



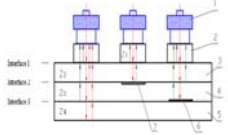
Architecture of Hardware

MA1-P(81) 11:00-12:00

Bonding test of carbon fibers by ultrasonic

Qinxue Pan, Lang Xu, and Shuai Liu
Key Laboratory of Fundamental Science for National Defense for Advanced Machining Technology., Beijing Institute of Technology. China Academy of Aerospace Aerodynamics
Beijing, China

- The research background and the basis on Bonding Test of Carbon Fibers
- Research methods and techniques
- Results
- Conclusions
- Acknowledgments



Principle of ultrasonic detection

MA1-P(82) 11:00-12:00

A Fuzzy-PID Glucose Control Strategy for Insulin Therapy in Type 1 Diabetics

Ruiqiang Hu, Chengwei Li
School of Electrical Engineering and Automation, Harbin Institute of Technology
Harbin, China

- Diabetes Mellitus is an incurable disease affecting millions of people worldwide.
- Insulin therapy is one of the most effective means in glucose control.
- The closed-loop system contains three main components, are (1) blood glucose sensor, (2) controller, (3) pump.
- A fuzzy-PID control strategy is designed for continuous insulin infusion.

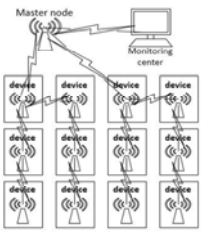
The closed-loop insulin pump

MA1-P(83) 11:00-12:00

Design and Implement of a Flammable Gas Detection System Based on Wireless Sensor Network

Jinjie Qin, Zhiwei Gao, Hui Li, Zhongming Sun
School of Electrical Engineering,Tianjin University of Technology,China

- This is a flammable gas detection system based on wireless sensor network.
- Device monitor the gas leak status timely and upload to the monitoring center.
- Once gas concentration is higher than threshold value, the audible and visual alarm will be started.
- The information will be shown on monitoring center.



Wireless Sensor Network

MA1-P(84) 11:00-12:00

Dual-Fault Tolerant Control Method of Feedback Loop for Permanent Magnet Synchronous Motor

Jianming Li[1,2], Jinglun Zhou[1], Zhiyuan Yu[2], Xiaorong Zhu[2]
[1]National University of Defense Technology, Changsha, China;
[2]Beijing Research Institute of Precise Mechatronics and Controls, Beijing, China

- Requirements analysis of feedback sensors for this method
- Fault tolerant detection design of PMSM rotor position
- Verify the influence of switching process on static and dynamic performance with load through experiments.
- The experiments show that this method has higher reliability without increasing cost.

Failure Modes	Work Mode	Rotor position	Motor speed	EMA position
No failure	NM	R	R	P
Resolver failed	PM	P	P	P
Potentiometer failed	RM	R	R	R

Dual-Fault Tolerant Control Method

MA1-P: Poster Session

Session Chairs: Liwei Shi, Beijing Institute of Technology
Zhangguo Yu, Beijing Institute of Technology
Juying Ballroom, 11:00-12:00, Monday, 3 August 2015

MA1-P(85) 11:00-12:00

Performance Evaluation of a Novel Telerehabilitation System for the Elbow Joint Training

Songyuan Zhang[*1] and Shuxiang Guo[*2*3]
[*1] Graduate School of Engineering, Kagawa University, Japan
[*2] Department of Intelligent Mechanical Systems Engineering, Kagawa University, Japan
[*3] Beijing Institute of Technology, china

- Designed a novel SEA-based upper limb-like device for therapists' use.
- Designed an compact exoskeleton device for patients' use.
- Aimed to solve the loss of real contact feeling in the telerehabilitation.

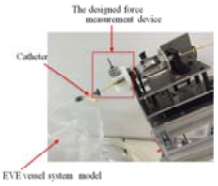
Telerehabilitation training

MA1-P(86) 11:00-12:00

Development of a Force Measurement Device for the Tele-Operative Catheter Operating System

Hengrui Li*1, Shuxiang Guo*2,*3, Jin Guo*1,Xuanchun Yin*1and Yu Wang*1
*1Graduate School of Engineering , Kagawa University, Japan
*2 Department of intelligent mechanical systems of Engineering, Kagawa University, Japan
*3 School of life science, Beijing Institute of Technology, China.

- A force measurement device has been development and fabricated.
- Catheter insertion force has been measured.
- Some experiments have been conducted to verify the efficiency of designed device.



Force measurement device

MP1-1: UAV

Session Chairs: Kazuhiro Kosuge, Tohoku University, Japan
Yoshio Yamamoto, Tokai University
Conf. Room 1, 13:30-15:00, Monday, 3 August 2015

MP1-1(1) 13:30-13:45

Real-Time 6DoF Deck Pose Estimation and Target Tracking for Landing an UAV in a Cluttered Shipboard Environment using On-Board Vision

Shanggang Lin, Matthew A. Garratt, and Andrew J. Lambert
School of Engineering and Information Technology
University of New South Wales, Australia, Canberra

- Vision-based approach for recognizing and tracking the international landing target, even when occlusion or contamination occurs.
- Full 6DoF relative pose estimation by means of target-shape evaluation.
- Real-time on-board implementation on Pelican quadrotor, demonstrated by vision-based closed-loop flight tests.

The Pelican quadrotor in hover

MP1-1(2) 13:45-14:00

Modelling, Simulation and Navigation Experiments of Unmanned Aerial Vehicle

Mitsuru Enomoto, Yoshio Yamamoto
Department of Precision Engineering, Tokai University, Japan

- This research is aimed at an autonomous long-run flight of a solar-powered UAV which is a joint research project between Tokai Univ. and King Abudraziz Univ., Saudi Arabia.
- This paper discusses aircraft modelling and a flight simulator using Datcom and Matlab.
- Navigation experiments are conducted with a UAV prototype.

Aircraft "Sunfalcon 1" used in this study

MP1-1(3) 14:00-14:15

A homography-based visual inertial fusion method for robust sensing of a Micro Aerial Vehicle

Ping Li, Matthew Garratt and Andrew Lambert
School of Engineering and Information Technology
The University of New South Wales, Australia

- The intensity image is binarized and used as input for the Lucas Kanade algortithm to improve its robustness.
- A new homography model is developed and a new parameterization avoids SVD after the homography matrix is calculated, greatly improving the accuracy of motion estimation.
- Visual estimation is fused with IMU data to obtain metric state estimation.

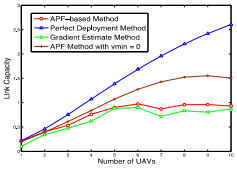
The AscTec Pelican

MP1-1(4) 14:15-14:30

Using Unmanned Aerial Vehicle Chain to Improve Link Capacity of Two Mobile Nodes

Ming Zhu, Yueyue Chen, Zhiping Cai and Ming Xu
College of Computer, National University of Defense Technology
Changsha, Hunan, China

- UAVs can be used as relays to improve communication link of ground mobile nodes.
- We study the optimization problem of motion control of UAVs to maximize the link capacity of two ground mobile nodes and propose an artificial potential field (APF) based solution.
- Simulation results demonstrate that the APF-based solution has better performance than existing methods.



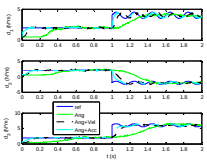
Simulation Result

MP1-1(5) 14:30-14:45

Disturbance Estimation for RUAV Using UKF with Acceleration Measurement

Ziya Jiang, Yuqing He, and Jianda Han
State Key Laboratory of Robotics, Shenyang Institute of Automation, CAS
Shenyang, China

- Attitude Dynamics of RUAV With Disturbance
- Unscented Kalman Filter for Disturbance Estimation
- Different Forms of Measurements
- Simulation Results and Comparison



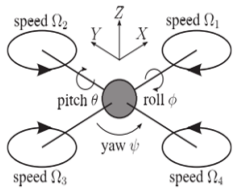
Comparison of UKFs for Estimation of Sine Disturbance with High Frequency

MP1-1(6) 14:45-15:00

The Quadrotor MAV System using PID Control

Minh Nguyen Duc[1], Thang Nguyen Trong[1], Yang Sheng Xuan[2]
(1) Dept. of Electrical & Electronics, Haiphong Private University, Vietnam
(2) Engineering Faculty, Dalian University of Technology, China

- The PID controller is designed by singer-loop control structure for the pitch, roll and yaw respectively for the quadrotor helicopter.
- The results of experiment verify that the PID control strategy can achieve the stabilization control of the quadrotor.



Quadrotor Coordinate System

MP1-2: Modeling and Simulation I

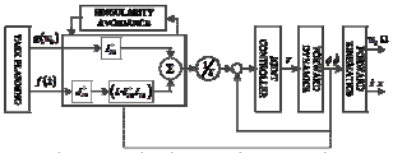
Session Chairs: Hongsheng Zhang, Beihang University
Xinkai Chen, Shibaura Institute of Technology
Conf. Room 2, 13:30-15:00, Monday, 3 August 2015

MP1-2(1) 13:30-13:45

Cartesian Path Planning for Base Attitude Adjustment of Space Robot

Minghe Jin, Cheng Zhou, Yechao Liu*,Hong Liu
State Key Laboratory of Robotics and System
Harbin Institute of Technology, Harbin, P.R.China

- A task-priority Reaction Null-space control method is applied to achieve the primary task to adjust attitude and secondary task to accomplish Cartesian task..
- the varied damping factors are introduced to avoid dynamics singularity



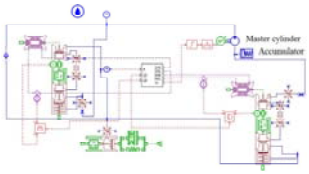
The control scheme of space robot

MP1-2(2) 13:45-14:00

The thermal analysis of drive circuit of High Speed On-Off Valve(HSV) based on Three Co-simulation

Guirong Zhuo and Hai Li
Clean Energy Automotive Engineering Center., Tongji University
Shanghai, China

- Introduction.
- Physical model of HCU.
- Drive circuit of HSV.
- ABS control simulation.
- Analysis simulation results.



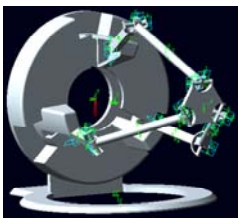
The hydraulic system

MP1-2(3) 14:00-14:15

Dynamics Forces Modelling and Simulation for 3-RUU Parallel Main Hand

Lingtao Yu[1], Wenjie Wang[1※], Huajian Song[2], Jing Yang[1], Lan Wang[1],
[1]College of Mechanical and Electrical Engineering, Harbin Engineering University
[2]State Key Laboratory of Robotics and System , Harbin Institute of Technology
Harbin, Heilongjiang Province, China

- Based on advanced dynamics, the absolute angular velocity of the passive rod was obtained
- 3-RUU parallel main hand dynamic force sensing model was established. Dynamic simulation results demonstrated the correctness of dynamic force sensing model.
- compared with statics model, the dynamic force sensing model is more applicative in an environment which need more force sensing accuracy.



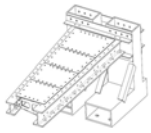
The model of 3-RUU Parallel Main Hand

MP1-2(4) 14:15-14:30

Visual Monitoring Research of Airfoil Structural Based on Virtual Test Technology

LIU Feng-yi,XIAO Li-feng, PENG Jin-bao ,YANG Xue-fei
School of Mechanical Engineering & Automation
Beihang University
Beijing, China

- Static loading test is conducted to obtain the measured strain data; finite element software ANSYS and WORKBENCH are used to simulate airfoil 3D model and obtain the simulation strain data;
- virtual test model is constructed through fusing measured and simulation strain data by applying Bayes-Kriging method. This model transforms the health monitoring process of structure into a visual fluctuating process of spatial curved surface, which helps realize dynamic observation of the structure state.
- Structure state model graph is constructed through contrasting the virtual test model and the reference model of health conditioning, which could amplify the strain changes. Then the structure condition could be qualified by the features of model graph.
- Structure visual monitoring and condition qualification are both realized by the experiment.



The test airfoil assembly drawing

MP1-2(5) 14:30-14:45

Thermal Model of Permanent-Magnet Synchronous Motor Based on Support Vector Machine and Fuzzy Modeling

Hongsheng Zhang, Yunze Li, Hang Zhou and Shengnan Wang
School of Aeronautics and Engineering, Beihang University, China
Qi Lu
Department of Mechatronics, ABB Corporate Research Center, Shanghai, China

- Various working conditions of the PMSM could be carried out on this experiment setup constructed.
- Thermal model yield by SVM has high regression accuracy, without requirement of physical models.
- T-S fuzzy model has a higher accuracy compared with SVM.

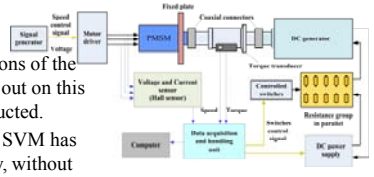


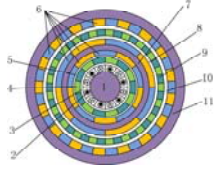
Diagram of The Experimental Setup

MP1-2(6) 14:45-15:00

Nonlinear Forced Vibration of Electromechanical Integrated Magnetic Gear System

Xiuhong Hao and Xuejun Zhu
School of Mechanical Engineering, Yanshan University
Qinhuangdao, China

- EIMG integrates field modulated magnetic gear, drive and control.
- The electromagnetic coupling forces among components in EIMG are the nonlinear functions of the relative displacements.
- When the exciting frequency is closed to the combination frequency between two modes of EIMG system, the strong transient responses will occur and decease very slowly, but not resonance.
- Electromagnetic coupling forces are much smaller than the mechanical meshing forces.



Electromechanical Integrated Magnetic Gear (EIMG)

MP1-3: OS30: Medical Robots for Minimal Invasive Surgery I

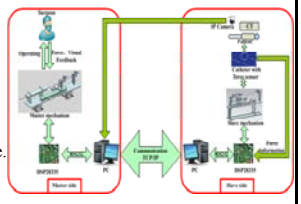
Session Chairs: Shuxiang Guo, Beijing Institute of Technology
Zhijiang Du, Harbin Institute of Technology
Conf. Room 3, 13:30-15:00, Monday, 3 August 2015

MP1-3(1) 13:30-13:45

Performance Evaluation of Force Feedback for the Improved Vascular Interventional Robotic System

Lin Shao*1, Jian Guo*1, Shuxiang Guo*1*2, and Yang Yu*1
*1 Tianjin Key Laboratory for Control Theory & Application in Complicated Systems and Biomedical Robot Laboratory Tianjin University of Technology Binshui Xidao 391, Tianjin, China
*2 Intelligent Mechanical Systems Engineering Department Faculty of Engineering Kagawa University Takamatsu, Kagawa, Japan

- In this paper, a novel master-slave robotic catheter system has been proposed for the VIS.
- The system uses MR (magneto rheological) fluid to implement force feedback.
- The force feedback evaluation experiments of the damper were done. The error between the detected force and the damping force is in the allowable range. The maximum of error is lower than 0.1N.



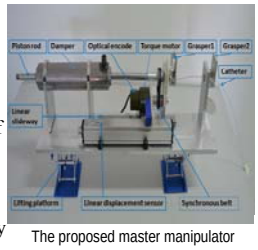
The conceptual diagram of the master-slave robotic catheter system

MP1-3(2) 13:45-14:00

Modelling and Analysis of the Damping Force for the Master Manipulator of the Robotic Catheter System

Yang Yu*1, Jian Guo*1, Shuxiang Guo*1*2 and Lin Shao*1
*1 Tianjin Key Laboratory for Control Theory & Application in Complicated Systems and Biomedical Robot Laboratory Tianjin University of Technology Binshui Xidao 391, Tianjin, China
*2 Intelligent Mechanical Systems Engineering Department Faculty of Engineering Kagawa University Takamatsu, Kagawa, Japan

- A mathematical model of the damper has been built to get the relationship between the current of the coil and the damping force.
- A PID control algorithm was designed to improve the accuracy of force feedback.
- The experimental results show that the proposed PID control algorithm can effectively enhance the accuracy of force feedback during VIS.



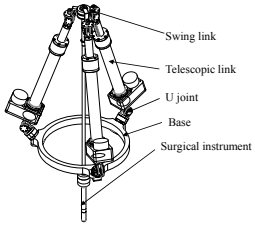
The proposed master manipulator

MP1-3(3) 14:00-14:15

Design and Kinematic Analysis of A Parallel Robot with Remote Center of Motion for Minimally Invasive Surgery

Zhang Zhenchuan, Yu Hongjian and Du Zhijiang
State Key Laboratory of Robotics and System, Harbin Institute of Technology
Harbin, China

- A design of a new type of RCM (Remote Center of Motion) parallel MIS (Minimally Invasive Surgery) robot is proposed.
- The 3D model of the parallel mechanism is available
- The inverse kinematics and jocabian matrix of the mechanism are deduced
- Significant structure geometric sizes are optimized by PSO algorithm.



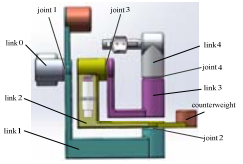
The parallel MIS robot

MP1-3(4) 14:15-14:30

Optimal Design of Dynamic Balancing for the Redundant Orientation Mechanism of a Master Manipulator

Lihong Chen, Zhiyuan Yan and Zhijiang Du
State Key Laboratory of Robotics and Harbin Institute of Technology
Harbin, Heilongjiang 150001, China

- A methodology of combining counterweight and actuator torque is proposed to achieve the dynamic balancing for the redundant orientation mechanism of a master manipulator
- With the method of Kane, the dynamic model is established.
- Simulated annealing is applied to optimize the counterweights based on the moment of inertia and actuator torque.



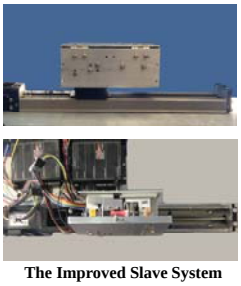
The redundant orientation Mechanism of a master manipulator

MP1-3(5) 14:30-14:45

A Novel Force Feedback Interventional Surgery Robotic System

Weili Peng, Nan Xiao, Shuxiang Guo, Yuan Wang
The Institute of Advanced Biomedical Engineering System, School of Life Science, Beijing Institute of Technology

- the phantom omni as the master controller, and design a new novel of interventional operation slave system
- force feedback structures
- The system uses Fuzzy PID looped control, and this paper analyses the dynamic performance of the surgery robot system.



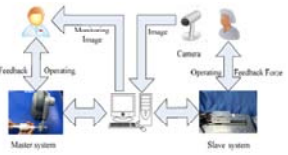
The Improved Slave System

MP1-3(6) 14:45-15:00

Study on Haptic Feedback Functions for an Interventional Surgical Robot System

Yuan Wang, Shuxiang, Ping Guo , Nan Xiao
The Institute of Advanced Medical Engineering System,
School of Life Science, Beijing Institute of Technology, Beijing, China

- This paper presents a novel interventional surgical robot systems.
- The robot system will simulate the procedure of the doctor's hand to operate the guide wire, and providing haptic feedback to the doctor.
- Performance improvement of the robot operation system which brought by the haptic feedback function was confirmed.



Interventional surgical robot system

MP1-4: Advanced Control Systems

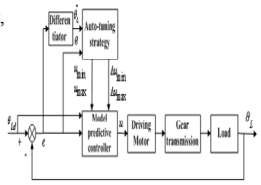
Session Chairs: Tzyh Jong Tarn, Washington University in St. Louis, USA
Jingnan Zhang, Harbin Engineering University
Conf. Room 4, 13:30-15:00, Monday, 3 August 2015

MP1-4(1) 13:30-13:45

An auto-tune model predictive control approach for position servo system with backlash

Chao Peng1, Jianxiao Zou2, Chongwei Han3 and Guanghui ZhangN
School of Automation Engineering.,University of Electronic Science and Technology of China
Chengdu, China

- Backlash which always exists in gear transmission position servo system, would cause dead-zone error, outputting oscillation, limit cycle and deteriorate system control performance.
- To enhance the control performance of position servo system with backlash, a novel auto-tune model predictive control approach is proposed.



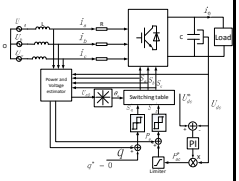
Control Scheme

MP1-4(2) 13:45-14:00

Triple-state hysteresis direct power control for three phase PWM Rectifier

Baolong Liu, Yabing Zha, Tao Zhang and Shiming Chen
National University of Defense Technology
Changsha, Hunan Province, China

- A new triple-state hysteresis DPC based on power analysis is designed
- A power zero state and hysteresis comparator is added into the switching table.
- The rectifier voltage vector is selected based on the voltage sector and power hysteresis comparator.
- The ability of decoupling power and dynamics performance are improved by this method.



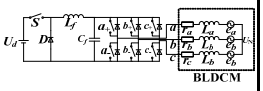
Main Process

MP1-4(3) 14:00-14:15

One-Cycle Control for Buck Inductor Current Based on BLDC Control System

Tao Shan, Xiaolin Wang, Tiantian Sheng
College of Automation Engineering, Nanjing University of Aeronautics and Astronautics
Nanjing, China

- Small Capacitance is used to make the whole system more compact.
- The capacitor voltage will be uplifted during commutation if the capacitance is small.
- Traditional PI controller is difficult to adapt these effects.
- In the proposed algorithm, the capacitor voltage is considered and used as an input to the controller.
- The duty ratio can be calculated accurately.



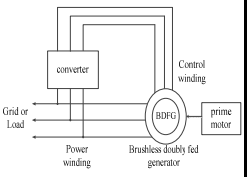
Equivalent Circuit

MP1-4(4) 14:15-14:30

The Vector Control Research of Brushless Doubly-fed Shaft Generator for Running Independently

Jingnan Zhang, Linlin Bai and Qiang Li
Department of Electrical Engineering, Harbin Engineering University
Harbin, Heilongjiang, China

- The variable speed constant frequency and constant voltage problem is a key technology of the ship shaft power generation system stable.
- Combining vector control strategy based on the stator power winding flux oriented with fuzzy adaptive PID controllers to control the system.
- Simulation results show that the system has good dynamic and static stability under this control strategy.



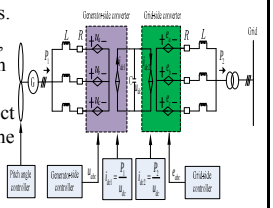
Brushless Doubly-fed Shaft Generation System

MP1-4(5) 14:30-14:45

General Average Model of D-PMSG and Its Application with Virtual Inertia Control

Li Xu,Gang Wang,Lijun Fu,You Wu, Qiaoming Shi
National Key Laboratory for Vessel Integrated Power System Technology
Wuhan, Hubei Province, China

- The GA model and the detailed model have the same response characteristics.
- By introducing virtual inertial control, D-PMSG can effectively participate in the system frequency regulation. And the GA model with VIC can still reflect the dynamic frequency responses of the D-PMSG.
- The GA model of D-PMSG can significantly improve the simulation speed of system.



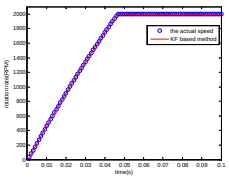
GA model and control strategies of D-PMSG

MP1-4(6) 14:45-15:00

Speed and Load Torque Estimation of SPMSM based on Kalman Filter

Hui Wang, Yunkuan Wang and Xinbo Wang
Institute of Automation, Chinese Academy of Sciences
Beijing, China

- Based on kinemic function of SPMSM model.
- Kalman filter algorithm is on the sense of the optimal information fusion of speed measurement and model estimation.
- Calculated covariance matrices Q and R in Kalman filter with large sample data.
- Load torque estimation at the same time time.



Speed Estimation at 2000RPM Based on KF

MP1-5: OS34: Cooperative Control and Multi-Agent Systems I

Session Chairs: Jie Chen, Beijing Institute of Technology
Zhongping Jiang, New York University
Conf. Room 5, 13:30-15:00, Monday, 3 August 2015

MP1-5(1) 13:30-13:45

Quantized Stabilization of Nonlinear Cascaded Systems with Dynamic Uncertainties

Tengfei Liu
Northeastern University Shenyang, 110819, China
Zhong-Ping Jiang
New York University Brooklyn, NY 11201, USA

This paper studies the quantized partial-state feedback stabilization of a class of nonlinear cascaded systems with dynamic uncertainties. Under the assumption that the dynamic uncertainties are input-to-state practically stable, a novel recursive design method is developed for quantized stabilization by taking into account the influence of quantization and using the small-gain theorem. When the dynamic uncertainty is input-tostate stable, asymptotic stabilization can be achieved with the proposed quantized control law.

$$\hat{x}_2 = \kappa_1(q_1(x_1)) \quad (47)$$
$$\hat{x}_{i+1} = \kappa_i(q_i(x_i) - \hat{x}_{i-1}), \quad i = 2, \ldots, n-1 \quad (48)$$
$$u = \kappa_n(q_n(x_n) - \hat{x}_{n-1}) \quad (49)$$

such that

$$x_2 \in \hat{S}_1(X_1) \Rightarrow \cdots \Rightarrow x_{i+1} \in \hat{S}_i(X_i) \Rightarrow \cdots \Rightarrow u \in S_u(X_n). \quad (50)$$

If the offsets δ_{q_i}'s in Assumption 1, $\delta_{\hat{x}_i}$'s in Assumption 2, δ_{κ_i}'s in Assumption 4, and a_i's in Assumption 5 are equal to zero, then the closed-loop quantized system is asymptotically stable.

MP1-5(2) 13:45-14:00

Robust Direct Visual Inertial Odometry via Entropy-Based Relative Pose Estimation

Jianjun Gui, Dongbing Gu, and Huosheng Hu
School of Computer Science and Electronic Engineering,
University of Essex, Colchester, UK

- An odometry method using only monocular camera and IMU;
- Direct image information (pixel intensity) is adopted instead of sparse features;
- Mutual information between images is used to perform pose tracking;
- Inertial driven estimates are loosely coupled with the results from visual tracking under an EKF framework.

Estimated Trajectories

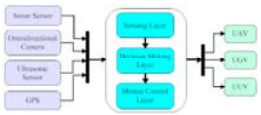
MP1-5(3) 14:00-14:15

Design of Formation Control Architecture Based on Leader-following Approach

Tianyong Zhang
Center For Control Theory and Guidance Technology, Harbin Institute of Technology, Harbin, China

Guoping Liu
Faculty of Advanced Technology University of South Wales
Pontypridd, U.K.

- Propose formation control architecture with three layers
- Transform formation control problem to several local motion control problem
- Define formation trajectory vector and formation shape matrix
- Make switching of formation trajectory and/or formation shape simple



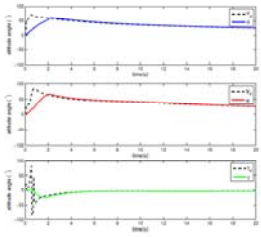
Three Layer Architecture

MP1-5(4) 14:15-14:30

Adaptive Sliding Mode Attitude Controller Design for Multi-missile Cooperation

Guangyuan Shao, Hao Fang, and Xueyuan Wang
School of Automation, Beijing Institute of Technology
Beijing, China

- Proposed a quaternion missile model for attitude control of multi-missile formation
- Designed a two-layer sliding controller to track the desired attitude angles for the 3-missile formation flight
- An adaptive item is added to the controller to deal with the uncertainty problems
- Simulation results illustrate the performance of the proposed controller



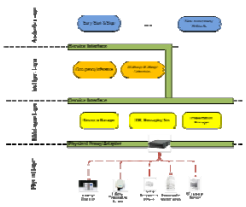
The Attitude Control Result

MP1-5(5) 14:30-14:45

Domestic Space Heating Energy Control via Smart Home Energy Management

Xi Chen, Shuang-Hua Yang, Chi Biu Wong, Philip Moore and Jie Chen
Department of Computer Science, Loughborough University, Loughborough, LE11 3TU, UK

- One of effective ways to reduce energy consumption in the home environment is the Smart Home Energy Management System (SHEMS) .
- This trial study intends to provide the evidences of SHEMS effectiveness.
- The trial result shows the achieved sustainable energy wastage reduction.



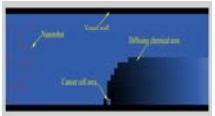
SHEMS Architecture

MP1-5(6) 14:45-15:00

A Nanorobot Control Algorithm Using Acoustic Signals to Identify Cancer Cells in Non-Newtonian Blood Fluid

Qingying Zhao, Min Li, Jun Luo, Lianhang Dou and Yang Li
School of Mechatronic Engineering and Automation, Shanghai University, China

- This paper presents a nanorobot control algorithm based on the mechanical properties of Non-Newtonian blood fluid.
- The control algorithm uses acoustic communication to coordinate nanorobots identifying cancer cells in blood vessel.
- Comparisons with other methods by simulation were carried out. The results show that the proposed algorithm performs well.



The nanorobots in the simulated blood vessel

MP1-6: Design and Analysis of NANO Systems I

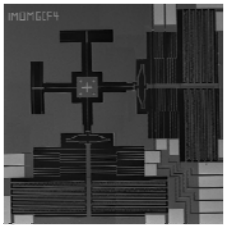
Session Chairs: Tatsuo Arai, Osaka University, Japan
Xiang Xi, National University of Defense Technology
Conf. Room 6, 13:30-15:00, Monday, 3 August 2015

MP1-6(1) 13:30-13:45

A MEMS *XY*-Stage with Sub-Nanometer Positioning Resolution

Xiang Xi[1,2], Tyler Clancy[1], Xuezhong Wu[2], Yu Sun[3], and and Xinyu Liu[1]*
[1]Department of Mechanical Engineering, McGill University, Canada
[2]Department of Mechatronics Engineering, National University of Defense Technology, China
[3]Department of Mechanical and Industrial Engineering, University of Toronto, Canada

- A MEMS *XY*-stage integrating motion amplification mechanisms.
- Bidirectional *Z*-beam electrothermal actuators drive the *XY*-stage.
- Motion amplification mechanisms linearly scale down output motions to achieve sub-nanometer resolution.
- Capacitive position sensor provide position feedback in *XY* directions.
- Closed-loop nanopositioning is performed.



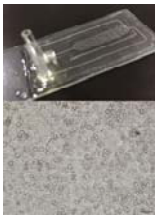
MEMS *XY*-stage

MP1-6(2) 13:45-14:00

NOA 81 Fabricated Microfluidic Chip for SH-SY5Y Cell Culture

Rui Li, Xuefei Lv and Yulin Deng*
School of Life Science, Beijing Institute of Technology
Beijing, China

- Microfluidic chip fast fabricated by NOA 81
- Best design options for the microfluidic chip
- SH-SY5Y cells in chip for long tern culture



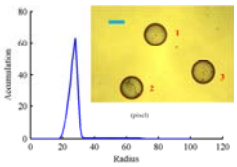
NOA81 chip for SH-SY5Y cell culture

MP1-6(3) 14:00-14:15

A Novel Detection Algorithm of Microspheres Based on Hough Transform and Ellipse Fitting

Changsheng Dai[1], Weibin Rong[2], Zenghua Fan[1], Yu Zou[1], Lining Sun[1]
[1]State Key Laboratory of Robotics and System, Harbin Institute of Technology, Harbin, China
[2] Key Laboratory of Micro-systems and Micro-structures Manufacturing, Ministry of Education, Harbin Institute of Technology, Harbin, China

- Coarse to fine and fully automated detection algorithm.
- Combines robustness, accuracy and speed.
- Obtaining center positons, radii, roundness, deficiency and adhesion.
- Experiments with nearly 100% successful detection rate and less than 10 μm absolute deviation of radius.



Microsphere Detection

MP1-6(4) 14:15-14:30

An Electromagnetic System for Magnetic mirobead's Manipulation

Fuzhou Niu, Weicheng Ma, Henry K.Chu, Haibo Ji, Jie Yang, and Dong Sun
Department of Precision Machinery and Instrumentation,
University of Science and Technology of China, China

- A magnetic micromanipulation system for wireless control of a single magnetic bead.
- Microbeads with a size of less than 15 μm.
- Each coil can generate a magnetic field with a magnetic flux density of 25mT and a magnetic gradient of 2T/m, per one ampere current input.

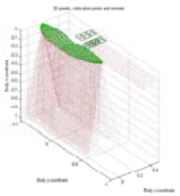
Magnetically actuated micromanipulation system

MP1-6(5) 14:30-14:45

Generalized design and optimization of small UAV based on flight dynamic analysis

Shuo Zhang, Zhengjie Wang, Yang Yu and Wenming Dong
School of Mechatronics, Beijing Institute of Technology
Beijing, China

- A generalized design approach for small unmanned aerial vehicle
- Design and optimize the structure arrangement, aerodynamic and control simultaneously by flight dynamic analysis
- Two SUAVs are studied in the research to show the universality of this method

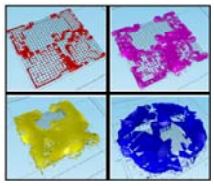


MP1-6(6) 14:45-15:00

Design of Electrode Topologies for Dielectrophoresis Through the Use of Genetic Optimization with COMSOL Multiphysics

Steven Kinio and James K. Mills
Laboratory for Nonlinear Systems Control, University of Toronto
Toronto, Canada

- Fast, easy-to-implement method of optimizing DEP electrodes using COMSOL Multiphysics is presented
  - Requires < 10 seconds to numerically evaluate candidate electrode designs
- Approach is demonstrated through optimization of custom electrode workspace



MP1-7: OS32: Biomimetic Underwater Robot

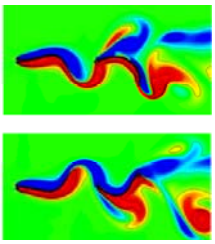
Session Chairs: Huosheng Hu, University of Essex, UK
Liwei Shi, Beijing Institute of Technology
Conf. Room 7, 13:30-15:00, Monday, 3 August 2015

MP1-7(1) 13:30-13:45

Hydrodynamic Interactions between Two Tandem Flexible Plates in Viscous Flow

Zhenbo Han, Dibo Dong, Junkao Liu, Weishan Chen
State Key Laboratory of Robotics and Harbin Institute of Technology
Harbin, China

- This paper is focus on investigating the fluid-structure interaction problem with two tandem biologically flexible structure.
- By varying the separate distance, the interactions between two plates have been analyzed, two opposite situations of the downstream one with drag increase or decrease are explained.



Vorticity contours of the simulation

MP1-7(2) 13:45-14:00

Characteristic Evaluation on Land for a Novel Amphibious Spherical Robot

Liguo Li *1, Jian Guo *1 and Shuxiang Guo *1,*2
*1 Tianjin Key Laboratory for Control Theory & Application in Complicated Systems and Biomedical Robot Laboratory Tianjin University of Technology Binshui Xidao 391, Tianjin, China
*2 Intelligent Mechanical Systems Engineering Department Faculty of Engineering Kagawa University Takamatsu, Kagawa, Japan

- This paper presents a novel amphibious spherical robot.
- Characteristic evaluation experiments on land for the robot in two movement patterns have been carried out. Experimental results indicate that the proposed robot has good movement performance both two movement patterns on land.
- It will have good application prospects in the field of sea island development in the future.

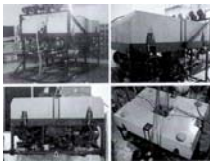
The prototype of a novel amphibious spherical robot

MP1-7(3) 14:00-14:15

Adaptive Integral Back-stepping Controller Design for ROV with Disturbance Observer

Yanhui Wei, Weixiang Zhou, Wei Chen, and Han Han
College of Automation, Harbin Engineering University
Heilongjiang, China

- Adaptive integral back-stepping controller with NDO for heading motion control of ROV is proposed.
- Based on Back-stepping method
- NDO for uncertainty and disturbance estimation
- Integral terms for improving the robustness
- Adaptive terms for getting rid of the dependence on the bund of the residual disturbance



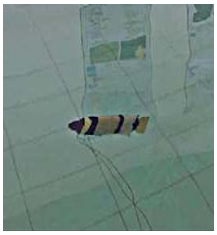
HW-1 work-class ROV

MP1-7(4) 14:15-14:30

Swimming Performance of a Robotic Fish in Both Straight Swimming and Making a Turn

Cheng Zhang, Junzhi Yu, and Min Tan
Institute of Automation, Chinese Academy of Sciences
Beijing, China

- The robotic fish not only performs well when swimming forward, but also performs a fast turn.
- The dynamic relationship, CPG model, and posture control are respectively researched.
- Under water tests are performed on the robotic fish, and the robotic fish achieves 3.07BL/s when swimming forward and achieves 63.8degrees per second when performing a complex turn.



The Robotic Fish

MP1-7(5) 14:30-14:45

A Low-power SoC-based Moving Target Detection System for Amphibious Spherical Robots

Shaowu Pan, Liwei Shi, Shuxiang Guo, Ping Guo, Yanlin He and Rui Xiao
The Institute of Advanced Biomedical Engineering System, Beijing Institute of Technology
Beijing, China

- Xilinx Zynq-7000 SoC was used to fabricate the detection system for the amphibious spherical robot.
- The Gaussian background modeling method was implemented in the PL (FPGA) of the SoC.
- A FCT tracker was running on the PS (ARM) of the SoC.
- CPU frequency scaling, DPM and DFS were adopted to reduce the power consumption of the detection system.

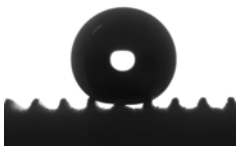
The SoC-based Robotic Detection System

MP1-7(6) 14:45-15:00

Anisotropic Hydrophobic Surface Fabricated by Microstructuring of Aluminum Alloy Using High Spe Micro-milling

Xinxin Zhang, Jinkai Xu, Zhongxu Lian, Zhanjiang Yu and Huadong Yu
School of Mechatronical Engineering, Changchun University of Science and Technology, Changchun
Jilin Province, China

- Hydrophobic surfaces is successfully fabricated only by building grating micro-array on aluminum alloy surface using high speed micro-milling machine tool.
- The hydrophobicity and super-hydrophobicity on aluminum alloy surface is a coupling function result by both submillimetre regular grating array and many irregular nanoscale pits and projections distributing on submillimetre grooves surface.



Water droplet on aluminum alloy surfa

MP2-1: Intelligent Systems I

Session Chairs: Makoto Kaneko, Osaka University, Japan
Jinglong Wu, Okayama University
Conf. Room 1, 15:15-16:45, Monday, 3 August 2015

MP2-1(1) 15:15-15:30

Temporal gap between visual and auditory stimuli lessen audiovisual integration in aging under cross-modal attention

Yan-Na Ren[1], Weiping Yang[2]; Satoshi Takahashi[3];
Kohei Nakahashi[4]; Jinglong Wu*
Engineering Laboratory,The Graduate School of Natural Science and Technology, Okayama University, Japan

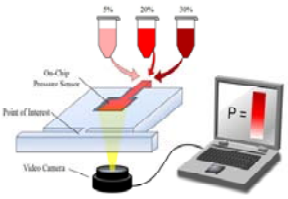
- Audiovisual integration(AVI) can aid us percept environment effectively.
- Stimulus onset asynchrony (SOA) can modulate AVI in younger brain.
- We detected how SOA modulate AVI in aging under cross-modal attention using A/V discrimination task.
- Results indicated temporal gap governs AVI under cross-modal attention greatly in aging.

MP2-1(2) 15:30-15:45

Characteristics of Vision-Based On-Chip Pressure Sensor with Different Concentrations of Sensing Fluid

Frederike Hesse, Chia-Hung Dylan Tsai and Makoto Kaneko
Department of Mechanical Engineering, Osaka University, Suita, Osaka, Japan

- On-chip pressure sensor based on visual feedback from sensing fluid
- Three different sensing fluid concentrations are used to test sensor characteristics
- 30% concentrated solution results in a three times better resolution than 5% solution



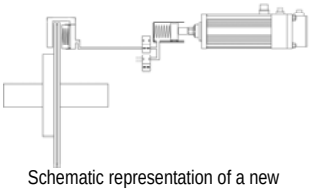
Different sensing fluids result in different resolutions

MP2-1(3) 15:45-16:00

New Compact EHBS, Increasing Regenerative Efficiency at Low Vehicle Speed

Zhang Junzhi, Arnaud Bertaux, Lv Chen, Li Yutong
State of Key Laboratory of Automotive Safety and Energy, Tsinghua University
Beijing, China

- **Integrated Braking System**: ESC + EPB + RBS
- **Electronically Control**: Emergency Braking, Maneuver Assistance…
- **Simple** and **Safe** decoupled braking system.
- Until **18%** of regenerative efficiency improvement for the ECE driving cycle.



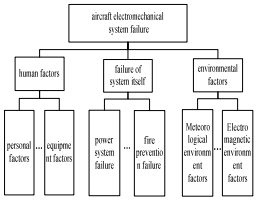
Schematic representation of a new generation of braking system.

MP2-1(4) 16:00-16:15

Man-machine-environment Based Aircraft Electromechanical System Reliability Analysis

SHI Shan , LI Chengmao,Liu Depeng and LUO Qianzhou
Air Force Engineering University
Xi'an, China

- the aircraft electromechanical system is a typical man - machine - environment system
- Man-machine-environment reliability model of electromechanical system
- Aircraft electromechanical system reliability simulation platform
- Man - machine - environment reliability simulation of actuating system



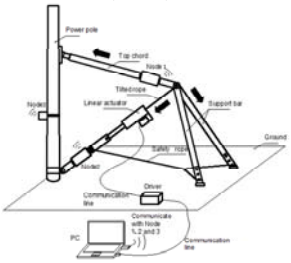
fault tree model

MP2-1(5) 16:15-16:30

Automatic Loading System of Bending Moment for Power Poles

He Sumei, Ye Jinhua, Li Zhijing, Li Jinwen and Wu Haibin
Department of Mechanical Engineering and Automation, Fuzhou University, Fuzhou, China
Guo Xiaojun, Huang Haikun and Xu Jun
State Grid Fujian Electric Power Research Institute, Fuzhou, China

- A mechanical loading scheme is proposed to simulate the wind loads for power poles
- The system can automatic loading and unloading control of pole bending moments
- Wireless communication simplified wiring
- Assembly convenience and easy operation



Schematic of Pole Bending Moment Loading System

MP2-1(6) 16:30-16:45

The feature analysis for transformer reliability assessment based on the improved artificial fish optimization algorithm and BP neural network

Hongyun JIANG,Hong YU,Hui Xu,Guochao QIAN,Zhongxi LU
Yunnan Power Grid Corporation, Kunming 650000, China,Yunnan Power Grid Electric Power Research Institute Co., Ltd., Kunming 650000, China

- In this paper, the calculation principle of the reliability assessment method is analyzed, and the contribution of each feature value is calculated.
- The reliability of a single transformer based on support vector machine, optimizing the weights and threshold of the BP neural network through improved artificial fish optimization,
- The reliability assessment provides a sufficient basis for of repair work, we can focus on the maintenance of the component, whose failure probability is high.

Transformer

MP2-2: Modeling and Simulation II

Session Chairs: Aitor J. Garrido, University of the Basque Country, Spain
Xingguang Duan, Beijing Institute of Technology
Conf. Room 2, 15:15-16:45, Monday, 3 August 2015

MP2-2(1) 15:15-15:30

Control-oriented Models for Plasma Magnetic Confinement Coils

Aitor J. Garrido*, Izaskun Garrido*, Vicente Queral** and Jesús A. Romero**

*Automatic Control Group - ACG, Dept. of Automatic Control and Systems Engineering, University of the Basque Country - UPV/EHU, Bilbao, Spain

**EURATOM-CIEMAT, Madrid, Spain

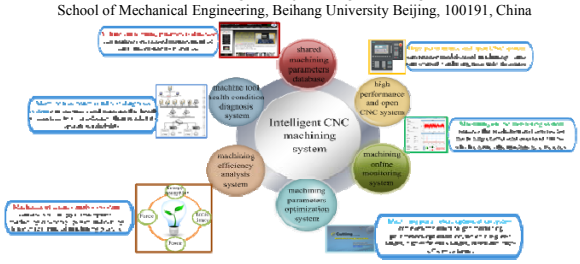
- Stellarators are a promising alternative for future demonstration fusion reactors.
- The paper presents the modelling and real-time control of a stellarator coil system.
- The proposed model is experimentally validated using the UPV/EHU stellarator.
- A real-time MPC is implemented and compared with traditional PID-based controls.
- Simulations and experimental results show the good performance of both model and MPC.

The UPV/EHU Stellarator ULISES

MP2-2(2) 15:30-15:45

Research on data-sharing and intelligent CNC machining system

Yao Li, Qiang Liu, Jiajun Xiong, Jian Wang
School of Mechanical Engineering, Beihang University Beijing, 100191, China



Structure of intelligent CNC machining system

1.Machining data can be transformed among different systems.
2.Machining efficiency can be significantly improved with the intelligent system.

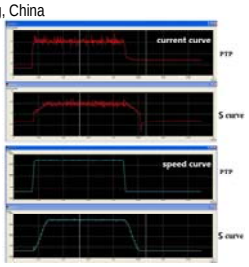
MP2-2(3) 15:45-16:00

Dynamics Modeling and Smooth Control of Flexibility Robot Joint

Yan Xu, Yan-hua Zhang and Wen-hui Liu
Department of Mechnical Engineering
Hebei Normal University
Shijiazhuang, Hebei, China

Xing-guang Duan*, Liang Gao
Department of Mechatronics Engineering
Beijing Institute of Technology
Beijing, China

- The flexibility of robot joint is the key for the high performance control.
- The dynamic model of the flexible joint is established by Lagrange's equations of the second kind.
- It is found that the S curve acceleration and deceleration control algorithm can realize the continuous acceleration on the trajectory of movement, improve the tracking performance of robot and reduce the residual vibration effectively.



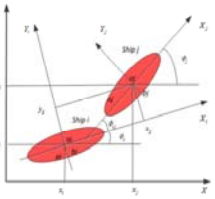
The contrast curve of current and speed

MP2-2(4) 16:00-16:15

Non-collision Coordination for Surface Vessels with Elliptical Shape

Minyu Fu and Yujie Xu
Department of Automation, Harbin Engineering University
Harbin, China

- In this paper, we address the problem of cooperation and collision avoidance for multiple surface vessels with disturbances.
- The surface vessels are regarded as elliptical agents with nonlinear dynamics.
- We design control laws that guarantee cooperation as well as collision-free maneuvers.
- we establish an ultimate bound on the avoidance term



Two ellipsoids and their coordinates

MP2-2(5) 16:15-16:30

Synchronization Control of Multiple Surface Vessels without Velocity Measurements

Mingyu Fu , Lingling Yu , Mingyang Li, Yulong Tuo and Chenglin Ni
Department of Automation, Harbin Engineering University
Harbin, China

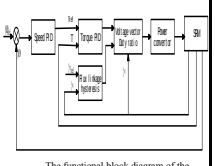
- This paper aims at studying the position synchronization problem of multiple surface vessels with model uncertainties and external disturbances.
- The synchronization controller is proposed under the situation when velocity measurements are unavailable.
- Extended state observer is employed to estimate the velocity measurements and the unknown external disturbances.
- Coupling errors are introduced to design the feedback control laws.

MP2-2(6) 16:30-16:45

Direct torque PID control of switched reluctance motor based on duty ratio control technique

Jianli Jing, Sibin Lv and Cheng fang Shi
Departement of Mechano-electronic Engineering
Bengbu College

The flux linkage loop and torque loop in the conventional direct torque control of switched reluctance motor are all hysteresis loops, the error ripple is permitted in the hysteresis loop width,torque increases or decreases ceaselessly, so the conventional direct torque control have the problem of bigger torque ripple inevitably. This paper presents a direct torque PID control of switched reluctance motor based on duty ratio control technique.The work time of active voltage vector is the total sampling period in the conventional direct torque control, in the direct torque PID control the work time of active voltage vector is determined by duty ratio,is the part of the total sampling period.Because the torque increases or decreases along with the work time of the active voltage vector, in the proposed method the work time of the active voltage vector can just satisfy the need of the given torqure, the proposed method has the torque characteristics of smoothness and exactness.The simulation results show that the torque ripple of the proposed method decreases greatly compared to the conventional one , better than the conventional one clearly.



The functional block diagram of the proposed control

MP2-3: OS30: Medical Robots for Minimal Invasive Surgery II

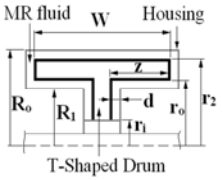
Session Chairs: Shuxiang Guo, Beijing Institute of Technology
Zhijiang Du, Harbin Institute of Technology
Conf. Room 3, 15:15-16:45, Monday, 3 August 2015

MP2-3(1) 15:15-15:30

Prosthetic Knee Using of Hybrid Concept of MR Brake with a T-Shaped Drum

Hassan Sayyaadi, and Seiyed Hamid Zareh
School of Mechanical Engineering, Sharif University of Technology
Tehran, Iran

- This paper focuses on developing a new configuration on magnetorheological (MR) brake damper as prosthetic knee.
- The main objective of this study is to investigate a prosthetic knee with one activating rotary disc to accomplish necessary braking torque in walking gait via implementing of Newton's equation of motion to derive generated torque at the inner and outer surfaces of the rotary drum.



Configuration of the hybrid T-type MR brake

MP2-3(2) 15:30-15:45

A Hybrid Rotational Matrix Extraction Method for Soft Tissue Deformation Modeling

Xiufen Ye, Jianguo Zhang, Peng Li
College of Automation, Harbin Engineering University
Harbin, China

- Improved co-rotational FEM method, which makes the deformation more feasible and stable.
- Using both QR decomposition and polar decomposition to balance the efficiency and accuracy.
- Advanced geometric data structure was used to guarantee the fastest decomposition method determined procedure.

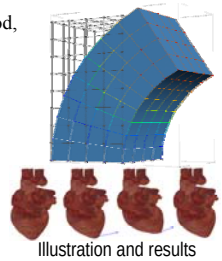


Illustration and results of the hybrid matrix extraction method

MP2-3(3) 15:45-16:00

A Novel System for Stereotactic Surgery: Preliminary Evaluation of Targeting Accuracy

Nan Xiao, Ping Luo, Shuxiang Guo, Ping Guo
The Institute of Advanced Medical Engineering System,
Key Laboratory of Convergence Medical Engineering System and Healthcare Technology,
The Ministry of Industry and Information Technology, Beijing Institute of Technology, Beijing, China

- Deep brain stimulation (DBS) has been a well-established technique in treating Parkinson's disease. Stereotaxy is indispensable for DBS.
- A micro stereotactic frame was created based on our previous work.
- A set of experiment was designed to evaluate the accuracy of the frame.
- Results showed that our stereotactic system could fulfill the requirements of DBS surgery.

Stereotactic Frame

MP2-3(4) 16:00-16:15

A Proximal Push Force-based Force Feedback Algorithm for Robot-assisted Vascular Intervention Surgery

Nan Xiao, Mingyang Qin, Shuxiang Guo, Ping Guo, Yuan Wang
The Institute of Advanced Biomedical Engineering System,
Key Laboratory of Convergence Medical Engineering System and Healthcare Technology,
Beijing Institute of Technology, Beijing, China

- This paper proposes a closed-loop force feedback algorithm based on measuring the proximal guide wire force.
- A new structure used on the Phantom has been designed to measure the force between the surgeon's hand and the handle.
- The result indicated that the closed-loop force feedback control reduced the error values between the real force feedback value and the actual force feedback.

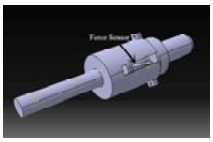


Fig.1. The novel designed handle

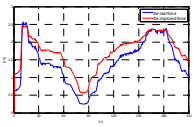


Fig.2. The real force feedback (blue) and the improved force feedback (red)

MP2-3(5) 16:15-16:30

Towards Deformation Control of Soft Tissues Based on Visual Servo for Flexible Needle Insertion Applications

Zhenzhou Yi, Wei Dong and Zhijiang Du
State Key Laboratory of Robotics and System. Harbin Institute of Technology
Harbin, China

- Apply a deformation control method for soft tissues with no priori knowledge which is hard to model.
- Use the deformation control law based on the uncalibrated visual servo to estimate the deformation Jacobian matrix.
- Do the target shift planning based on the trajectory planning of the fexible needle insertion.

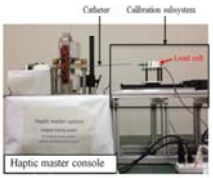
The Deformation Control device

MP2-3(6) 16:30-16:45

Force Model-based Haptic Master Console Design for Teleoperated Minimally Invasive Surgery Application

Xuanchun Yin*1 , Shuxiang Guo*2,*3 and Yu Wang *1
*1Graduate School of Engineering , Kagawa University, Japan
*2 Department of intelligent mechanical systems of Engineering, Kagawa University, Japan
*3 School of life science, Beijing Institute of Technology, China.

- ☐Force model of catheter intervention surgery has been established.
- ☐ A haptic master console has been designed.
- ☐ Primary experiments illustrated that haptic sensation (kinesthetic sensation) can be obtained by operating the designed haptic master console.



Haptic master console

MP2-4: Control System Design

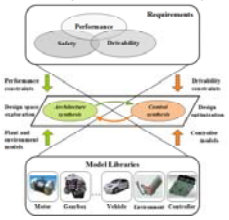
Session Chairs: Aiguo Ming, The University of Electro-Communications
Hong Zhang, University of Alberta, Canada
Conf. Room 4, 15:15-16:45, Monday, 3 August 2015

MP2-4(1) 15:15-15:30

Design Optimization of the Control System for the Powertrain of an Electric Vehicle: A Cyber-Physical System Approach

Chen Lv, Junzhi Zhang, Yutong Li, and Ye Yuan
State Key Laboratory of Automotive Safety and Energy, Tsinghua University, Beijing, China
Pierluigi Nuzzo and Alberto Sangiovanni-Vincentelli
Department of Electrical Engineering and Computer Sciences, University of California, Berkeley

- A co-design optimization methodology of the architecture and active damping controller of the powertrain system in an electric vehicle is proposed to harmonize vehicle acceleration and drivability.
- The results validate the proposed method and also demonstrate the significance and effectiveness of system co-design.



Methodology for the design optimization

MP2-4(2) 15:30-15:45

Integrated Guidance and Control Design of Missile with Terminal Impact Angle Constraint

Ke Zhang, Peng Li, Ming Lv, and Xiaoma Liu
Institute of Electromechanical Engineering and Automation, National University of Defense Technology
Changsha, Hunan Province, China

- This paper studied the integrated guidance and control(IGC) for missiles against maneuvering target.
- First, the integrated guidance and control model of pitch plane was established on a roll stable missile
- Then we designed the IGC law based on the variable structure control which chose zero effort miss as the sliding mode surface.

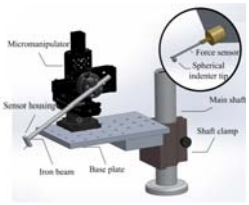
The Cruise Missile

MP2-4(3) 15:45-16:00

A Cost-Effective Microindentation System for Soft Material Characterization

Weize Zhang[1], Xianke Dong[1], Simon Silva-Da Cruz[1], Hossein Khadivi Heris[1,2], Luc G. Mongeau[1], Allen J. Ehrlicher[2], and Xinyu Liu[1]*
[1]Department of Mechanical Engineering, McGill University, Canada
[2]Department of Bioengineering, McGill University, Canada

- Cost-effective instrumentation of a microindentatation system using common lab equipment.
- Capable of elastic and viscoelastic microindentation tests.
- Switched fuzzy-PD controller provides accurate and fast force control.
- Reliable results are obtained which match well with those from expensive commercial systems.



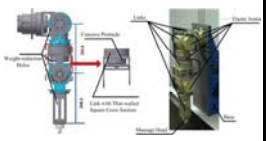
Microindentation system setup

MP2-4(4) 16:00-16:15

PD Type Control With Neural Network Based Gravity Compensation for Compliant Joint Robots

Yuancan Huang, Zeguo Li, Zonglin Huang, and Qiang Huang
Mechatronics Research Lab., Beijing Institute of Technology Beijing, China

- Dynamic modeling of compliant joint robots.
- A PD type controller with neural network compensator is developed.
- Singular perturbation theory is used to analyze the stability and passivity.
- Three experiments are implemented to validate the effectiveness of the proposed PD type controller



4-DOF compliant-rotary-joint arm

MP2-4(5) 16:15-16:30

Research on Three-dimensional Impact Angle Constrained Guidance Laws

Zhen Shi, Jian Wang, Chendi He, and Xiaohui Chi
Department of Automation, Harbin Engineering University
Harbin, China

- The paper aims at improving the missile's operational effectiveness against the stationary target.
- The derived guidance law should consider miss distance as well as terminal impact angle.
- An sliding mode control based guidance law was proposed.
- An extended trajectory shaping guidance is analyzed and deduced in three-dimensional space.

The Surface-To-Surface Missile

MP2-4(6) 16:30-16:45

The Design of a DeviceNet - SPI Converter Module Based on the STM32 MCU

Shuo Sun, Jianyun Ni, Zaiping Chen
Tianjin Key Laboratory for Control Theory & Applications in Complicated Systems
School of Electrical Engineering, Tianjin University of Technology, Tianjin, China

- Design a DeviceNet - SPI converter module based on the STM32 MCU.
- Solve the problem of conversion between the DeviceNet fieldbus and the SPI protocol.
- Make the equipment with SPI interface have the communication function of DeviceNet fieldbus through the converter module.
- Make up for the shortcomings of SPI protocol with no response mechanism.

The Converter Module

MP2-5: OS34: Cooperative Control and Multi-Agent Systems II

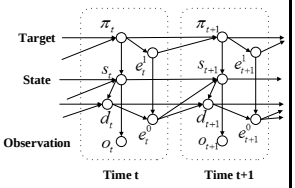
Session Chairs: Hao Fang, Beijing Institute of Technology
Yong Tang, The Second Institute of CAAC
Conf. Room 5, 15:15-16:45, Monday, 3 August 2015

MP2-5(1) 15:15-15:30

A Two-layer Semi-Markov Model for Recognizing the Destination of a Moving Agent

Shiguang Yue, Kai Xu, Long Qin, and Quanjun Yin
College of Information System and Management,
National University of Defense Technology, Changsha, China

- Propose a two-layer semi-Markov model to recognize the destination of a moving agent.
- Model the duration of the states explicitly with a discrete K-phase Coxian distribution.
- Use the PF to solve inference problem of the TLSMM with noisy and partial data.
- Compute the precision, recall, and F-measure of the TLSMM in a simulation game.



The DBN Structure of the TLSMM

MP2-5(2) 15:30-15:45

A Novel Backstepping Method for the Three-dimensional Multi-UAVs Formation Control

Huan Liu, Xiangke Wang and Huayong Zhu
College of Mechatronic Engineering and Automation,
National University of Defense Technology, Changsha 410073, China

- Introduce the load factors as the control variables.
- Use the novel backstepping method to design the controller.
- Use the state estimation to overcome the communication jam.

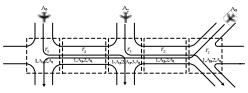
UAV Formation

MP2-5(3) 15:45-16:00

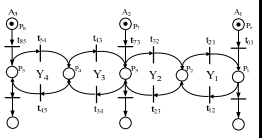
Real-time Adjustment Strategy for Conflict-free Taxiing Route of A-SMGCS Aircraft on Airport Surface

Xiao Luo, Yong Tang, Honggang Wu and Donglin He
The Second Research Institute of CAAC
Chengdu, China

- The process of aircrafts visiting an airport road section according to the planned time windows could be interpreted as the priority of aircrafts on a road section.
- Aircraft taxi route was adjusted by decreasing the priority of delayed aircrafts to visit road section, which could avoid long waits.
- A colored taxiway-oriented Petri net model was proposed to describe the process of aircraft taxiing on airport.
- Sufficient condition and priority change strategy of aircrafts conflict-free taxiing were proposed to solve conflicts which may be caused by changing priority of aircraft.



Operation Situation of Partial Taxiway in A-SMGCS



CTOPN Modeling for Partial Taxiway

MP2-5(4) 16:00-16:15

Adaptive Switch Gain Time-Varying Sliding Mode Controller Design for the Low Speed Servo System in a Control Moment Gyroscope

Zhichao Du, Zhen Chen, Xiangdong Liu and Jing Zhao
Mechatronics Key Laboratory of Complex System Intelligent Control and Decision
Beijing Institute of Technology
Haidian District, Beijing 100081, China

- An adaptive switch gain time-varying sliding mode controller is designed.
- A time-varying sliding Surface based on error reference.
- An adaptive switch gain.
- Simulation and experiment.

Control Moment Gyroscope

MP2-5(5) 16:15-16:30

A General Vector-based Algorithm to Generate Weighted Voronoi Diagrams Based on ArcGIS Engine

Song Tian1, Ximin Cui2, and Yu Gong3
Geoscience and Surveying Engineering,China University of Mining and Technology, Beijing
State Oceanic Administration,China Sea Branch, Guangzhou,China

- This paper proposes a vector-based approach to generate three types of weighted Voronoi diagrams for points using methods of region division and region union based on ArcGIS Engine.
- The proposed approach works seamlessly with ArcGIS applications.
- It aims to establish a kind of spatial data model.

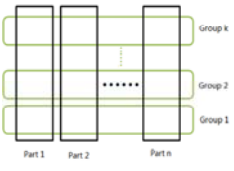
Weighted Voronoi diagram

MP2-5(6) 16:30-16:45

A Method for UAVs **Detection Task Planning of Multiple Starting Points**

Ming Lei, Quanjun Yin and Xinyu Yao
College of Information System and Management
National University of Defense Technology
Changsha, China

- In allusion to the UAV detection task planning problem of multiple starting points,in MS ACA, deferent ant colonies are allocated to every UAV starting point.
- distribute the artificial ants into *n* parts, there are *k* artificial ants in one part, which is defined as *k* groups.
- MS ACA is capable of arranging proper air route for UAVs to complete tasks.



Operating principle of MS-ACA

MP2-6: Design and Analysis of NANO Systems II

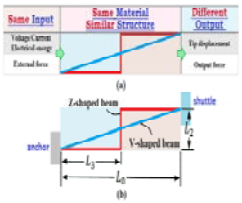
Session Chairs: Yulin Deng, Beijing Institute of Technology
Masaru Kojima, Osaka University
Conf. Room 6, 15:15-16:45, Monday, 3 August 2015

MP2-6(1) 15:15-15:30

A Comparison Model of V- and Z-shaped Electrothermal Microactuators

Zhuo Zhang, Yueqing Yu, Xinyu Liu, and Xuping Zhang*
Beijing University of Technology, Beijing, China
*Aarhus University, Aarhus, Denmark

- A novel comparison model is proposed for the V- and Z-shaped microactuators.
- A common analytical system model for both V- and Z-shaped actuators is developed and verified.
- Following the comparison model and the analytical model, detailed performance comparison and analysis of this two types of electro-thermal actuators are presented.



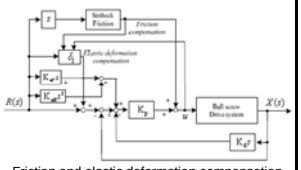
The Comparison Model

MP2-6(2) 15:30-15:45

Compensation of Friction and Elastic Deformation for Ball Screw Drive System

Xiang Hongbiao[1*], Wang Shoujun[1], Zhang Chunqiu[1], Li Xingfei[2] and Liu Jun[1]
Tianjin Key Laboratory of the Design and Intelligent Control of the Advanced Mechatronical System, Tianjin University of Technolog[1], Tianjin 300384, China
State Key Laboratory of Precision Measuring Technology and Instruments[2], Tianjin University, Tianjin 300072, China

- Modeling, identification, and compensation of non-linear frictio and elastic deformation for ball screw drive system.
- Effectively compensate the disturbance of friction and elastic deformation, and improve the tracking accuracy of the ball screw drive system



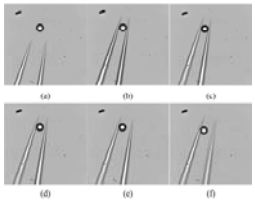
Friction and elastic deformation compensation

MP2-6(3) 15:45-16:00

Releasing of Adhered Micro-Objects using Local Stream Generated by High Speed Motion of End Effector

Eunhye Kim, Masaru Kojima, Kazuto Kamiyama, Mitsuhiro Horade, Yasushi Mae, and Tatsuo Arai
Department of Systems Innovation, Osaka University, Osaka, Japan

- Propose contactless release method using local stream generated by the high speed motions of an end effector
- Utilize four motions for producing local stream
- Analyze placing accuracy after release by comparing the trajectory of each motion

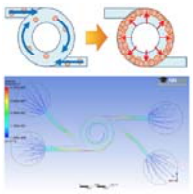


MP2-6(4) 16:00-16:15

Generation of Rotational Flow for Formation of Spheroid by Using Microfluidics Device

*Masaru Kojima[1], Mitsuhiro Horade[1], Hirochika Takai[1], Kenichi Ohara[2], Tamio Tanikawa[3], Kazuto Kamiyama[1], Yasushi Mae[1] and Tatsuo Arai[1]
[1] Graduate School of Engineering Science, Osaka University, Japan
[2] Faculty of Science and Technology, Meijo University, Japan
[3] National Institute of Advanced Industrial Science and Technology (AIST), Japan

- Utility and possibility of applying microfluidics for formation of toroidal-like spheroid was suggested.
- Novel microchannel was designed according to our concept and rotational flow in the microchannel was confirmed.
- Microchannel with the electrode was fabricated and effectiveness of this device was confirmed.



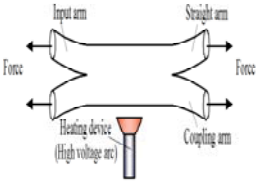
Concept and flow simulation for formation spheroid

MP2-6(5) 16:15-16:30

Simulation on fused biconical tapering of the fiber based on creep experiments

Yao Lu[1], Weibin Rong[2], Wei Zhang[1], Lining Sun[1]
State Key Laboratory of Robotics and System Harbin Institute of Technology
Harbin, Heilongjiang Province, P.R.China

Firstly, viscoelastic mechanics performance of fiber is described by the Maxwell model and time temperature equivalence principle. Then the creep experiment is performed to obtain viscoelastic parameters. Finally, simulation analysis on the fused biconical tapering is carried out using finite element method.



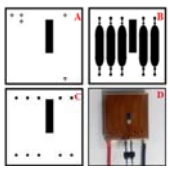
Schematic diagram of fusedbiconicaltapering

MP2-6(6) 16:30-16:45

The thermal performance of PCR chip with copper target ion beam sputtering deposition on the ceramic peltier

Kuiwei Qin, Qiaorui Xing, Xuefei Lv, Di Zhou, Rui Li, Yulin Deng*
School of life science., Beijing Institute of Technology., Beijing, China

- Copper target ion beam sputtering on the commercial ceramic peltier.
- New type of NOA81 PCR chip was fabricated on the sputtering peltier.
- The ramp rate and temperature uniformity of copper sputtering peltier was simulated by Comsol.
- PCR was realized on the copper sputtering peltier successfully.



PCR chip on copper sputtering peltier

MP2-7: OS31: Humanoid Robot I

Session Chairs: Atsuo Takamishi, Waseda University, Japan
Qiang Huang, Beijing institute of technology
Conf. Room 7, 15:15-16:45, Monday, 3 August 2015

MP2-7(1) 15:15-15:30

Mechanical Design of a 3-DOF Humanoid Soft Arm Based on Modularized Series Elastic Actuator

Xiaoxu Gu, Kun Wang,Tianyu Cheng, and Xiuli Zhang*
School of Mechanical, Electrical and Control Engineering, Beijing Jiaotong University
Beijing, China

- Realization of a modularized series elastic actuator.
- Proposing a joint stiffness determination method for compliant robotic arm.
- Design of a 3-DOF humanoid soft arms based on the modularized SEA and the task-oriented method to determine the joint stiffness.
- Simulational Experimental results validate the method we proposed.

The 3-DOF Humanoid Soft Arm

MP2-7(2) 15:30-15:45

Mechanical Design and Gait Plan of a Hydraulic-actuated Biped Robot

Yu Lei, Jianwen Luo, JiaWei Yang and Yili Fu
State Key Laboratory of Robotics and System, Harbin Institute of Technology
Harbin, China

- Application: Fieldwork robots with big load capacity
- Overall structure: 12 DOFs actuated by hydraulic actuator for walking in all directions
- Gait planning: Inverted pendulum model and spline interpolation method to obtain gait
- Simulation test: Stable walking with speed of 0.31m/s
- ANSYS analysis: Stress check in essential parts.

The Robot Prototype

MP2-7(3) 15:45-16:00

Biomimetic inspiration for PKM torso design in humanoid robots

Hulin Huang, Ceccarelli Marco, Weimin Zhang, Qiang Huang,
Zhangguo Yu, Xuechao Chen
Intelligent Robotics Institute, Beijing Institute of Technology
Beijing, China

- The PKM (Parallel Kinematic Manipulator) torso is designed with the biomimetic inspiration of torso in humans and animals.
- The designed PKM torso is a 3-DOFs parallel manipulator structure, driving by four linear mechanism.
- The designed PKM torso has good payload capacity and high stiffness.

The PKM torso

MP2-7(4) 16:00-16:15

Kinematics and Singularity Analysis of a Novel 7-DOF Humanoid Arm Based on Parallel Manipulating Spherical Joints

Yanhe Zhu, Tianlu Wang, Hongzhe Jin and Jie Zhao
State Key Laboratory of Robotics and System,
Harbin Institute of Technology
Harbin, China

Guangyu Luan
College of Information Technology,
Heilongjiang Bayi Agricultural University
Daqing, China

- Possessing the same DOF distribution as human being's (3-1-3), which shows the better anthropomorphic characteristics.
- Different from the traditional series mechanism, its load is supported by three motors of shoulder joint and wrist joint, demonstrating better load bearing ability.
- Kinematics and singularity analysis is derived in the paper.

MP2-7(5) 16:15-16:30

Design and Similarity Evaluation on Humanoid Facial Expression

Ying Wu, Qiang Huang, Xuechao Chen, Zhangguo Yu, Libo Meng
Gan Ma, Peisen Zhang and Weimin Zhang
Intelligent Robotics Institute., Beijing Institute of Technology
Beijing, China

- similarity evaluation on humanoid facial expression
- based on both the kinematics and dynamics factors
- selecting the key value of parameter in similarity function
- experiment of facial expressions

The BHR-4

MP2-7(6) 16:30-16:45

A Method of Human-robot Collaboration for Grinding of Workpieces

Jianhua Su, Hong Qiao, Lijin Xu and Ming Wang
Institute of Automation, Chinese Academy of Science
Beijing, China

- We detect the collision-avoidance region by tracking the operator motion.
- We uses control points of NURBS (Non-Uniform Rational B-Splines) to modify the path of the robot.
- A human-robot collaboration grinding system is built to enable a robot to perform safe grinding operations with the aid of humans.

The Grinding System

MP3-1: Intelligent Systems II

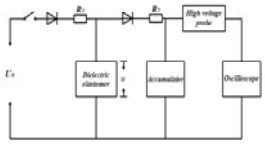
Session Chairs: Junpeng Gao, Changchun University of Science and Technology
Huang Li, Jiangsu University
Conf. Room 1, 17:00-18:30, Monday, 3 August 2015

MP3-1(1) 17:00-17:15

Research on Power Generation of Dielectric Elastomer Based on MATLAB

Shiju E, Caijun Ge, Jianbo Cao, Aifei Liu, Lili Jin and Xiaoqi Jiang
College of Engineering, Zhejiang Normal University, China
School of Mechatronic Engineering, Lanzhou Jiaotong University, China

- The simulation model of dielectric elastomer generator was set up in MATLAB/Simulink environment.
- The power generation process, the relationships between the pulling force, stretch rate, initial voltage, and generation energy were studied.
- The generating capacity of dielectric elastomer in the power generation process increased as the pulling force, stretch rate, and initial voltage increased.
- An inflection point of power generation efficiency was found in the simulation research.



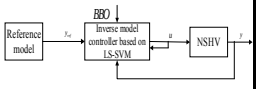
Peripheral Circuit Diagram of Elastomer

MP3-1(2) 17:15-17:30

A fault-tolerant control of inverse system based on LS-SVM and BBO

Zhang Pengfei, Cai Guobiao, Song Jia
Department of astronautics., Beihang university
Beijing, China

- Present a fault-tolerant control scheme of inverse system based on improved Least Squares Vector Machine(LS-SVM).
- Take advantage of the superiority of LS-SVM in solving small sample, high dimension and local minima problems .
- Use the Biogeography-Based Optimization (BBO) to optimize parameters of SVM for the advantage of BBO in optimizing parameters.



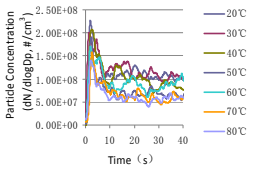
fault-tolerant control system

MP3-1(3) 17:30-17:45

Research on Exhaust Particle Emissions of Two Direct Injection Gasoline Engines During Cold Start

Chao Yuan, Wei Hong, Yan Su, Fangxi Xie, Qunjie Xu
State Key Laboratory of Automobile Simulation and Control,Jinlin University,
Changchun, China

- Gasoline direct injection mixture formation have a great impact on particle emissions during starting
- cold start particle emissions are four times than hot running, , twice than idling.
- Within 1-2s start, particle number concentration reaches maximum value 2.3 × 10^8 during coolant temperature is 20 ℃



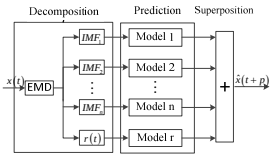
Changing history of particle concentration number

MP3-1(4) 17:45-18:00

Intelligent Prediction for Ship Motion Based on Decomposition Strategy

Lei Yang, Jianpei Zhang and Zhen Yang
College of Computer Science and Technology, Harbin Engineering University
Heilongjiang, China

- The different characteristics information of time series for ship motion is decomposed by EMD.
- The OLSSVM prediction model is built for each component.
- the superposition of the each component is taken as the ultimate forecasting value



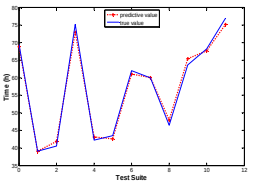
forecast diagram of ship motion based on EMD-OLSSVM

MP3-1(5) 18:00-18:15

Research on the Time Prediction Model of Product Variant Design

Zhaohua Wang, Shurong Tong, and Li Huang
School of Management , Northwestern Polytechnical University
Xian, China

- It is difficult to predict product variant design time before product secondary development.
- A variant design time prediction model based on the combination of CPSO and FNN is proposed.
- Experiment and simulation results show that the model can be used to forecast product variant design time with high precision, rapid forecasting speed and good performance.



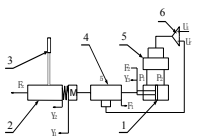
Comparison between predictive value and true value

MP3-1(6) 18:15-18:30

Research on Hydraulic Load Simulation System of Steering Test Platform

Junpeng Gao, Tao Jiang and Guilin Zhang
Department of Mechatronical Engineering, Changchun University
of Science and Technology
Changchun, China

- Composition and loading principle of hydraulic load simulation system;
- Modeling and simulation of the hydraulic load simulation system;
- Error analysis and compensation of the simulation results.



Stress diagram of steering gear

MP3-2: Modeling and Analysis

Session Chairs: Baofeng Gao, Beijing Institute of Technology
Peng Li, Harbin Engineering University
Conf. Room 2, 17:00-18:30, Monday, 3 August 2015

MP3-2(1) 17:00-17:15

Intelligent Analysis Platform of Industrial Circulating Water Based on VB and Matlab

Junfang Li, Tieqiang Wang
Tianjin Key Laboratory For Control Theory & Applications
in Complicated Systems., Tianjin University of Technology
Tianjin, China

- Corrosion and scaling are the common faults of the circulating cooling water system.
- In this paper ,water quality prediction model has been proposed.
- The platform has realized the data collection, reading and analysis of water quality.
- The IAA platform can ensure smooth and reliable operation of the industrial cooling water system.

Expert system interface

MP3-2(2) 17:15-17:30

Direct Radius Compensation and Evaluation Method for Quadric Surface at Arbitrary Position in Space

Yuchun Wang1,2, Heyi Sun1, Wenyan Tang1, Huaqi Zhao2*

1.Harbin Institute of Technology University, China2.Jiamusi University,China

- Illustration of quadric profile error and radius compensation.
- The model of the radius compensation.
- Angle Subdivision Approach Algorithm.
- IPSO algorithm.
- Experiment and conclusion.

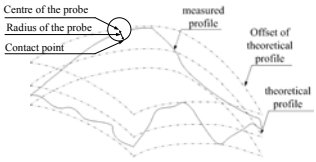


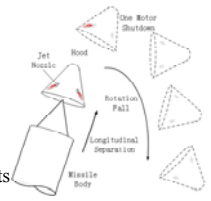
Illustration of quadric profile error and radius compensation

MP3-2(3) 17:30-17:45

A Predictive Research for the Range of Hood Separation and Landing Locations Considering Multiple Factors

Huitong Li, Yang Zhao, Yixin Huang and Hao Tian
School of Astronautics, Harbin Institute of Technology
Harbin, Heilongjiang Province, China

- This study description for hood separation process and establish dynamic simulation model .
- A simulation platform is established to predict the range of hood landing locations considering multiple factors .
- This study obtain movements and location range of hood after separation and the results will help scientific researchers to determine the hood location range, and then take protection measures.



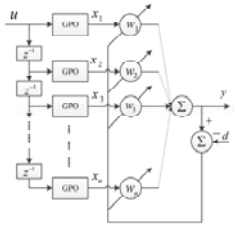
Hood Separation Process

MP3-2(4) 17:45-18:00

A Novel Nonlinear Adaptive Filter for Modeling of Rate-Dependent Hysteresis in Giant Magnetostrictive Actuator

Zhen Zhang, Yaopeng Ma, Yongxin Guo
School of Automatic Science and Electrical Engineering Mechatronics, Beihamg University
Beijing, China

- Introduction
- Generalized Prandtl-Ishlinskii Hysteresis Model
- Generalized Play Operator Adaptive Filter.
- Experiment.
- Conclusions

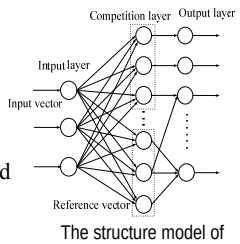


MP3-2(5) 18:00-18:15

Surface Targets Recognition Method Based on LVQ Neutral Network

Peng Li, Yihui Zhang, Chao Wang, and Shuangmiao Li
College of Automation of Harbin Engineering University
Harbin, China

- A method to identify the different surface targets with combination features.
- Image segmentation and feature extraction.
- Training and recognition based on LVQ neural network .
- The analysis of results on simulation research .



The structure model of LVQ neural network

MP3-2(6) 18:15-18:30

Analysis and Design of Low-Speed Six-Phase Fractional-Slot Concentrated-Winding PM Motor Applied to Marine Propulsion

Mingzhong Qiao, Yongxin Zhu, Geng Li, and Jinghui Liang
College of Electrical Engineering, Navel University of Engineering
Wuhan, China

- 6-phase fractional-slot PM motor slot-pole combinations tables under different constraint factors are listed;
- Slot-pole combinations which can make motor have good performances should have the following characteristics: big winding distribution coefficient, large Nc, and most of them are basic combinations.

Experimental system

MP3-3: OS30: Medical Robots for Minimal Invasive Surgery III

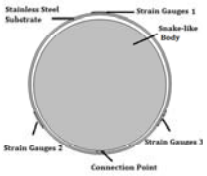
Session Chairs: Shuxiang Guo, Beijing Institute of Technology
Zhijiang Du, Harbin Institute of Technology
Conf. Room 3, 17:00-18:30, Monday, 3 August 2015

MP3-3(1) 17:00-17:15

Research on Force Sensing System for a Colonoscopy Robot

Xiaoxiao Feng, Haiyan Hu, Lining Sun, et al
School of Mechanical and Electric Engineering, Soochow University
Suzhou, China

- This paper proposes and investigates A force-sensing system for a colonoscopy robot.
- The proposed force-sensing system has the property of small and simple structure , and the sensor signal output value is large and responsive.
- Experimental results have verified that It can measure the contact pressure based on the results given by parameter identification, thus meeting the needs for the robot to sense the force when it bends.



The structure of the pressure sensor

MP3-3(2) 17:15-17:30

An Algebraic Non-Penetration Filter for Continuous Collision Detection using Sturm Theorem

Xinyu Zhang and Yao Liu
Shanghai Key Laboratory of Trustworthy Computing
MoE Engineering Research Center for Software/Hardware Co-design Technology & Application
Intelligent Robot Motion & Vision Laboratory
Shanghai, CHINA

A new non-penetration filter for continuous collision detection

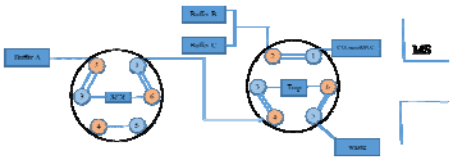
- Sturm's Theorem for counting roots
- Very efficient for soft/deformable objects
- Up to 99% filtering ratios

Benchmarking Scenarioes

MP3-3(3) 17:30-17:45

Nano-flow multidimensional liquid platform using strong ion-exchange and reversed-phase chromatography for improved proteomic analyses

Yun Wang, Yahui Liu, Song Lu, Yujuan Li, Yongqian Zhang, Hong Qing and Yulin Deng*
School of Life Science, Beijing Institute of Technology, Beijing,China



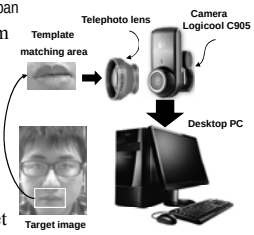
Schematics of peptide analysis by integrated microSCX-nanoRPLC-ESI-MS/MS systems A is the loading status. The sample is first loaded onto the SCX column and eluted stepwise onto the trap column. The sample is then desalted and subsequently eluted onto the analytical RP column followed by MS analysis.

MP3-3(4) 17:45-18:00

Vision-Based Displacement Sensor for People with Serious Spinal Cord Injury

C.Zhang, T.Ishimatsu, J.Yu, L.Murray,L,Shi
Nagasaki University Graduate School of Science and Technology, Nagasaki University
Nagasaki, Japan

- A human-computer interface system for serious spinal cord injury
- Multiple pattern image processing for accuracy and variable control methods.
- Precise and robust tracking of target by using Orientation Code Matching.



Vision-based displacement sensor

MP3-4: Biomedical Robotic System

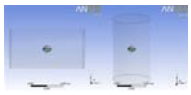
Session Chairs: Jinglong Wu, Okayama University,Japan
Liwei Shi, Beijing Institute of Technology
Conf. Room 4, 17:00-18:30, Monday, 3 August 2015

MP3-4(1) 17:00-17:15

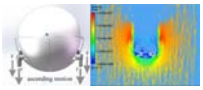
Numerical Simulation and Hydrodynamic Analysis of an Amphibious Spherical Robot

Yanlin He[1, 2, 3], Liwei Shi[1, 2, 3]*, Shuxiang Guo[1, 2, 3, 4], Ping Guo[1, 2, 3], and Rui Xiao[1, 2, 3]
1The Institute of Advanced Biomedical Engineering System, School of Life Science, Beijing Institute of Technology, No.5, Zhongguancun South Street, Haidian District, Beijing 100081, China

- Due to the complexity of underwater environment, hydrodynamic characteristic is a critical factor for underwater robot.
- This paper presents the investigation of hydrodynamic performance of concept structure design of an amphibious spherical robot based on 3D printing technology with three basic motion.
- The drag coefficients of simulation analysis are acceptable and successful. And the velocity vector and pressure contours have proved the hydrodynamic features and provided important evidence to conform the assumptions made during the hydrodynamic parameter estimation.



3D model of amphibious spherical robot in the flow field



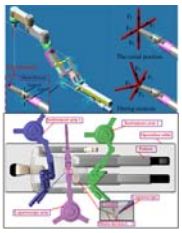
Underwater vertical motion and velocity vectors

MP3-4(2) 17:15-17:30

Dynamic characteristics analysis based on ADAMS for general robotic arm of Minimally Invasive Surgical Robot

Jing Yang1, Lingtao Yu1,2※, Lan Wang1, Zhengyu Wang1, Zhongping Zhuang1
1College of Mechanical and Electrical Engineering, Harbin Engineering University Harbin, Heilongjiang Province, China
2Department of Mechanical Engineering, Faculty of Engineering, National University of Singapore

- This paper analyze dynamic characteristics of general surgery robotic arm under three different operating conditions.
- The relationship between the driving torque/ force and motion are studied through running a serial of numerical dynamic simulation in Adams.
- The simulation results are presented to illustrate the feasibility of existing institutional systems and provide the reference for further research of general robotic arm.



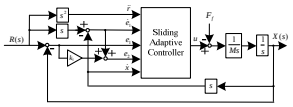
The model and simulation of a combined MIS robot system

MP3-4(3) 17:30-17:45

Design of Dual-frequency Bioreactor Control System

Xiang Hongbiao[1*], Wang Shoujun[1], Zhang Chunqiu[1], Li Xingfei[2] and Liu Jun[1]
Tianjin Key Laboratory of the Design and Intelligent Control of the Advanced Mechatronical System, Tianjin University of Technolog[1], Tianjin 300384, China
State Key Laboratory of Precision Measuring Technology and Instruments[2], Tianjin University, Tianjin 300072, China

- In order to build appropriate mechanical environment for cartilage tissue engineering, this paper design a dual-frequency bioreactor.
- Considering the parameters of friction model changed with the system, the controller of adaptive sliding friction compensation is designed.



adaptive sliding friction compensation

MP3-4(4) 17:45-18:00

The Effect of Temporal Alignment on Audiovisual Integration in a Divided Attention Task

Jingjing Yang[1] , Qi Li[1], Xiujun Li[1], Xiaojun Zhao[1], Jinglong Wu[2] and Lingjun Li[1]
1 School of Computer Science and Technology, Changchun University of Science and Technology, China
2 Graduate School of Natural Science and Technology, Okayama University, Japan

- The purpose of this experiment was to investigete whether temporal asynchrony of visual-auditory stimuli affects audiovisual integration. The visual and auditory stimuli onset asynchrony (SOA= ±250 ms, ±200 ms, ±150 ms, ±100 ms, ±50 ms, 0 ms), both the auditory and visual stimulus were attended.
- The result of cumulative distribution functions (CDFs)shown that the significant audiovisual integration were found at SOA = -100ms, -50ms, 0, 50ms conditions.

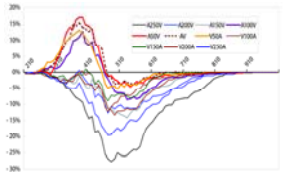


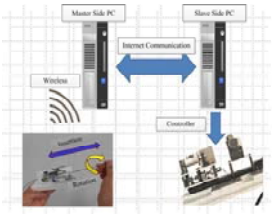
Fig. The cumulative probability difference curve. The behavioral enhancements under audiovisual conditions(11 types SOA) compared with the race model prediction.

MP3-4(5) 18:00-18:15

Laser Mouse-based Master-Slave Catheter Operating System for Minimally Invasive Surgery

Yu Wang1, Shuxiang Guo 2,3 and Xuanchun Yin 1
1Graduate School of Engineering., Kagawa University, Japan
2Department of Intelligent Mechanical Systems Engineering, Kagawa University, Japan
3School of Life Science, Beijing Institute of Technology, China

- Design laser mouse-based portable master device.
- Conduct calibration for master device to ensure position measurement accuracy.
- Realize PID control strategy for laser mouse-based master-slave system



Structure of Laser Mouse-based Master-Slave System

MP3-4(6) 18:15-18:30

Performance Evaluation of a Magnetic Microrobot Driven by Rotational Magnetic Field

Qiang Fu*1 Shuxiang Guo*2*3 Songyuan Zhang*1 Yasuhiro Yamauchi*1
*1 Graduate School of Engineering
*2Department of Intelligent Mechanical Systems Engineering
*3 School of Life Science Beijing Institute of Technology

- The surgeon views a monitor image which is produced by a CT-scan and operates the wireless microrobot to detect or treat the disease in human body.
- The external magnetic field is used to control the position and posture of the wireless microrobot in human body.

Conceptual diagram of the whole control system

MP3-5: Biomimetic Systems

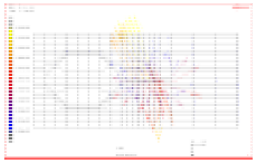
Session Chairs: Hideyuki Hirata, Kagawa University, Japan
Jian Guo, Tianjin University of Technology
Conf. Room 5, 17:00-18:30, Monday, 3 August 2015

MP3-5(1) 17:00-17:15

Fluid Simulation around Tail Fin of a Fish Robot

Hideyuki Hirata, Akinori Hayashi, Yuki Hinayama, Seiichiro Yano and Shuxiang Guo
Kagawa University
Japan

In this study, the newly developed fluid analysis technique when the flow path wall shape changes. Furthermore, by applying this analysis technique, it was clarified water flow caused by the moving tail fin of the fish robot. Also, the driving force acting on the robot by the resulting water flow was calculated. Tail fin shape and its moving way to obtain appropriate driving force can be clarified by these analysis.



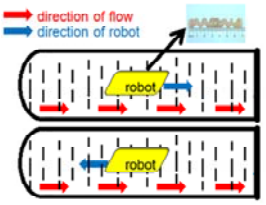
Plane view of the distribution of the flow velocity

MP3-5(2) 17:15-17:30

Performance Evaluation of the Wireless Micro Robot in the Fluid

Nan Liang*1, Jian Guo*1, Shuxiang Guo*1*2, and Xiang Wei*1
*1 Tianjin Key Laboratory for Control Theory & Application in Complicated Systems and Biomedical Robot Laboratory Tianjin University of Technology Binshui Xidao 391, Tianjin, China
*2 Intelligent Mechanical Systems Engineering Department Faculty of Engineering Kagawa University Takamatsu, Kagawa, Japan

- In this paper, we evaluated the performance of the robot in the fluid.
- We proposed the structure and the control principle of the micro robot and analyzed the buoyancy and resistance of the robot in the fluid.
- The experimental results can provide a strong support for the future clinical application.



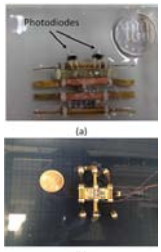
The Wireless Micro Robot

MP3-5(3) 17:30-17:45

Insect-inspired Biomimetic Underwater Microrobots for a Father-son Robot System

Maoxun Li[1], Shuxiang Guo[2,3], Kazuhiro Yamashita[1]
[1] Graduate School of Engineering, Kagawa University, Japan
[2] Faculty of Engineering, Kagawa University, Japan
[3] Beijing Institute of Technology, China

- Two kinds of ICPF actuator-based insect-inspired microrobots for mounting on the father robot were developed.
- Using a proximity sensor, the hexapod microrobot can realize the operation of object recovery.
- Use the photodiodes and two light sensors carried on the eight-legged microrobot to realize the tracking motion and microrobot recovery.



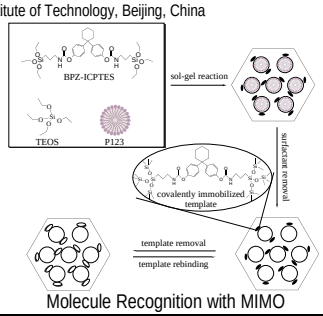
Microrobots

MP3-5(4) 17:45-18:00

Preparation and Characterization of Molecularly Imprinted Mesoporous Organosilica for Biphenol Z Recognition and Separation

Shu Yang, Yun Liu, Huamin Yi, Liquan Sun and Aiqin Luo
School of Life, Beijing Institute of Technology, Beijing, China

- With the help of structure directing agent, the template-complex monomer is co-condensed with TEOS to achieve MIMO
- After template removal, empty cavity is ready for selective capture of target molecules.



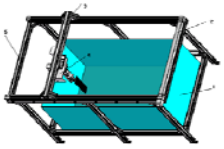
Molecule Recognition with MIMO

MP3-5(5) 18:00-18:15

Numerical and experimental investigation of flapping foil added in-line motion

Weishan Chen and Fujuan Liu
State Key Laboratory of Robotics and Harbin Institute of Technology
Harbin, China

- The hydrodynamics of flapping foil added in-line motion is numerical and experimental investigated in this paper.
- The 3 DOF motion was simulated in CFD. The synthetic effect of four parameters on the propulsive efficiency are investigated by the response surface methodology.
- An experimental setup was designed to analysis the hydrodynamic forces generated on the hydrofoils.



The experimental setup

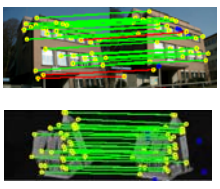
MP3-5(6) 18:15-18:30

Introducing Authority and Hubness into Graph Matching

Yu-Ren Zhang, Xu Yang and Hong Qiao
Institute of Automation, Chinese Academy of Sciences

Li-Jin Xu and Wei You
Anhui Efort Equipment Co., Ltd

- Inspired by the Web page ranking method Hypertext Induced Topic Search (HITS), we introduce hubness vector and authority vector to replace the traditional confidence vector;
- An iterative algorithm is proposed to solve the subgraph matching problem;
- The incorporation of hubness and authority can help reduce the distraction caused by outliers, and provides better robustness against outliers.



MP3-6: Nano Sensor Design

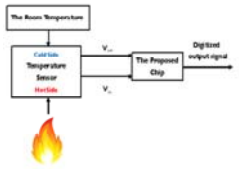
Session Chairs: Cheng-Ta Chiang, National Chia Yi University, Taiwan
Qingyu Wang, Naval University of Engieering
Conf. Room 6, 17:00-18:30, Monday, 3 August 2015

MP3-6(1) 17:00-17:15

A CMOS Temperature Difference to Frequency Converter with Calibration Circuits for Environmental Temperature Difference Monitoring Applications

Cheng-Ta Chiang and Fu-Wen Chang
Department of Electrical Engineering, National Chia Yi University
Chiayi, Taiwan

- The output of the proposed chip are directly digitized, they could be easily sent over a wide range of transmission media
- A calibration technique is proposed in this work
- Being a general-purpose temperature difference sensor transducer, it can be combined with various temperature difference sensors



Block diagram of the proposed chip

MP3-6(2) 17:15-17:30

Impact Detection of Intelligent AC Contactors and Optimization of the Dynamic Characteristics

Liang Shu, Chengwen Xu, and Guichu Wu
The Key Laboratory of Low-voltage Apparatus Intellectual Technology of Zhejiang,
Wenzhou University, Wenzhou, China

- The closing process of intelligent AC contactors can be affected by selection phase angle.
- A control strategy is proposed to compensate the influence of closing process at different phase angles.
- An impact detection sensor is developed to measure the impact in the rigid body collisions by using PVDF.
- The proposed control method together with the measuring method are useful in the optimal design of electric contactors.

PVDF Impact Force Sensor

Experimental Setup

MP3-6(3) 17:30-17:45

Temperature Characteristic of ring type dynamometer based on FBG sensors

Mingyao Liu, Zhijian Zhang, Dongliang Ji, and Shuang Xiao
School of Mechanical and Electronic Engineering, Wuhan University of Technology
Beijing, China

- FBG sensors used in the ring type dynamometer are easily to be affected by temperature fluctuation.
- The wavelength of FBG sensors fitted in the annulus elastic body varies linearly with temperature.
- FBG sensors can test temperature and strain simultaneously by using wavelength multiplexed technology.
- Temperature compensation can be realized by utilizing fiber Bragg grating temperature sensor.

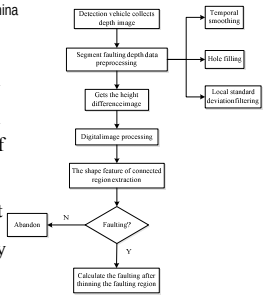
The Annulus Elastic Body

MP3-6(4) 17:45-18:00

Subway lining segment faulting detection based on Kinect sensor

Xinwen Gao1, Liqing Yu2 and Zhengzhe Yang3
School of Mechatronics Engineering and Automation. Shanghai University
Shanghai, China

- The algorithm optimize the depth data. Transform the depth image into the binary image.Process it by digital image processing and recognise faulting,Finally, identify and calculate the different forms of faulting in the depth image.
- The experimental results show that the algorithm can detect and automatically identifies the subway lining segment faulting at the distance of 0.8-1m.



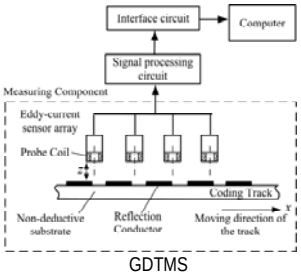
The Operation Process

MP3-6(5) 18:00-18:15

Inductance Calculation of Planar Eddy-Current Sensor Coils in Grating-Type Displacement Measurement System

WANG Qingyu, HE Na, RUI Wanzhi
National Key Lab. For Vessel Integrated Power System Technology, Naval Univ.of Engineering
Wuhan, China

- Eddy-current sensor works under axial asymmetric condition in GDTMS.
- A method combining both theoretical analysis and FEA is proposed to calculate the sensor coil inductance.
- Formulas of inductance calculation is derived.
- Formulas are validated by simulation and practical measurement.



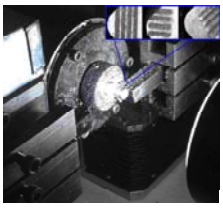
GDTMS

MP3-6(6) 18:15-18:30

Design of Micro Grove Texture Tool and Experimental Study on High Speed Micro-turning

YU Zhanjiang, ZHANG Chaonan, WANG Wen, ZHOU Yudong and YU Huadong
College of Mechanical and Electric Engineering
Changchun University of Science and Technology
Changchun, Jilin Province, China

- Design of micro grove texture tool.
- Cutting simulation of micro grove texture tool.
- High speed micro turning test.
- Experiment analysis and conclusion.



High speed micro turning test

MP3-7: Humanoid Robot II

Session Chairs: Jianfeng Xu, KDDI R&D Laboratories
Hong Qiao, Institute of Automation, Chinses Academy of Science
Conf. Room 7, 17:00-18:30, Monday, 3 August 2015

MP3-7(1) 17:00-17:15

Efficient Body Babbling for Robot's Drawing Motion

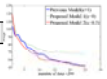
Kanta Watanabe (Iwate Univ.), Akio Numakura (Iwate Univ.), Shun Nishide (Tokushima Univ.), Manabu Gouko (Tohoku Gakuin Univ.), and Chyon Hae Kim (Iwate Univ.)

- The robot autonomously learns precise pen handling through drawing-motion-learning with body bubbling.
- We developed Continuous System Learning Tree (CSLT), which is able to learn the motion online.
- We proposed a learning model based on CSLT.
- In the experiment, three models, previous model, proposed model, and proposed model with ε-greedy method are compared.
- The proposed model with ε-greedy method successfully learned the dynamics of the pen handling faster than the other models.

Humanoid robot NAO was used

Schematic of CSLT

Proposed model



Experimental Results

MP3-7(2) 17:15-17:30

Perceptual Evaluation of Non-verbal Cues from a Humanoid Robot for Multi-Party Teleconferences

Jianfeng Xu and Shigeyuki Sakazawa
KDDI R&D Laboratories, Inc.
Fujimino-shi, Saitama, Japan

Yusuke Matsumura and Hideaki Kuzuoka
University of Tsukuba
Tsukuba, Ibaraki, Japan

- In order to analyze the relationship between the robot motions and the motivation to speak, we conducted10 quasi-naturalistic teleconference experiments.
- The findings revealed what kind of motions should be used and how intense the motions should be when we want to indicate motivation to speak.

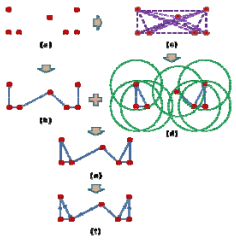
A humanoid robot acting as a proxy for a real person in a remote location who is attending a teleconference with two other local persons, where robot motions are evaluated in real time.

MP3-7(3) 17:30-17:45

New Algorithm for Non-rigid Point Matching Using Geodesic Graph Model

Deheng Qian, Tianshi Chen, and Hong Qiao
State Key Laboratory of Management and Control for Complex Systems, Institute of Automation, Chinese Academy of Sciences, Beijing 100190, China

- Point matching.
- Non-rigid deformation and manifold.
- Geodesic distance



The procedure of building the GGM

MP3-7(4) 17:45-18:00

Gait planning of biped robot based on feed-forward compensation of gravity moment

ZHAO Jianghai, ZHANG Xiaojian and TANG Cheng
Institution of Advanced Manufacturing Technology, Hefei Institution of Physical Science, CAS
Hefei, China

- A 3D-LIM is applied for depicting the motion of the biped robot.
- The motion trajectory of the biped robot is generated by using the cosine and cycloid functions.
- the walk stability of the biped robot is greatly improved by the compensation of gravity moment.
- the robot can steady walk at a speed of 80mm/s.

Developed Biped Robot

MP3-7(5) 18:00-18:15

Task-based whole-body control of humanoid robots to a walking motion

Kaibing Xie, Jianghai Zhao and Tao Mei
IAMT. Hefei Institutes of Physical Science. CAS
Changzhou, Jiangsu, China

- A whole-body control strategy based on the centre of mass with a ZMP regulation as well as the relative pose of the feet of the robot is proposed for walking of humanoid robots.
- The control strategy adjusts the ZMP back to the stability domain when the robot is out of balance.
- Simulation results are presented to show the effectiveness.

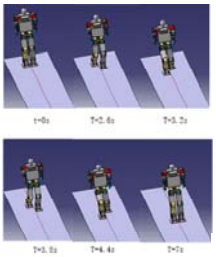
The IPR Robot

MP3-7(6) 18:15-18:30

The Arm and Waist Motion Design of Humanoid Robot for Fast Walking

Si Zhang, Ye Tian, Xuechao Chen, Zhangguo Yu, Qiang Huang, Yunhui Liu, and Junyao Gao
Intelligent Robotics Institute, Beijing Institute of Technology
Beijing, China

- Human yaw torque compensation mechanism analysis for fast walking
- The arm and waist motion design for humanoid robot is proposed based on human yaw torque compensation mechanism and ZMP stability region
- The effectiveness of this method is confirmed through dynamics simulation



Walking snapshot with proposed method

Tuesday
August 4, 2015

Morning Sessions

TA1-1	Mobile Robot Design
TA1-2	Modeling and Simulation Techniques
TA1-3	Multi and Reconfigurable Robot Systems
TA1-4	Manipulator control and Manipulation
TA1-5	Complicated Systems
TA1-6	Sensor Network & Fault Diagnosis
TA1-7	Robotic Structure and Manipulator Control

Tuesday
August 4, 2015

Afternoon Sessions

TP1-1	Intelligent Mechatronics and Application I
TP1-2	Modeling, Simulation Techniques and Methodology I
TP1-3	Medical and Rehabilitation
TP1-4	Adaptive Intelligent Control System
TP1-5	Signal and Image Processing I
TP1-6	Sensor Network
TP1-7	OS33: Robot Dynamics, Vibration Analysis and Vibration Control I
TP2-1	Intelligent Mechatronics and Application II
TP2-2	Modeling, Simulation Techniques and Methodology II
TP2-3	Rehabilitation Systems
TP2-4	Adaptive Control Application
TP2-5	Signal and Image Processing II
TP2-6	Sensor Design
TP2-7	OS33: Robot Dynamics, Vibration Analysis and Vibration Control II

TA1-1: Mobile Robot Design

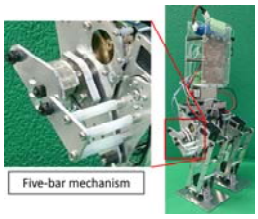
Session Chairs: Aiguo Ming, The University of Electro-Communications
Jian Guo, Tianjin University of Technology
Conf. Room 1, 10:30-12:00, Tuesday, 4 August 2015

TA1-1(1) 10:30-10:45

Development of Leg Mechanism Using a Knee Joint with Continuously Variable Reduction Ratio Adaptive to Load

Takuma Uchida, Ryuki Sato, Aiguo Ming, and Makoto Shimojo
The University of Electro-Communications, Tokyo, Japan

- A new knee joint mechanism with continuously variable reduction ratio adaptive to load and control method are proposed in order to improve backdrivability for a bipedal robot.
- A prototype of the bipedal robot with this new mechanism has been developed.
- The effectiveness of the mechanism is confirmed by experimental results.

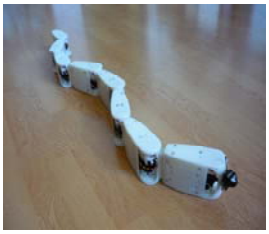


The prototype of bipedal robot with the proposed knee joint mechanism

TA1-1(2) 10:45-11:00

New Approach of Fixation Possibilities Investigation for Snake Robot in the Pipe

Erik Prada, Michael Valášek and
Ivan Virgala, Alexander Gmiterko, Michal Kelemen, Martin Hagara, Tomáš Lipták
Vehicle Center of Sustainable Mobility, Czech Technical University in Prague
Roztoky u Prahy, Czech Republic
Department of Mechatronics, Technical University of Kosice
Kosice, Slovak Republic



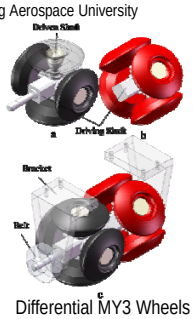
- Fixation curves for concertina in-pipe locomotion of snake robot.
- New innovative kinematic structure enabling both rotary and translational movements of links of a snake robot.
- Experimental snake robot static links analysis with using method of digital image correlation.

TA1-1(3) 11:00-11:15

A Control Approach of an Omnidirectional Mobile Robot with Differential Wheels

Changlong Ye, Jun Chen, Mingchun Chen and Li Liu
School of Mechatronic Engineering, Shenyang Aerospace University
Shenyang, China

- An OMR with differential MY3 wheels is developed.
- A hyperbolic filtering PD controller is proposed for the trajectory following.
- A control strategy (sinusoidal method) is proposed to simplify the control.
- Simulation results illustrated that by using the sinusoidal method tracking errors can reduce about 50%.



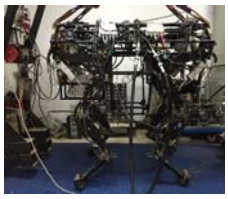
Differential MY3 Wheels

TA1-1(4) 11:15-11:30

Actively-Compliant Locomotion Control with the Hydraulic Quadruped Robot on Rough Terrain

Haojian Lu, Junyao Gao, Lin Xie, Xin Li, Zhe Xu, Yi Liu, Jingchao Zhao, Haoxiang Cao, Fangzhou Zhao and Xuanyang Shi
Intelligent Robotics Institute, School of Mechatronical Engineering
Beijing Institute of Technology, Beijing, China

- Propose a dual length linear inverted pendulum method (DLLIPM) to generate the trajectory which uses limited robot dynamics parameters.
- Propose an active compliance control scheme for quadrupedal locomotion.
- Perform an experiment which is trot-walking on uneven surface through LMS Virtual. Lab software.



The BIT Dog

TA1-1(5) 11:30-11:45

Analysis and Design of Electromagnetic Vehicles Climbing on Steel Plates

Fang Fang, Tiejun Wang, and Bing Li
College of Electrical EngineeringNaval University of Engineering
Wuhan, China

- Principal of electromagnetic vehicle.
- Design of electromagnetic vehicle.
- Simulation results of electromagnetic vehicle.
- Experimental results of electromagnetic vehicle.

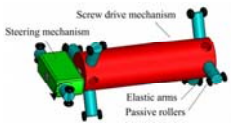
The Electromagnetic Vehicle

TA1-1(6) 11:45-12:00

Design and Locomotion Control Strategy for a Steerable In-pipe Robot

Te Li, Shugen Ma, Bin Li, Minghui Wang, and Yuechao Wang
State Key Laboratory of Robotics, Shenyang Institute of Automation,
Chinese Academy of Science, Shenyang, China

- A steerable in-pipe robot based on screw drive for curved pipes and T-pipes.
- The robot with only two motors is composed of the drive mechanism and steering mechanism.
- The steering locomotion control strategy proposed based on a simplified planar connecting rod model.
- The abilities of posture adjustment and steering.



The Steerable In-pipe Robot

TA1-2: Modeling and Simulation Techniques

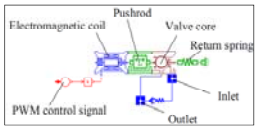
Session Chairs: Xinkai Chen, Shibaura Institute of Technology
Junzhi Zhang, Tsinghua University
Conf. Room 2, 10:30-12:00, Tuesday, 4 August 2015

TA1-2(1) 10:30-10:45

Modeling and Analysis of Regenerative Braking System for Electric Vehicle Based on AMESim

Junzhi Zhang, Ye Yuan, Chen Lv and Yutong Li
State Key Laboratory of Automotive Safety and Energy, Tsinghua University
Beijing, China

- A parametric and modularized method in modeling is adopted gaining noticeable improvement in precision.
- The strategy for the exiting of regenerative braking is optimized aiming at decreasing jerk.
- The simulation result shows that the maximum jerk exerted on the vehicle is decreased from 2.69 m/s^3 to 0.59 m/s^3 during the exiting of regenerative braking.
- The regeneration efficiency is increased slightly to 76.18%.



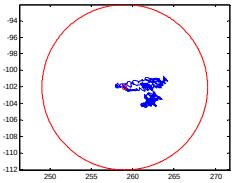
The valve model in AMESim

TA1-2(2) 10:45-11:00

EKF Based Model Identification for a Relaxed Dynamic Positioning Ship Using NMPC Method

Guoqing Xia, Ju Liu, Xinghua Chen, Dapeng Wang, Rongtao Yang
Colledge of Automation, Harbin Engineering University
Harbin, China

- Modelling of DP ships
- EKF identification for DP ships
- NMPC based relaxed DP controller design
- Simulation & analysis
- Conclusion



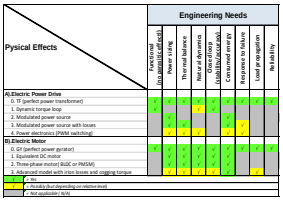
Relaxed DP illustration

TA1-2(3) 11:00-11:15

Incremental Modelling and Simulation of Power Drive Electronics and Motor for Flight Control Electro-mechanical Actuators Application

FU Jian[1,2], Jean-Charles MARÉ[2], FU Yongling[1] and HAN Xu[1]
1. School of Mechanical Engineering and Automation, Beihang University, Beijing, China
2. Institut Clément Ader, INSA, Toulouse, France

- A progressive approach basing on Bond Graph for developing simulation models for EMA used in aircraft flight controls.
- Focus on energy losses, available for components' sizing, limiting risks, development costs.
- Interest of multilevel models with different physical effects to be simulated vs. engineering needs.



Physical effects Vs. Engineering needs

TA1-2(4) 11:15-11:30

Research on Electric Simulation of Mechanical Inertia in an Inertia Brake Dynamometer

Sen Lee, Xia Dong and Kedian Wang*
School of Mechanical Engineering, Xi'an Jiaotong University
Xi'an, China

- This paper presents an optimized way to improve the accuracy of electric simulation with torque control method.
- The causes of deviations in inertia were explored and some targeted improvements were applied to the torque control method based on the analysis.
- The deviations in inertia were reduced by the optimized control method.

The Inertia Brake Dynamometer

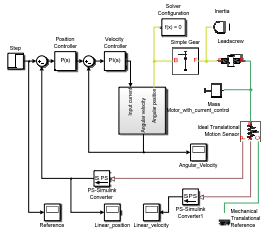
TA1-2(5) 11:30-11:45

Object-oriented Modeling of Machine Tool Feed Axes: an Approach to Analysis of Control Parameters

Yi Xie
Dept. of Mechanical Engineering, Tsinghua University
Beijing, China

Denis Özdemir and Werner Herfs
Lab. for Machine Tools and Production Engineering, RWTH Aachen University
Aachen, Germany

- Object-oriented modeling method of machine tool feed axes is introduced with MATLAB/SIMSCAPE.
- Simulation results are validated with the measured results on a vertical machine center Chiron FZ 18 S.
- Usability and advantages of the method on analyzing mechatronic systems are demonstrated.



The Model of Feed Drive System

TA1-2(6) 11:45-12:00

The Design and Implementation of Laser Shooting Simulation Training Monitoring System Based on GPS and GIS

Yusen Li,Qingchao Qi, Liying Cao
School of Electrical Engineering, Tianjin University of Technology(TJUT)
Tianjin, China

- GPS positioning and signal reception design
- GIS system
- The system design
- The layer display design

The Monitor Map

TA1-3: Multi and Reconfigurable Robot Systems

Session Chairs: Weimin Ge, Tianjin University of Technology
Youngjin Choi, Hanyang University, Korea
Conf. Room 3, 10:30-12:00, Tuesday, 4 August 2015

TA1-3(1) 10:30-10:45

Hybrid Dynamical Moving Task Allocation Methodology for Distributed Multi-robot Coordination System

Guanghui Li[1, 2, 3], Shuiguang Tong[1, 2], Yang Li[2], Feiyun Cong[1, 2], Zheming Tong[2]
Atsushi Yamashita[3] and Hajime Asama[3]
1. School of Mechanical Engineering, Zhejiang University, Hangzhou, China
2. R&D Center of Mechatronics and Intelligent Control,
Zigong Innovation Center of Zhejiang University, Zigong, China
3. Department of Precision Engineering, The University of Tokyo, Tokyo, Japan

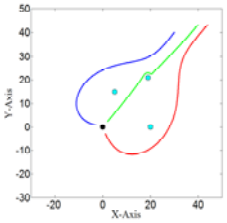
- A hybrid dynamical moving task allocation method was proposed.
- Either robots or tasks update their conditions, robots independently select tasks from a combinatorial cost table as to minimize an objective function.
- Two sample time thresholds were used for robots to decide the conditions of robots and tasks, and reallocate tasks.
- Simulation results demonstrated the efficiency and robustness of our proposed method.

TA1-3(2) 10:45-11:00

Neural Oscillator-based Multi-Robot Coordination Algorithm to Catch-Observe-Protect a Target

Sajjad Manzoor and Youngjin Choi
Department of Electronic Systems Engineering, Hanyang University
Ansan, South Korea

- A neural oscillator-based algorithm for the multi-robot navigation, coordination and formation control is proposed.
- A group of robots is directed to move towards a static or dynamic target in such a way that the robots gradually get apart from each other.
- In this way the target can be Caught, Observed or Protected (COP) by the robots.



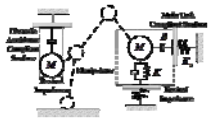
Neural Oscillator-based coordination for three robots

TA1-3(3) 11:00-11:15

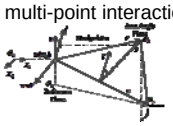
Hybrid Impedance Control of 7-DOF Redundant Manipulator with Dual Compliant Surface

Minghe Jin, Cheng Zhou, Yechao Liu*
State Key Laboratory of Robotics and System
Harbin Institute of Technology, Harbin, P.R.China

- A control strategy based on the hybrid impedance control of 7-DOF manipulator is investigated to achieve force control and obstacle avoidance.
- The control strategy based on the non-contact impedance control is adopted to deal with virtual contact.



The multi-point interaction



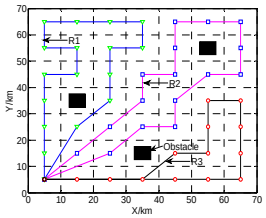
Geometrical sketch

TA1-3(4) 11:15-11:30

Task Assignment of Multi-Robot Systems based on Improved Genetic Algorithms

Siding Li, Xin Xu and Lei Zuo
College of Mechatronics and Automation, National University of Defense Technology
Changsha, China

- Multi-robot systems;
- Task assignment;
- Parallel processing;
- Improved genetic algorithm (IGA).



Result with IGA

TA1-3(5) 11:30-11:45

A Reconfiguration Approach for Self-reconfigurable Modular Robot Using Assisted Modules

Xueyan Sun1,Weimin Ge2, Xiaofeng Wang3 and Jun Liu4.
School of Electrical Engineering, Tianjin University of Technology
Tianjin, China

- A Spatial Linking Matching Matrix (SLMM) representing the spatial complex topological configurations of the multi-module robot
- The corresponding logic addresses of the modules
- A new Disconnect-before-Connect method in reconfiguration strategy.
- the use of auxiliary modules introduced in the reconfiguration process.

M²SBot module diagram

TA1-3(6) 11:45-12:00

Improved particle swarm optimized fuzzy neural network based fault diagnosis for computer numerical control

Bo Qin, Yunzhong Yang, Yongliang Liu and Jianguo Wang
Mechanical Engineering School, Inner Mongolia University of Science & Technology
Baotou, Inner Mongolia, China

- The conventional fault diagnosis algorithms are not able to deal with human knowledge.
- Combination of fuzzy logic and RBF neural network is given in this paper to establish fault model.
- The experiment results show that the effectiveness of the proposed.

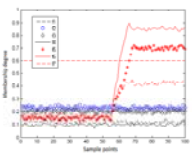


Fig. 1 Membership degree output under fault conditions: Excessive cutting fault

TA1-4: Manipulator control and Manipulation

Session Chairs: Yong Yu, Kagoshima University, Japan
Dan Zhang, University of Ontario Institute of Technology
Conf. Room 4, 10:30-12:00, Tuesday, 4 August 2015

TA1-4(1) 10:30-10:45

Development of A Space Arm-Hand System for On-orbit Servicing

Pengfei Hou, Yiwei Liu*, Zongwu Xie, Hong Liu
State Key Laboratory of Robotics and System
Harbin Institute of Technology

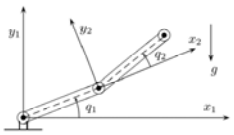
Facing current on-orbit servicing tasks, a space arm-hand system is designed and developed in this paper. The arm system includes humanoid links and modular joints. The five-fingered hand system is developed including modular fingers, multi-sensor integration system and hardware system. The ground test result confirms on-orbit servicing capability of this space arm-hand system.

TA1-4(2) 10:45-11:00

Adaptive Control for a Robotic Manipulator with Uncertainties and Input Saturations

Trong-Toan Tran, Shuzhi Sam Ge and Wei He
Center for Robotics and School of Automation Engineering
University of Electronic Science and Technology of China, Chengdu 611731, China

- Propose A Model Reference Adaptive Control like approach.
- Use a combination of the regressor and non-regressor approaches for estimation.
- Achieve semi-global uniform ultimate boundedness of the closed-loop system.
- Prevent the violation of the input saturations.



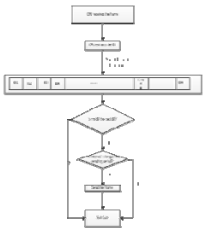
The Planar Elbow Manipulator with two revolute joints

TA1-4(3) 11:00-11:15

A Method to Improve the Stability and Real-time Ability Of CAN

Jianqun Wang, Jingxuan Chen, Ning Cao
School of Mechanical and Vehicular Engineering, Beijing Institute of Technology
Beijing, China

- the contents,drawbacks and resolvents of current methods to ensure a reliable and real-time communication in conventional CAN .
- the new method based on frame identity queue
- a test to justify the effectiveness of the proposed method.



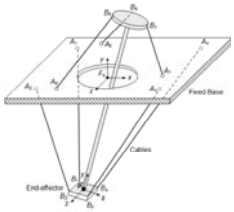
Approach to send a frame

TA1-4(4) 11:15-11:30

Singularity Analysis of Fully-Constrained Cable-Driven Parallel Robots with Seven Cables

Xiumin Diao
School of Engineering Technology, Purdue University
West Lafayette, Indiana, USA

- Discuss various categories of singularities of fully-constrained cable-driven parallel robots.
- Propose an algorithm of identifying force-closure singularities of 6-DOF fully-constrained cable-driven parallel robots with seven cables.



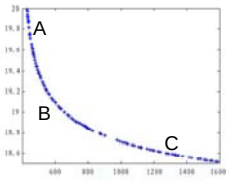
Example 6-DOF fully-constrained cable-driven parallel robots with seven cables

TA1-4(5) 11:30-11:45

Multi-objective Trajectory Optimization for Space Manipulator with Multi-constraints

Yuqiang Liu, Chunlin Tan, Hanxu Sun, and Gang Chen
Institute of Spacecraft System Engineering CAST
Beijing, China

- Multi objective and multi-constraints problems
- Trajectory optimization
- A non-dominated sorting genetic algorithm (NSGA-II)
- Pareto optimal front
- 7 DOF space manipulator



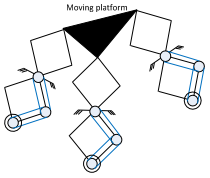
Pareto optimal solution set of two-objective optimization

TA1-4(6) 11:45-12:00

Advances and Issues on Dynamic Balancing of Parallel Mechanisms

Dan Zhang, Bin Wei
Robotics & Automation Lab., University of Ontario Institute of Technology
Oshawa, Canada

- The advances and problems on dynamic balancing of mechanisms are discussed based on different research families.
- Recent advances and theories in synthesizing of parallel robots are discussed.
- New 3DOF planar and spatial reactionless parallel manipulators are derived.



3DOF spatial 3-2RRR reactionless manipulator

TA1-5: Complicated Systems

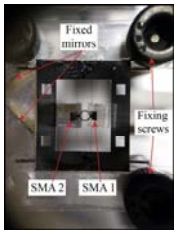
Session Chairs: Yili Fu, Harbin Institute of Technology
Guoping He, Harbin Institute of Technology
Conf. Room 5, 10:30-12:00, Tuesday, 4 August 2015

TA1-5(1) 10:30-10:45

An Optical Wireless Bistable Micro-actuator

X LIU, H AL HAJJAR, F LAMARQUE and E DORE
CNRS, UMR 7337 Roberval Lab, Université de Technologie de Compiègne – France
O CARTON, A ZEINERT and S CHARVET
Lab de Physique de la Matière Condensée EA 2081, Université de Picardie Jules Verne
Amiens - France

- The bistable mechanism is based on antagonistic pre-shaped double beams.
- The bistable micro-actuator was fabricated on silicon wafer using deep reactive ion etching technique.
- Laser heated shape memory alloy was used to realize the wireless actuation.
- An 8 μm thick SiO_2 layer was deposited on the shape memory alloy element to eliminate the load effect.



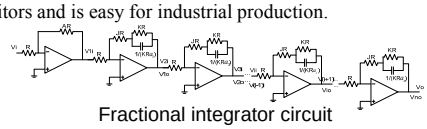
Bistable Micro-actuator

TA1-5(2) 10:45-11:00

Realization of Fractional Order Integrator by Rational Function in the Form of Continued Product

Lili Jin, Xingguang Li*, and Meng Wu
Dept. of Electronics and Information Engineering, Changchun Univ. of Scie. & Tech.
Changchun, China

- Arbitrary fractional order integrator can be designed by a method of constructing the rational approximation function in the form of continued product. The circuit is made up of level-N active operational amplifier network.
- It only needs four different resistors and a series of regular capacitors and is easy for industrial production.

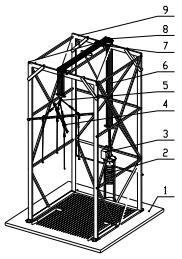

Fractional integrator circuit

TA1-5(3) 11:00-11:15

Design Analysis & Verification of Separation Test Platform for Spacecraft

Zheng Shengyu, Yi Wangmin, Li Qing, Chen Qiwei, Guo Dabao, and Tang Laiying
Beijing Institute of Spacecraft Environment Engineering
Beijing, China

- Used for spacecraft modules separation test on the ground.
- Composed by framework, connection rope, pulley modules, buffer module, lock modules, balance weight, force recorder and lifting sling.
- The stiffness coefficient of connection rope is significant to system stability, and it is the core part of the platform.
- 2) The damping coefficient of connection rope and frictional resistance force is NOT significant.



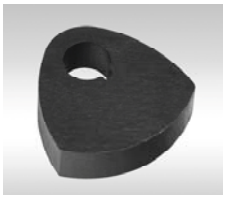
The Separation Test platform

TA1-5(4) 11:15-11:30

Cross Coupling Compensation Control For Cam Grinding Based on Arbitrary Proportion Error Distribution

Zhen Sui, Hongyu Wang, and Jing Wang
Department of Control Science and Engineering, Jilin University
Changchun, China

- Motivation by the Recent Progress
- Cam Contour Error Model
- Improved Coupling Compensation Control Scheme
- Arbitrary Proportion error Distribution Method Based on BP Neural Network Technique
- Simulation Implementation and Comparative Analysis

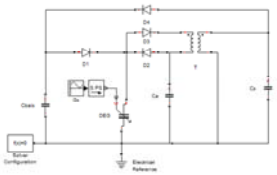

The Cam

TA1-5(5) 11:30-11:45

Research on Energy Harvesting Circuit Based on Self-filling DEG

Shiju E, Aifei Liu, Jianbo Cao, Caijun Ge, Lili Jin and Xiaoqi Jiang
College of Engineering, Zhejiang Normal University, China
School of Mechatronic Engineering, Lanzhou Jiaotong University, China

- DEG employs high flexible dielectric elastomer as mechanical-electrical energy conversion medium.
- This paper presented a self-filling energy harvesting circuit.
- The self-filling circuit can transfer portion of the harvested energy back to DEG as bias voltage to compensate for the energy loss during energy harvesting.
- This new type of circuit can also increase the voltage across the storage capacitor, and harvest electrical energy continuously.

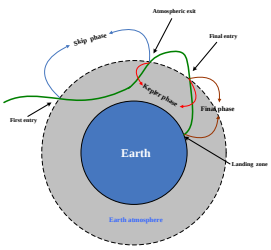

Equivalent Simulation Model of Self-filling DEG Energy Arvesting Circuit

TA1-5(6) 11:45-12:00

Robust Skip Earth Entry Guidance for a Low L/D Spacecraft

Chengchao Bai, Jifeng Guo, Xibao Xu, Guoping He
School of Astronautics, Harbin Institute of Technology
Harbin, China

- INTRODUCTION
- REENTRY DYNAMICS MODELING OF THE LUNAR CAPSULE
- ALGORITHM DESCRIPTION
- REENTRY SIMULATION
- CONCLUSION



Skip entry trajectory for lunar-return mission

TA1-6: Sensor Network & Fault Diagnosis

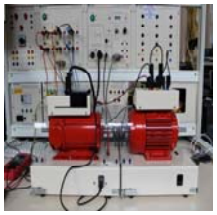
Session Chairs: Nan Xiao, Beijing Institute of Technology
Hong Zhang, University of Alberta, Canada
Conf. Room 6, 10:30-12:00, Tuesday, 4 August 2015

TA1-6(1) 10:30-10:45

Robust Sensor Fault Estimation for Induction Motors Augmented Observer and GA Optimisation

Kai Sun, Zhiwei Gao, and Sarah Odofin
Faculty of Engineering and Environment, University of Northumbria
Newcastle upon Tyne, NE1 8ST

- Current sensors of induction machines would have faults or malfunctions due to the age.
- Augmented observer is designed to simultaneously estimate system states, and current sensor faults.
- GA optimisation technique is employed to attenuate uncertainties.
- The real-data of the induction motor collected by experiment is utilized to validate the proposed method.



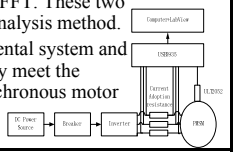
Induction Motor

TA1-6(2) 10:45-11:00

The Correlation Analysis of PM Inter-turn Fault based on Stator Current and Vibration Signal

Yongcan Li, Yongchun Liang
Department of Electrical Engineering, Hebei University of Science and Technology
Shijiazhuang, China

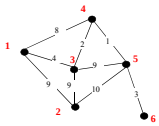
- Inter-turn fault is the most probably fault in permanent motor.
- It is difficult to find small inter-turn fault using only stator current. In this paper, the vibration spectrum and stator current spectrum are obtained by FFT. These two spectrum is fused with the correlation analysis method.
- Test shows that the permanent experimental system and the correlation analysis method can fully meet the requirements of permanent magnet synchronous motor fault test and research.



TA1-6(3) 11:00-11:15

Applying Differential Evolution Algorithm to Deal with Optimal Path Issues in Wireless Sensor Networks

Ren Jingjuan, Wang Jiuwei, Xu Yulong, Cao Li
School of Information Technology
Henan University of TCM
Zhengzhou, China
rjj666@126.com, kgyl1029@126.com



The path topology of six sensor nodes in WSNs

TA1-6(4) 11:15-11:30

Doppler Shift Signature for BPSK in a Vehicular Network: IEEE 802.11p

E.A Feukeu1, S.M Ngwira2, and T.Zuva3
Dept. Computer System Engineering, Tshwane University of Technology
Pretoria 0001, South Africa

- System Development
- Mathematical Model derivation
- Doppler Shift Signature
- Signature Linearization
- Conclusion

V2V and V2I communication systems transfer of information

TA1-6(5) 11:30-11:45

Sensor Fault Diagnosis Study of UUV Based on The Grey Forecast Model

Juan Li, Xiaoyou Zhang and Xinghua Cheng
Department of Automation, Harbin Engineering University
Harbin, China

- The paper aims at studying sensor fault dianosis of UUV which is performing tasks.
- On the basis of analyzing the abnormal sensor model of UUV, put forward the corresponding method of fault diagnosis .
- The improved gray model GM(2,1) theory is introduced.
- Through analyzing the actual output signal and output signal , detect sensor fault in real time.

Underwater Unmanned Vehicle

TA1-7: Robotic Structure and Manipulator Control

Session Chairs: Toshio Fukuda, Beijing Institute of Technology
Tatsuo Arai, Osaka University, Japan
Conf. Room 7, 10:30-12:00, Tuesday, 4 August 2015

TA1-7(1) 10:30-10:45

A Methodology for Comparing the Dynamic Efficiency of Different Kinematic Structures

Bhanoday Vemula, Giacomo Spampinato, and Törgny Brögardh *
Mälardalen University, Eskilstuna, Sweden
*ABB Robotics, Västerås, Sweden

- Comparison is based on actuator torque requirement criteria.
- The method is applied to find out what type of robot structure is best suited as a lightweight industrial robot in the conceptual design phase.
- As a proof of concept this method is applied on the industrial robot structures showed in the picture.

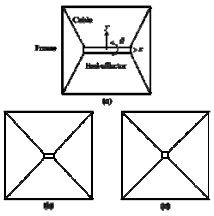
ABB Industrial robots with serial And parallelogram structures

TA1-7(2) 10:45-11:00

Simulation of Effect of Cable Robot Configuration on Natural Frequency

Jinlong Piao, Jinwoo Jung, Jeong-An Seon, Sukho Park, Jong-Oh Park, and Seong Young Ko
Department of Mechanical Engineering & Robot Research Initiative
Chonnam National University, Gwangju, South Korea

- To obtain equations of motion for a planar cable robot using Lagrange formulation
- To linearize the Lagrange equations for mode analysis
- To simulate and to analyze natural frequencies of a planar four cable robot according to the shape of end-effector and the shape of frame



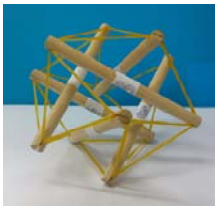
Different end-effector shapes

TA1-7(3) 11:00-11:15

A Low-CG Configuration Realization Method for Increasing the Stability of the TR-6 on a Slope

Wenjuan Du, Shugen Ma, Bin Li, Minghui Wang
State Key Laboratory of Robotics, Shenyang Institute of Automation,
Chinese Academy of Sciences, Shenyang, China

- Description of the TR-6.
- Low-CG configuration realization method.
- Stability test.
- Conclusion.



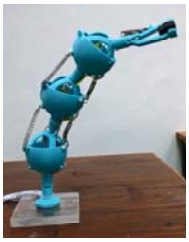
6-strut tensegrity model

TA1-7(4) 11:15-11:30

The Ultimate Hyper Redundant Robotic Arm Based on Omnidirectional Joints

Yingtian Li and Yonghua Chen
Department of Mechanical Engineering, The University of Hong Kong
Hong Kong SAR

- Review and Comparison between Hyper-redundant Robots and Continuum Robots
- Proposed Joint – Stiffness Control
- Proposed Joint – Rotation Control
- Proposed Prototype and Potential Applications



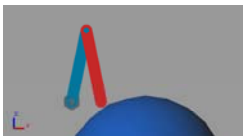
Prototype Arm with Three Omnidirectional Joints

TA1-7(5) 11:30-11:45

Adaptive Hybrid Impedance Control of Robot Manipulators with Robustness against Environment's Uncertainties

Jianfei Li[1], Li Michael Liu[1], Yaobing Wang[2], Wenyuan Liang[1]
[1]Center of Excellence for Intelligent Mechanical Systems , Peking University
[2]Beijing Key Laboratory of Intelligent Space Robotic Systems Technology and Applications , Beijing Institute of Spacecraft System Engineering
Beijing, China

- Designed a hybrid impedance controller that can implement impedance control and motion control.
- The adaptive strategy copes with the lack of accuracy of dynamics model .
- The robustness of the controller allows us command a contact force even when we do not know the dynamics or the shape of the environment.



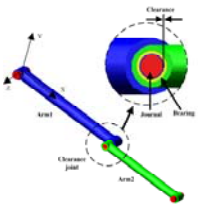
Force control on a sphere face

TA1-7(6) 11:45-12:00

Modeling and Simulation of Joint Clearance Effects on Space Manipulator

Junlan Li, Hongzhou Huang and Yunqiang Yang
School of Mechanical Engineering, Tianjin University, Tianjin, China

- The clearance generates kinematic error of space manipulator.
- Vibration of manipulator angular acceleration is enlarged with increase of clearance size.
- The fluctuation of manipulator angular velocity is enlarged by microgravity effects.
- Microgravity aggravate impact behavior between journal and bearing in clearance joint.



Space manipulator system

TP1-1: Intelligent Mechatronics and Application I

Session Chairs: Dingsheng Luo, Peking University
Jiayu Liu, Beijing Institute of Technology
Conf. Room 1, 13:30-15:00, Tuesday, 4 August 2015

TP1-1(1) 13:30-13:45

Design of a Male-type Dance Partner Robot for Leading a Physical Human-Robot Interaction

Diego Felipe Paez Granados, Kosuge Kazuhiro
Department of Bioengineering and Robotics, Tohoku University
Sendai, Japan

- A robot leader conceptualization for physical Human-Robot Interaction.
- Design of a robot capable of leading a human partner while dancing.
- Analysis of the human body motion for DOF extraction and minimization.
- Interaction forces analysis for leading in the pHRI.
- Robotic platform design through multi-objective optimization to maximize dynamic stability.

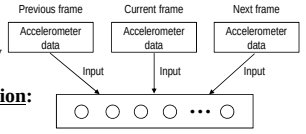
The Dance Partner Robot Project

TP1-1(2) 13:45-14:00

Improving Activity Recognition with Context Information

Licheng Zhang, Xihong Wu, Dingsheng Luo *
Key Lab of Machine Perception (MOE), Speech and Hearing Research Center, Peking University, Beijing, China
{zhanglc, wxh, dsluo}@cis.pku.edu.cn

- **Motivation:**
  How to make use of context information to improve activity recognition performance.
- **Involving context information:**
  - Traditionally, only taking current frame as inputs.
  - Context information are involved in this research, where apart from current frame, corresponding previous and next frames are also considered.
- **Conclusion:**
  With context information, the performance of activity recognition could be improved, and the more context the better performance.



The input layer of a DNN with context information

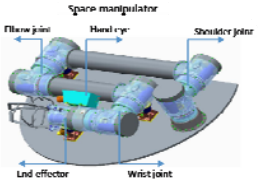
Fig. New learning manner for a DNN model involving context information

TP1-1(3) 14:00-14:15

A Space Robot Hand Arm System: Designed for Capture

Jiayu Liu, Qinglin Fan, Yanbo Wang, Ke Li and Qiang Huang
Intelligent Robotics Institute, Beijing Institute of Technology
Beijing, China

- 6-DOF
- Mass:25 kilograms.
- Length: 1.5 meters.
- Envelope:740*460*220mm^3.
- Load:10 kilograms.
- End velocity:0.5m/s.
- Location precision:±0.05mm
- Servo bandwidth: 40kHz



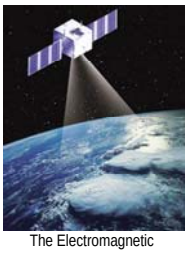
Space Manipulator

TP1-1(4) 14:15-14:30

Mission Planning for Electromagnetism Environment Monitors Satellite Based on Genetic Algorithm

Zhenhai Lin
School of Automation Science and Electrical Engineering,
Beihang University, Beijing

- The mission planning for Electromagnetic Environment Monitors Satellite (EEMS) involves a lot of complicated constraints.
- This article establishes the constraints satisfaction problem (CSP) models for the EEMS mission planning problem.
- The problem of mission planning for EEMS can be solved effectively with Genetic algorithm (GA).



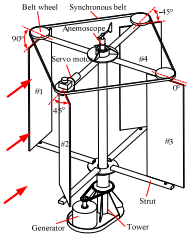
The Electromagnetic Environment Monitors Satellite

TP1-1(5) 14:30-14:45

Design and Implementation of Straight-bladed Vertical Axis Wind Turbine with Collective Pitch Control

Lixun Zhang[1], Yue Pei[1], Yingbin Liang[1], Fengyue Zhang[2],
Yong Wang[1], Jingjia Meng[1], and Haoran Meng[3]
1 College of Mechanic and Electronic Engineering, Harbin Engineering University
2 Department of Technology Centre, Great Wall Motor co., LTD
3 College of marine engineering management, Harbin shipping school

- A prototype of straight-bladed vertical axis wind turbine with collective pitch control was designed.
- The stating capacity of SB-VAWT had been greatly improved, and the Cp_{max} is more than 16%.
- The region of operating TSR for SB-VAWT with CPC is about 0.5 to 0.7 for different rotor configuration.



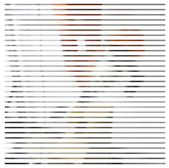
SB-VAWT with CPC

TP1-1(6) 14:45-15:00

Motion Planning for Vision-based Stevedoring Tasks on Industrial Robots

Shijun Wang, Hao Guo, Xuewei Cao, Xiaojie Chai, Feng Wen and Kui Yuan
Institution of Automation Chinese Academy of Sciences
Beijing, China

This paper proposed an autonomous robot motion planner for industrial robots with a focus on vision-based stevedoring applications. In the first stage, with the 3D model of the environment and the picking and placing pose of the robot's wrist obtained by visual system, the planner finds a collision-free path. In the second stage, the planner transforms the path nodes described in the Cartesian space into joints angels in the joints configuration space, then formulates and solves the optimization problem by means of cubic splines.



The Grasping System

TP1-2: Modeling, Simulation Techniques and Methodology I

Session Chairs: Zhenyu Yang, AaLborg University
Jiewu Leng, Xi'an Jiaotong University
Conf. Room 2, 13:30-15:00, Tuesday, 4 August 2015

TP1-2(1) 13:30-13:45

Development of a Unique Grip and Lift Mechanism for Automated Test Water Systems

Kevin Tai, Abdul-Rahman El-Sayed, and Mohammad Biglarbegian
Mechanical Research Lab., University of Guelph
Guelph, ON, Canada

- Designed a unique, two-pronged forklift mechanism.
- Simple, cost effective, lightweight and strong.
- Built from Aluminum T6-6061.
- Analyzed using Instron 5965 Compression Tester and FEA analysis.
- Factor of Safety = 3.37.

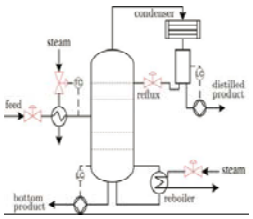
Completed two-pronged forklift mechanism.

TP1-2(2) 13:45-14:00

Modeling Separation Dynamics in a Multi-Tray Bio-Ethanol Distillation Column

Petar Durdevic, Simon Pedersen and Zhenyu Yang
Department of Energy Technology, Aalborg University Esbjerg, Denmark

- Distillation columns have been more and more employed in the bio-ethanol industry, with respect to the fact that they play a key role in refining the ethanol fraction
- This work investigates a relatively simple dynamic model of a multi-tray distillation column based on energy and mass balance principles, so that mass and energy travel inside the column can be properly estimated.



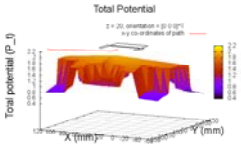
A typical distillation process

TP1-2(3) 14:00-14:15

Automatic Path Planning for 3-D Assembly System using Configuration Space and CAD model

A. Saksena, T. Nammoto, J. Kinugawa, K. Kosuge
System Robotics Lab, Department of Bioengineering and Robotics, Tohoku University, Japan

- New method for the motion planning for the assembly of components, using mobility potential.
- System generates a smooth trajectory and hence the system becomes continuous and faster.
- The path is planned from assembled state to disassembled state, using the potential variation method.



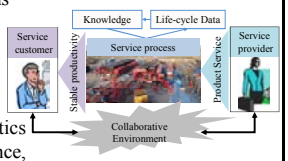
Automatic path generation using mobility potential

TP1-2(4) 14:15-14:30

Proposal of Industrial Product Service System for Oil Sands Mining

Jiewu Leng, Pingyu Jiang and Yongsheng Ma
Xi'an Jiaotong University
Xi'an, China

- Presented the concept of an industrial product-service system for oil sands mining (om-iPSS)
- Cloud computing are proposed as embedding knowledge in the outsourcing-oriented om-iPSS
- om-iPSS has advanced characteristics such as distributed, intelligence, adaptation and self-organization, as well as enabling individualized and highly-customized production.



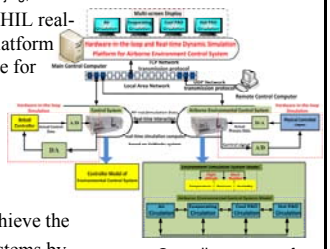
Concept of om-iPSS

TP1-2(5) 14:30-14:45

Construction Method and Implementation of HIL Real-time Dynamic Simulation Platform for Airborne ECS

Wei Liu, Yunhua Li, Juntao Jia and Lina Ling
School of Automation Science and Electrical , Beihang University
Beijing, China

- The structure and function of a HIL real-time and dynamic simulation platform based on distributed architecture for airborne ECS is presented.
- The simulation platform can realize real-time and dynamic simulation of airborne ECS through main control software.
- The simulation platform can achieve the co-simulation of large-scale systems by the simulation network.



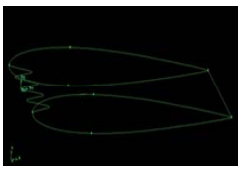
Overall structure of simulation platform

TP1-2(6) 14:45-15:00

Research on the Lift Characteristic of Morphing Bionic Fin Stabilizer at Zero/low Speed

Qi Zhigang1, Liu Yanwen2, Jia Hong3
Automation College, Harbin Engineering University
Harbin, China

- The lift of humback whale fin stabilizer and fin stabilizer with humps is studied at zero/low speed.
- The lift of humback whale fin stabilizer and fin stabilizer with humps is simulated by Fluent.
- The humpback whale fin stabilizer is more suitable to produce bigger lift than standard fin stabilizer not only at zero/low speed but also at medium/high speed.



humpback whale fin

TP1-3: Medical and Rehabilitation

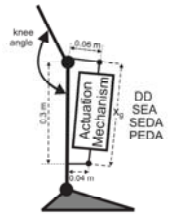
Session Chairs: Zhidong Wang, Chiba Technology Universty
Jun Liu, Tianjin University of Technology
Conf. Room 3, 13:30-15:00, Tuesday, 4 August 2015

TP1-3(1) 13:30-13:45

Comparison of Peak Power and Energy Requirements in Different Actuation Concepts for Active Knee Prosthesis

Patrick Scholl, Verena Grabosch, Mahdy Eslamy and André Seyfarth
Locomotion Lab., Technische Universität Darmstadt
Darmstadt, Germany

- Investigation on peak power and energy requirement of different actuation concepts
- 3 different gaits examined
- SEA shows best results for passive concepts
- Variable damping PEDA and SEDA show best overall results



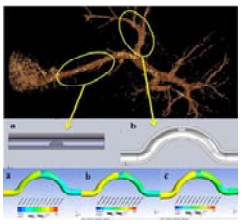
Knee Prosthesis Geometry

TP1-3(2) 13:45-14:00

Studies on the Dynamic Behaviours and Mechanisms of Hepatic Vessel Perfusion with Simple Vessel Models

Jun Liu,Yong Fan, Yihe Liu, and Hongbiao Xiang
Tianjin key laboratory of the Design and Intelligent Control of the Advanced Mechanical System
Tianjin key Laboratory of Organ Transplantation
Tianjin, China

- Hepatic Vessel Modeling
- Establishment of Mathematical Model of The Fluid Dynamics and The Vessel Wall
- Determination of The Physical Parameters of The Perfusion Fluid
- Fluid-solid Coupling Dynamics Simulation

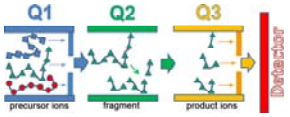


TP1-3(3) 14:00-14:15

Quantitative Detection of Dopamine, Serotonin and Their Metabolites in Rat Model of Parkinson's Disease using HPLC-MS/MS

Jianqing Lu, Feiyi Sun, Hong Ma, Hong Qing, Yulin Deng
School of life science, Beijing institute of technology
Beijing, China

- In this study, we established two viral vector-based Parkinson's Disease models in rat.
- DA content reduction was detected in striatum, and the more reduction in rAAV-α-synuclein A53T group owning to the more toxicity of mutation protein.



TP1-3(4) 14:15-14:30

Review of Comanipulation Robot in Surgery

Yue Zhan, Xing-guang Duan*, Jian-xi Li
Intelligent Robotics Institute, Beijing Institute of Technology University
Beijing, China

- Comanipulation with the novel feature of high backdrivability and high precision because of active constrain control is a prime solution of Interaction of human and robot.
- This paper introduces several comanipulation robots in surgery and summarizes the characteristics of each robot.
- The challenges and opportunities of comanipulation robots in the future are concluded.

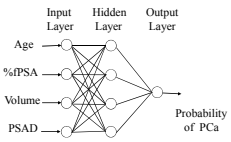
Typical comanipulation robot

TP1-3(5) 14:30-14:45

Predictive Models for Prostate Cancer based on Logistic Regression and Artificial Neural Network

Ping Ge[1], Fei Gao[1], Guangfei Chen*[2]
[1]Beijing Institute of Technology, Beijing, China
[2]Chinese People's Liberation Army General Hospital, Beijing, China

- 586 men with histologically confirmed diagnoses were enrolled in this study. Predictors for modeling included age, %fPSA, prostate volume, and PSAD.
- The sensitivity, specificity, accuracy, AUC of LR model were 0.8623, 0.8616, 0.8618, 0.924 versus 0.8563, 0.8854, 0.8771, 0.933 for the ANN. These two models performed equally.



The trained ANN

TP1-3(6) 14:45-15:00

A Quadrotor Helicopter Control System Based on Brain-computer Interface

Yu Song, Junjie Liu, Qiang Gao and Min Liu
School of Electrical Engineering, Tianjin University of Technology
Tianjin, China

- Introduction.
- Control Strategy.
- Experiment.
- Experimental Results.
- Conclusion.

The Control Digram

TP1-4: Adaptive Intelligent Control System

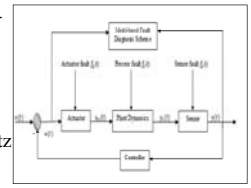
Session Chairs: Jian Guo, Tianjin University of Technology
Jingnan Zhang, Harbin Engineering University
Conf. Room 4, 13:30-15:00, Tuesday, 4 August 2015

TP1-4(1) 13:30-13:45

Unknown Input Observers for Fault Diagnosis in Lipschitz Nonlinear Systems

Xiaoxu Liu and Zhiwei Gao
Engineering and Environment, University of Northumbria
Newcastle upon Tyne, United Kingdom

- The significance of novel fault diagnosis and detection approaches.
- Integration of fault estimation and unknown input observer associated with linear matrix inequality to reduce influences of disturbances.
- Robust observer design for Lipschitz nonlinear systems subject to noises in both process and sensors.
- Simulation results to show the effectiveness.



Model-based fault diagnosis Scheme

TP1-4(2) 13:45-14:00

Adaptive Neural Network Position/Force Decomposed Control for Constrained Reconfigurable Manipulator

Guibin Ding[1], Bo Zhao[2,3], Bo Dong[1], Yingce Liu[2] and Yuanchun Li[2]
1. Jilin University, Changchun, Jilin Province, China;
2. Changchun University of Technology, Changchun, Jilin Province, China;
3. Institute of Automation, Chinese Academy of Sciences, Beijing, China.

- This paper is concerned with the position/force control problem for constrained reconfigurable manipulator via dynamic model decomposition.
- The superiorities of this scheme lie in that the control strategy can be used in different configurations and applied in practice easily due to the decomposed dynamics.
- Simulations have verified the effectiveness of the proposed method.

The constrained reconfigurable manipulator

TP1-4(3) 14:00-14:15

A New Motion Control Method for Omnidirectional Intelligent Wheelchair Based on Improved Fuzzy Support Vector Machine

Wentao Guo,Songmin Jia,Tao Xu,Xiuzhi Li
College of Electronic and Control Engineering ,Beijing University of Technology
Beijing, China

- This paper proposed the Fuzzy Support Vector Machine based on affinity to achieve the intelligent wheelchair motion control.
- The improved fuzzy membership function of FSVM can reduce the effect of clustering gravity center caused by abnormal clustering gravity center data generated from malfunction.

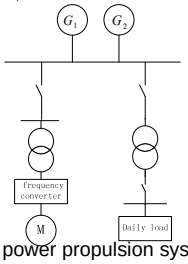
The Intelligent Wheelchair

TP1-4(4) 14:15-14:30

Comparison of Wavelet and Fourier Analysis in harmonics in electric propulsive shipping system

Jingnan Zhang and Lingzi Zhang and Jin Li and Linlin Bai
Department of Electrical Engineering, Harbin Engineering University
Harbin, Heilongjiang Province 150001, China

- To guarantee high power quality the monitoring of the power grid is essential part of the process.
- the comparison of different Fourier and wavelet algorithm.
- Through effective simulation to provide the solution about harmonic analysis algorithm for ship power system in the steady state and transient.



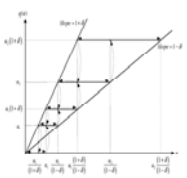
Ac power propulsion system diagram of the ship

TP1-4(5) 14:30-14:45

Adaptive Backstepping Quantized Control for a Class of Nonlinear Systems

Zaihua Yang, Xiaowei Yu, and Yan Lin
School of Automation, Beijing Univerity of Aeronautics and Astronautics, Beijing, China

- We design a backstepping based adaptive quantized control for a class of nonlinear systems with unknown parameters appear in all the differential equations. It is proved that by using the proposed method, all signals of the closed-loop system are globally bounded.
- Moreover, a very coarse quantization input can be obtained and the tracking error can be made arbitrarily small by choosing suitable design parameters.



The hysteretic quantizer

TP1-4(6) 14:45-15:00

Fuzzy PID Algorithm-based Motion Control for the Spherical Amphibious Robot

Jian Guo*1 , Guoqiang Wu*1 , Shuxiang Guo*1*2
*1 Tianjin Key Laboratory for Control Theory & Application in Complicated Systems and Biomedical Robot Laboratory, Tianjin University of Technology, Binshui Xidao 391, Tianjin, China
*2 Intelligent Mechanical Systems Engineering Department Faculty of Engineering Kagawa University, Takamatsu, Kagawa, Japan

- This paper presents a Fuzzy PID algorithm-based motion control for the amphibious spherical robot.
- Simulation experiments are carried out with Fuzzy PID algorithm and regular PID algorithm, the simulation results indicate that the proposed Fuzzy PID can improve more effectively the performance of the amphibious spherical robot than regular PID algorithm.

The proposed Fuzzy PID control algorithm

TP1-5: Signal and Image Processing I

Session Chairs: Baofeng Gao, Beijing Institute of Technology
Han Yu, Harbin Institute of Technology
Conf. Room 5, 13:30-15:00, Tuesday, 4 August 2015

TP1-5(1) 13:30-13:45

Error Analysis of Fisheye Correction Curve

Gang Bi, Xiaoling Zhang, Weijia Feng, Junchao Zhu, Xinya Lv
School of Electrical Engineering, Tianjin University of Technology, Tianjin, China

- a SVM-based distortion shape correction method for fisheye lens.
- The training data is obtained by corner detection.
- The center of the data is gained by Hough transform.
- The concern of this paper is the accuracy of the proposed algorithm.

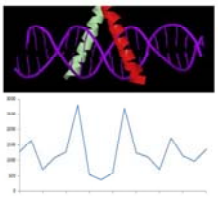
The image of fisheye

TP1-5(2) 13:45-14:00

Identification method of transcription factor binding sites based on DNase-Seq signal

Peichao Sang, Duojiao Chen, Siwen Xu and Weixing Feng
College of Automation,Harbin Engineering University,Harbin,Heilongjiang Province,China

- A model was designed to depict pattern of particular transcription factor binding sites.
- We processed the DNase-Seq signal detailedly before modelling.
- With the model, the specific transcription factor binding sites can be predicted in the experiment about C-jun transcription factor.



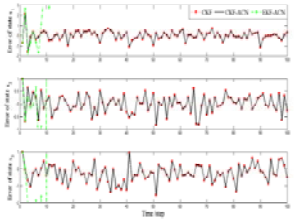
Signatures of transcription factor binding site based on DNase-Seq signal

TP1-5(3) 14:00-14:15

An Improved Gaussian Filter with Asynchronously Correlated Noises

Han Yu[1], Xiujie Zhang[2], Shenmin Song[1], Shuo Wang[1]
1. Center for Control Theory and Guidance Technology, Harbin Institute of Technology
2. Academy of Fundamental and Interdisciplinary Sciences, Harbin Institute of Technology
Harbin, China

- Gaussian filter
- Noises correlation
- Cubature Kalman filter



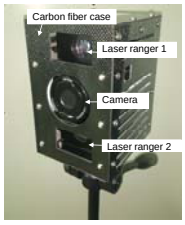
States estimation errors of CKF, CKF-ACN and EKF-ACN in $S_k = 0$

TP1-5(4) 14:15-14:30

High Voltage Transmission Lines Remote Distance Inspection System

Zhichao Wang[1], Zhanjiang Yu[1], Jinkai Xu[1], Xingxing Wang[1], Huadong Yu[1], Dianquan Zhao[2] and Dong Han[2]
1.Changchun University of Science and Technology , China; 2.Jinlin Electric Power Company Limited, China

- A remote distance inspection system is developed based on laser ranging and image processing technology
- The total mass is 4kg, it is available on vehicle and unmanned aerial vehicle.
- Working efficiency has been improved by automation in high voltage transmission lines inspection with the use of the system.



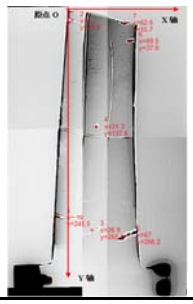
Components of lower position machine

TP1-5(5) 14:30-14:45

Region segmentation based radiographic detection of defects for gas turbine blades

Yuegen Wang, Bing Li, Lei Chen and Zhuangde Jiang
State Key Laboratory for Manufacturing Systems Engineering
Xi'an Jiaotong University, Xi'an, Shaanxi Province, China

- Digital radiography method for detecting defects in gas turbine blades.
- Aiming at the difficulty caused by the complex shape and uneven thickness, a region segmentation based method is proposed.
- Extracting and analysing gas turbine blades defects by using digital image processing technology.

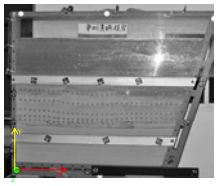


TP1-5(6) 14:45-15:00

Least Squares Based on Rodrigues Matrix and Its Application in Similar Material Model of Mining

Fuqin Yang[1], Huayang Dai[1]and Huimin Xing[2]
1.Geoscience and Surveying Engineering,China University of Mining&Technology,Beijing, China
2.Shangqiu Normal University Department of Environment and Planning,Shangqiu,Hennan Province,China

- (1)this paper designs a high-precision multiple intersections close-range photography process using non fixed camera station free direct shooting technology.
- (2)Patterns and procedures of parameter calculating in coordinate are proposed based on Rodrigues matrix, which efficiently resolve small amount of control points and uneven distribution of them, showing a good application result.



Similar Material Model

TP1-6: Sensor Network

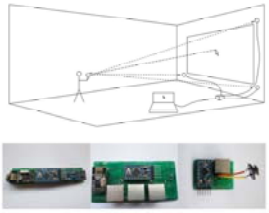
Session Chairs: Nan Xiao, Beijing Institute of Technology
Deyuan Wang, Harbin Institute of Technology
Conf. Room 6, 13:30-15:00, Tuesday, 4 August 2015

TP1-6(1) 13:30-13:45

The Design of a new type of TDOA-Based Local Space Mouse

Haonong Du
School of Mechanical Engineering., Shanghai Jiao Tong University
Shanghai, China

- Based on TDOA(time difference of arrival) and nine-axis attitude sensor.
- Can calculate the position of the see-point on reference plane.
- Transmitted in encoded wireless and ultrasonic signals.
- Has high accuracy, high sensitivity and high refresh rate.



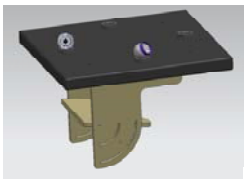
TDOA-Based Space Mouse

TP1-6(2) 13:45-14:00

A Universal Precision Positioning Equipment in Coordinate Unified for Large Scale Metrology

Wang Deyuan,Tang Wenyan, Zhang Xiaolin, Ma Qiang, Wang Jun, Sun Heyi, and Shao Jiang
School of Electrical Engineering and Automation,Harbin Institute of Technology
Harbin ,Heilongjiang Province, China

- Proposed a method for improving the accuracy of coordinates unified in large scale metrology.
- Used the calibrated relations of geometry in artifacts to control the errors of common points in coordinate unified .
- The artifacts are convenient and effective for positioning.
- The seven parameters algorithm is very effective.



Artifact for Large Scale Metrology

TP1-6(3) 14:00-14:15

Optimal Attention Allocation to Visual Search Tasks of Multi-UAVs Based on Operator Model

Lixuan Jian, Dong Yin, Lincheng Shen and Jian Yang
College of Mechatronic Engineering and Automation, National University of Defense Technology, Changsha, China

- Design a decision support system framework based on the operator decision-making model.
- Put forward an algorithm which is intended to solve the problem based on dynamic programming using a receding horizon strategy.
- Compare this algorithm with the greedy policy.

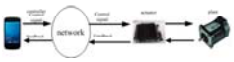
Unmanned Aerial Vehicle

TP1-6(4) 14:15-14:30

A Real-time Networked Control Framework Based on Mobile Phones

Dongliang Chen Guoping Liu, Fellow, IEEE
Department of Control Science and Engineering.
Harbin Institute of Technology. Harbin, China

- Hardware platform of networked controller: Mobile phones with android OS.
- New points: taking mobile phone as a real networked controller; adopting simulink coder which frees the user from programming in C or Java.
- Advantages of the framework: no need to design hardware platform; mobility, low-cost and easy to use.



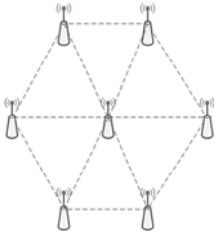
networked control framwork

TP1-6(5) 14:30-14:45

An Energy Balanced-Virtual Force Algorithm for Mobile-WSNs

Yaobing Li, Baihai Zhang and Senchun Chai
School of Automation, Beijing Institute of Technology
Beijing, China

- Sensor redeployment is researched in this paper.
- A modified model is introduced to increase the redeployment speed.
- An energy-balanced VFA is proposed to balance the energy distribution among nodes and prolong the entire network's lifetime.



The Optional Distribution of Nodes

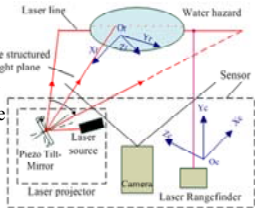
TP1-6(6) 14:45-15:00

Research on Water Hazard Detection Based on Line Structured Light Sensor for Long-Distance All Day

Haiyan Shao, Zhenhai Zhang, and Kejie Li
Intelligent Robotics Institute, Beijing Institute of Technology Beijing, China

Bullet points of this paper:

- In an unknown environment, the line structured light vision sensor can recognize the water hazards on nearly 107m. This distance is further than the current detection methods.
- The sensor can recognize the water hazards throughout the day.
- The processing algorithm of light strip image is faster than other methods. It can meet real-time requirements of UGVs.



The line structured light vision sensor

TP1-7: OS33: Robot Dynamics, Vibration Analysis and Vibration Control I

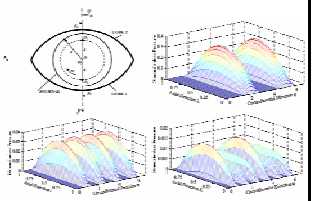
Session Chairs: Jun Liu, Tianjin University of Technology
Li Zhi, Xian Jiaotong University
Conf. Room 7, 13:30-15:00, Tuesday, 4 August 2015

TP1-7(1) 13:30-13:45

An Investigation of the Relationship Between Pressure Field and Periodic Bearing Structure

Zhi Li, Ruirui Duan, Jian Zhou and Lie Yu
State Key Laboratory for Strength and Vibration of Mechanical Structures,
Xi'an Jiaotong University, Xi'an, China

- Use Fourier series method to expand the oil-film thickness.
- Construct governing equations satisfied by the components of pressure expansion.
- Reveal inherent relationship between the components of the pressure and those of the oil-film thickness.



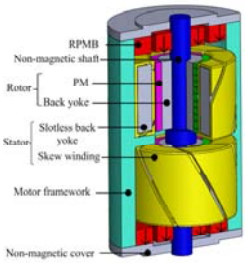
configuration of an elliptical bearing and the distribution of its pressure component

TP1-7(2) 13:45-14:00

Design and Analysis of a Novel Axial Actively Regulated Slotless Skew Winding Bearingless Motor

Guyu Wu, Xiaolin Wang, Qiang Ding, and Tuocheng Ni
College of Automation Engineering, Nanjing University of Aeronautics and Astronautics
Nanjing, Jiangsu Province, China

- The three-phase windings are wound in circumferential direction around a ring shaped stator, in the meantime skew from z-axis of α degree around the radial direction.
- Two pairs of PM rings are magnetized in the same axial direction to compose a repulsive passive magnetic bearing .
- Due to the Fleming's left-hand rule, the Lorentz force is generated according to the currents which go through the windings.



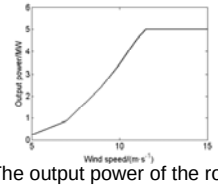
The SSWBM structure

TP1-7(3) 14:00-14:15

Study on Load and Aerodynamic Characteristics for Rotating Wind Turbine Rotor

Xudong Wang, Licun Wang and Hongjun Xia
Key Laboratory of Manufacturing Equipment Mechanism Design and Control of Chongqing
ChongQing Technology and Business University
Chongqing, China

- Load model of rotating wind turbine rotor.
- Aerodynamic loads and performances of wind turbine rotor.
- Aeroelastic deflections simulation of the rotor.



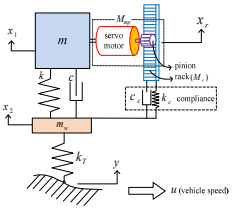
The output power of the rotor

TP1-7(4) 14:15-14:30

Control of Vehicle Vibration Using the Combined Compliant Actuator and Suspension System

Sannia MARETA[1)], Dunant HALIM[1)] and Atanas POPOV[2)]
Department of Mechanical Materials and Manufacturing Engineering,
[1)] The University of Nottingham Ningbo, China 315100
[2)] The University of Nottingham, NG7 2RD ,United Kingdom

- **Aim**: To develop a combined compliant actuator and suspension system for controlling vehicle vibration.
- **Results**: Vehicle body vibration is controlled by 2 means: (a) active control at around vehicle body resonance frequencies; (b) passive control by reducing the vehicle body vibration at low frequencies, improving the overall vehicle ride comfort and road handling.



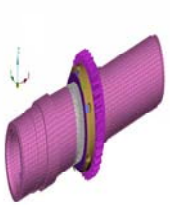
A Quarter-Vehicle Model with A Compliant Actuator

TP1-7(5) 14:30-14:45

Torsional Vibration Analysis of Fastening Structure Based on Finite Element Method

Jinle Zhang, Minggang Du,Yimin Shao, and Juan Chen
Science and Technology on vehicle transmission laboratory,China North Vehicle Institute
Beijing, China

- Fastening structure mainly plays a role of fastening and connection, and is widely used in all kinds of mechanical equipment. In modern engineering, due to the action of the torsional vibration excitation, pre-tightening force of fastening structure will be reduced gradually, and fastening structure loosening failure happens

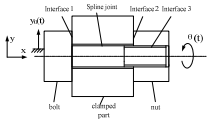


TP1-7(6) 14:45-15:00

Simulation on loosening behavior of threaded fastener under transverse vibration

Jinle Zhang, Minggang Du,Yimin Shao, and Juan Chen
Science and Technology on vehicle transmission laboratory,China North Vehicle Institute
Beijing, China

- The loosening mechanism of threaded fastener under transverse vibration is presented here. By using lumped-mass method with these stiffness, a three-degree-of-freedom dynamical model of threaded fastener under transverse vibration is developed to study the effects of amplitude of transverse activation on dynamical response.



The fastening structure

TP2-1: Intelligent Mechatronics and Application II

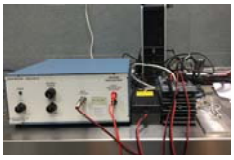
Session Chairs: Qingsong Xu, University of Macau, Macau
Dingsheng Luo, Peking University
Conf. Room 3, 15:15-16:45, Tuesday, 4 August 2015

TP2-3(1) 15:15-15:30

Adaptive Control with Unknown Parameters Estimation for Motion Tracking of Piezo-Driven Micromanipulator

Yulong Zhang and Qingsong Xu
Department of Electromechanical Engineering
University of Macau
Macau, China

- Introduction to piezo-driven micro-nanopostition
- Dynamics model of micogripper
- Conventional controller design
- Adaptive robust controller design
- Simulation results



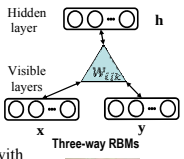
Microgripper experimental setup

TP2-3(2) 15:30-15:45

Modelling Inter-Task Relations to Transfer Robot Skills with Three-way RBMs

Yi Wang, Xiaoqiang Han, Zhan Liu, Dingsheng Luo *, Xihong Wu
Key Lab of Machine Perception (MOE), Speech and Hearing Research Center, Peking University, Beijing, China
{wangyi, hanxq, liuz, dsluo, wxh}@cis.pku.edu.cn

- **Motivation:**
  How a robot achieve new skills with knowledge from past skills ?
- **Transfer learning with three-way RBMs:**
  - Sample from source task and target task
  - Model inter-task relations with three-way RBMs
  - Train the model with the proposed CCD algorithm
  - Transfer the policy from source task to target task with the obtained inter-task mapping model
  - Use the transferred policy as initialization for reinforcement learning to achieve the desired new skill
- **Conclusion:**
  With three-way RBMs, new skills could be efficiently achieved using past experiences.



Three-way RBMs

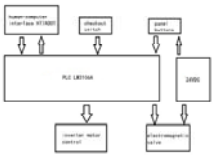
PKU-HR5.1

TP2-3(3) 15:45-16:00

Design and Realization of Liquid Filling Machine Intelligent Control System

Demin Zhang, Shibo Li
Tianjin Key Laboratory for Control Theory & Applications in Complicated System
Tianjin University of Technology
Tianjin, China

- Along with the socio-economic development and people's living standards constantly improving, demand for beverages and alcohol increases.
- This system is composed by HOLLSYS LM3106A PLC
- This system improves work efficiency 11.27%.



The Filling Machine System

TP2-3(4) 16:00-16:15

Study of space micro-vibration active isolation platform acceleration measurement

Feng Zhu, Zhiguo Shi, Zhaopei Gong, Liang Ding*, Honghao Yue, Rongqiang Liu, Qianqian Wu, Zongquan Deng
State Key Laboratory of Robotics and System, HIT
Harbin, China

- A kind of nine linear accelerometers allocation scheme containing redundant information compared with a basic configuration of six linear accelerometers.
- The data acquisition and filtering and makes use of the Kalman filter algorithm for the processing of the acceleration signal.
- Simulation and experiment results.

micro-vibration isolation platform

TP2-3(5) 16:15-16:30

Research on the Stability of High-level Order Pickers based on Gravity Center Self-balancing Technology

Changqing Cui, Yiqiang Wang, Chunyan Yang
College of Mechanical Engineering, Baicheng Normal University
Baicheng, China

- Proposes a high - level order pickers focus self-balancing technology.
- Improve the stability of the vehicle,
- Ensure the maneuverability of vehicle and reduce the labor intensity of workers, improving the working efficiency.

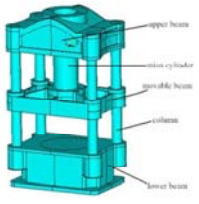
High actual model of the vehicle

TP2-3(6) 16:30-16:45

The Structural Static Analysis of Four-Column Hydraulic Press

Yuefeng Li, Tieqiang Wang
Tianjin Key Laboratory For Control Theory &
in Complicated Systems., Tianjin University of Technology
Tianjin, China

- In the structure calculation of hydraulic , usually use thetheory of "material mechanics" or "elastic mechanics" as a tool for the analysis of component.
- The structure strength of the hydraulic press is enough but the lack of rigidity of the upper beam and the movable beam, need to improve the design.



The overall structure of the three-dimensional model of the hydraulic machine

TP2-2: Modeling, Simulation Techniques and Methodology II

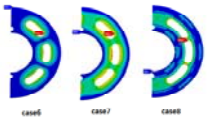
Session Chairs: Hechun Yu, Zhongyuan University of Technology
Guoqing Xia, Harbin Engineering University
Conf. Room 2, 15:15-16:45, Tuesday, 4 August 2015

TP2-2(1) 15:15-15:30

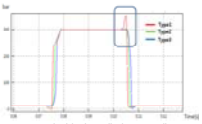
A Study on SimulationX® - based Simulation Technique to the Design of Valve Plate and Pressure Pulsation Characteristic according to Pre-compression Sections for Swash Plate Type Piston Pump

jin Woong Sa, Won Jee Chung, Jeong Min Lee, Jun Hyeong Bae
Robotics & System Lab., National University of Changwon
Changwon, Korea

- To analyse the effects of pulsation of the '*b*' factor, which is a design factor for valve plate, first, it is necessary to make a kinematic analysis of the swash plate type piston pump.
- these pre-compression sections can reduce pulsation which causes severe pressure fluctuations by making the internal pressure of the cylinder pre-compressed.



Result of the structure analysis about case6 to 8



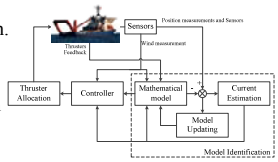
Pressure inside the cylinder according to pre-compression type

TP2-2(2) 15:30-15:45

Nonlinear Model Identification of a Ship Using Recursive Subspace Methods

Guoqing Xia, Ang Zhao, Xinghua Chen, and Guoqing Wang
College of Automation, Harbin Engineering University
Harbin, China

- This paper propose an online identification algorithm for ships of the dynamic positioning system.
- The model of the ship is first translated into a Hammerstein form, then subspace identification method is used and Givens rotation matrices are introduced for online updating.
- Simulation results have showed the feasibility and effectiveness of the proposed method.



System block of DP-3

TP2-2(3) 15:45-16:00

Hardware-in-the-loop Simulation System of VIS Based on MATLAB and ADAMS

Xian Li[1], Mingli Ding[1], Muding Wang[2], Chao Yang[2], Yanbo Sun[2], and Haitao Jing[2]
1. Harbin Institute of Technology, Harbin, China.
2. Shanghai Institute of Satellite Engineering, Shanghai, China

- The paper presents a novel method of hardware-in-the-loop co-simulation to improve the efficiency of research and development of the vehicle independent suspension system by using both MATLAB and Adams software.
- This proposed method is used in advance to obtain the characteristics and to validate the correctness of the control circuit of VIS
- Experimental results have verified the effectiveness of the proposed method.

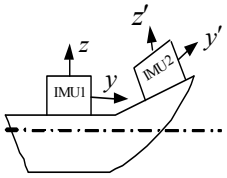
The VIS of McPherson

TP2-2(4) 16:00-16:15

Nonlinear Deformation Measurement method based on IMU for Ship

Gao Wei ,Shan Wei ,Xu Bo and Deng Li Ying
College of Automation, Harbin Engineering University
Harbin, China

- Ship deformation is a key element for high precision navigation.
- Because of the limitation of IMU installation location, it can leads to the nonlinear of the error model.
- The UKF method is used in this paper which shows that it has more high estimate precision and faster convergence speed than EKF



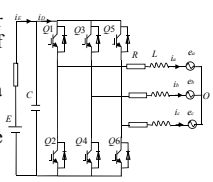
The deformation of ship

TP2-2(5) 16:15-16:30

The Flexible Grid-connection Research of Two-levle High-power Offshore Wind Power Grid Inverter

Yi Zhao Yongchun Liang
Mechatronics Research Lab., Beijing Institute of Technology
Beijing, China

- In this paper,we present a high-power offshore wind power grid inverter of two-level .
- We design an inverter of 30MW as a sample,the dc bus voltage is 35KV.
- The voltage loop is designed to keep the dc-link voltage steady.
- Simulation results successfully validate the proposed control strategy of grid-connection.



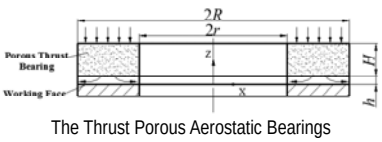
The Main Circuit

TP2-2(6) 16:30-16:45

Research on the Static Characteristics of Circular Thrust Porous Aerostatic Bearings

Yu Hechun, Li Huanhuan, Zhao Huiying and Ma Wenqi
Zhongyuan University of Technology, Zhengzhou, Henan Province, China

- The three-dimensional models of circular thrust porous aerostatic bearings were built and the simulations were carried out with the Fluent software.
- The effect of the porous material thickness, the working surface error and the rotating speed on the static characteristics of circular thrust bearings were studied. The following conclusions were obtained.



The Thrust Porous Aerostatic Bearings

TP2-3: Rehabilitation Systems

Session Chairs: Jian Guo, Tianjin University of Technology
Ping Sun, Shenyang University of Technology
Conf. Room 3, 15:15-16:45, Tuesday, 4 August 2015

TP2-3(1) 15:15-15:30

The Design and Implementation of the Electrically Powered Wheelchair Controller Based on STM32

Xinying Shan, Man Li,Heping Yan,Qiang Wang ,ZhiLan
National Research Center for Rehabilitation Technical Aids ,Beijing, China

- System Design of Electrically powered wheelchair controller.
- Design of Controller Hardware.
- Algorithm of Controller .
- Result of Controller.
- Solved their key technical problem while going outside for the elderly

Electrically powered wheelchair controller

TP2-3(2) 15:30-15:45

A gait trajectory measuring and planning method for lower limb robotic rehabilitation

Xiaonan Wang, Xuewei Cao, Haitao Song, Tao Lu and Kui Yuan
Institute of Automation, Chinese Academy of Sciences
Beijing, China

- Robotic Rehabilitation is a promising technique for nervous system injuries.
- This work focused on gait planning and customization in lower limb robotic rehabilitation.
- A visual marker system base on stereo vision was used to track the gait movement of healthy individuals, which acted as bases of gait planning.
- Gait planning and customization were implemented using patient parameters on a lower limb rehabilitation robot.

Lower Limbs rehabilitation robot

TP2-3(3) 15:45-16:00

Objective Evaluation System for Noise Reduction Performance of Hearing Aids

Li Zhang1, Xiaomei Chen1, Bo Zhong2, Longbiao He2, Huan Xu2 and Ping Yang2
1.North China Electric Power University, Beijing, China
2.National Institute of Metrology, Beijing, China

- Build an experimental platform which can simulate the real working conditions.
- Aligns the input signal and output signal before calculating indicators.
- Calculate the SNR and segSNR indicators, according to the values of these indices for opening and turning off noise reduction of hearing aid to analysis the noise reduction performance of hearing aid.

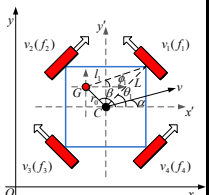
Objective Evaluation System

TP2-3(4) 16:00-16:15

Tracking Control for an Omnidirectional Rehabilitative Training Walker with Safety Velocity Performance

Ping Sun and Shuoyu Wang
Information Science and Engineering, Shenyang University of Technology, P.R.China
Intelligent Mechanical Systems Engineering, Kochi University of Technology, Japan

- The safety velocity trajectory tracking control algorithm is proposed for an omnidirectional walker.
- Closed loop stability of the tracking error system is established based on Lyapunov function and the safe tracking velocity performance are derived.
- As an application, the safety velocity tracking control is considered. The efficiency of the proposed scheme is demonstrated.



The structure of walker

TP2-3(5) 16:15-16:30

Feasibility Study of a Novel Rehabilitation Training System for Upper Limb Based on Emotional Control

Shuxiang Guo[1, 3], Xin Zhao[1], Wei Wei[2], Jian Guo[1], Fang Zhao[1], Yuye Hu[1]
[1]Tianjin Key Laboratory for Control Theory and Applications in Complicated Systems, Tianjin University of Technology, Tianjin, China
[2]College of Physics, Optoelectronics and Energy, Soochow University, Jiangsu, China
[3]Intelligent Mechanical Systems Engineering Department, Kagawa University, Takamatsu, Japan

- A novel rehabilitation training system for upper limb based on emotional control is proposed.
- Four types of mental states were analyzed and interpreted into control commands.
- Experimental results showed that it's much easier to control the training process with the collaborating of the semi-autonomous robot.

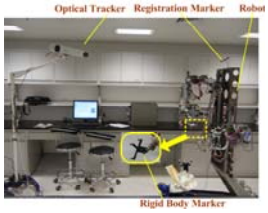
The upper limb rehabilitation training system

TP2-3(6) 16:30-16:45

Study on a Medical Robot for Mandible Reconstruction Surgery

Honghua Zhao[1], Jianying Tian[2]
[1]School of Mechanical Engineering, University of Jinan
[2]Department of Mechtronical Engineering, Shandong Institute of Commerce and Technology
Jinan, China

- Introducion.
- Overview of MRR.
- Image processing.
- Coordinate transformation.
- Experiment and result.
- Discuss and outlook.



slave side of experiment

TP2-4: Adaptive Control Application

Session Chairs: Xinkai Chen, Shibaura Institute of Technology
Nan Xiao, Beijing Institute of Technology
Conf. Room 4, 15:15-16:45, Tuesday, 4 August 2015

TP2-4(1) 15:15-15:30

SVM Based Adaptive Output Following Control for a Networked Cooling Process

Xiangming Zhang, Shengjun Wen, Dongyun Wang, and Xinkai Chen
Zhongyuan University of Technology, Zhengzhou, China

- An approximated model of the networked cooling process is built.
- The system parameters are estimated by using SVM model.
- The adaptive model output following controller based on the identification parameters is designed.
- Experimental results demonstrate tracking performance of the networked control systems is ensured.

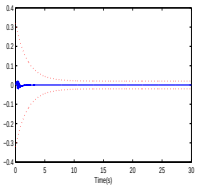
The cooling process

TP2-4(2) 15:30-15:45

Decentralized Adaptive Output Feedback Control for Interconnected Nonlinear Time-delay Systems with Unknown Hysteresis Input

Ye Liu, Zaihua Yang, and Yan Lin

- A class of interconnected nonlinear time delay systems with hysteresis input is investigated.
- By using local high-gain observers and backstepping technique, our proposed control scheme can guarantee the closed loop stability, prespecified transient tracking performance and steady state tracking performance.



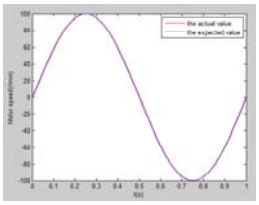
Tracking error

TP2-4(3) 15:45-16:00

Mode-free adaptive control method application for Auto-Door servo system

Guangyan Chen, Rongmin Cao, Huixing Zhou
School of Automation, Beijing Information Science & Technology University
Beijing, China

- The model-free adaptive control (MFAC) which is based on compact from format dynamic linearization (CFDL) is applied in the automatic door.
- The paper is directly based on the estimation and prediction of pseudo partial derivative (PID).
- It analyzed and compared the effects of speed control which displayed by model free adaptive control and PID algorithm.

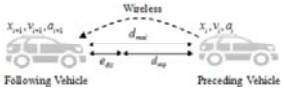


The speed tracking performance of MFAC algorithm

TP2-4(4) 16:00-16:15

Development and Evaluation of Cooperative Adaptive Cruise Controllers

Peidong Wang, Zhenping Sun, Jun Tan, Zhenhua Huang, Qi Zhu and Wei Zhao
College of Mechatronics and Automation
National University of Defense Technology
Changsha, P.R.China



Vehicles equipped with CACC functionality in the platoon

- Spacing Policy, Communication Structure and Problem Statement
- Control Structure and Controllers

A. Low-Level Control

B. High-Level Control 1) Linear Controller 2) MPC Controller

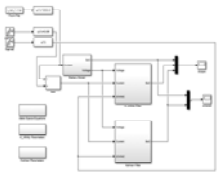
- Experimental Validation

TP2-4(5) 16:15-16:30

An H_∞ Filter Based Approach for Battery SOC Estimation with Performance Analysis

Yuehang Chen[1], Dagui Huang[1], Daiwei Feng[1] and and Kaiming Wei[2]
[1]School of Mechatronics Engineering, [2]School of Automation Engineering
University of Electronic Science and Technology of China
Chengdu, Sichuan, China

- Battery SOC estimation is key to battery management system design.
- Present a new battery SOC estimation algorithm using H_∞ filter.
- Performance under different noises and different parameters are analyzed using computer simulation.
- A comparison with traditional method shows its robustness.



MATLAB Model for Algorithm (Partial)

TP2-4(6) 16:30-16:45

Research on Ship Slanting Rudder Anti-pitching Intelligent Adaptive Generalized Predictive Control

Hongli Chen, Luo Gong, Xiaojing Xia
College of Automation, Harbin Engineering University,
Harbin, China

- Present research on ship's longitudinal control
- Introduction of the proposed GPC control.
- Simulation results and Conclusion

TP2-5: Signal and Image Processing II

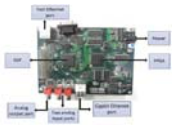
Session Chairs: Baofeng Gao, Beijing Institute of Technology
Bo Zhong, National Institute of Metrology
Conf. Room 5, 15:15-16:45, Tuesday, 4 August 2015

TP2-5(1) 15:15-15:30

Real-time Detection and Classification of Machine Parts with Embedded System for Industrial Robot Grasping

Hao Guo, Han Xiao, Shijun Wang, Wenhao He and Kui Yuan
Institution of Automation Chinese Academy of Sciences
Beijing, China

In this paper, a real-time machine vision system is designed for an industrial robot to grasp from an assembly line a class of machine parts which are similar in the general shape but different in details. In order to get real-time performance, the system is implemented on an embedded image card with an FPGA (Field Programming Gate Array) accelerating the computation. A rotationally adaptive edge-based template matching technique is used in our method, which not only reduces the amount of computation but also provides robustness against illumination changes.

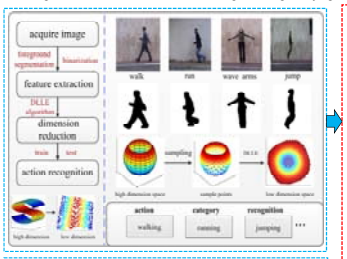


The Embedded System

TP2-5(2) 15:30-15:45

An Improved Body Action Recognition Method Based on Manifold Learning

Peng Zhang , Songmin Jia , Tao Xu, Xiuzhi Li , Xuan Xuan
College of Electronic and Control Engineering, Beijing University of Technology, Beijing, China



The process of body action recognition

Step 1: obtain the images of body action by the camera.
Step 2: extract the images' main feature for body action.
Step 3: adopt the DLLE algorithm to obtain the effective data information
Step 4: complete the recognition for kinds of body actions.

TP2-5(3) 15:45-16:00

Improved Dark Channel Prior Dehazing Approach Using Adaptive Factor

C. Chengtao, Z. Qiuyu, L. Yanhua
Department of Automation, University of Harbin Engineering
Harbin Province, China

- The foggy image always includes the sky and non-sky regions while the pixel values in this two distinguished regions is extremely different.
- The air light and transmission is different in sky and non-sky regions.
- The classic gray level threshold segmentation algorithm is used segmentation image.

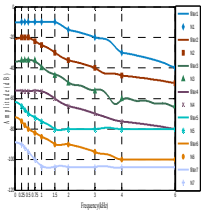
Defogging imge

TP2-5(4) 16:00-16:15

Design and Implementation of Filter for Simulating Hearing Loss

Bo Zhong1, Li Zhang2, Ying Bai1, Xiaomei Chen2, Feng Niu1 and Xiujuan Feng1
1.National Institute of Metrology, Beijing, China
2.North China Electric Power University, Beijing, China

- Design digital filters according to standard audiograms to simulate the hearing loss of deaf people based on the least square method.
- Do a set of experiments and analysis the frequency spectrograms of signals to show the attenuation effectiveness of the filters.
- Compare with standard audiograms by calculating correlation coefficient.



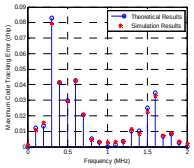
Amplitude-frequency response of the filters

TP2-5(5) 16:15-16:30

CWI Effects on Code Tracking Performance of Noncoherent Delay Lock Loop

Zhi Qu, Jun Yang, and Jianyun Chen
College of Mechatronics Engineering and Automation, National University of Defense Technology, Changsha, China

- A continuous frequency spectrum of spread spectrum signal is introduced.
- Analytical expressions of code tracking error under CWI are provided.
- The demodulation loss and squaring loss are presented.
- The interference not only changes the discriminator slope but also induces a code tracking bias.



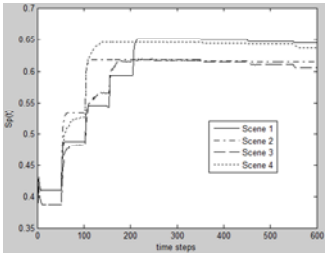
Comparison of maximum bias between theoretical results and simulation results.

TP2-5(6) 16:30-16:45

Research on Information Security Awareness of Groups Based on Cellular Automata

Fuxiong Sun, Mengshan Yu and Ping Xiong
School of Information and Safety Engineering,Zhongnan University of Economics and law
Wuhan, Hubei Province, China

- The paper has viewed the information security awareness of groups as a complex system, and proposed an ISA evolutionary model based on cellular.
- It can provide organizations with an overall picture of information security state.



Security training with movement

TP2-6: Sensor Design

Session Chairs: Haining Li, University of Electronic Science and Technology of China
Mingyu Fu, Harbin Engineering University
Conf. Room 6, 15:15-16:45, Tuesday, 4 August 2015

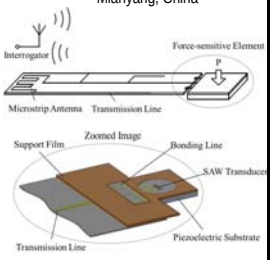
TP2-6(1) 15:15-15:30

Mechanical Simulation and Test of Force-sensitive Element in Surface Acoustic Wave Contact Stress Sensor

Haining Li, Jiexiong Ding, Yunpeng Zhang, Bowen Chu
University of Electronic Science and Technology of China
Chengdu, China

Guangmin Liu
China Academy of Engineering Physics
Mianyang, China

- Diaphragm structure integrated with SAW resonator was proposed for contact stress measurements in slits.
- Related simulation was implemented in COMSOL for determination of structural parameters.
- Test results show that the sensor has a good linearity to load in the range of 0-4MPa, which proved that this approach is feasible in this harsh environment.



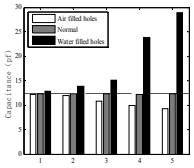
Force-sensitive Element

TP2-6(2) 15:30-15:45

Application of Interdigital Capacitive Sensors for Detecting Power Cable Insulation Damage

Liu Yonghong ,Huang Yunzhi, Tang Rui and Wang Beibei
School of Electrical Engineering and Automation, Hefei University of Technology
Hefei, China

- Interdigital capacitive sensors are widely used to measure moisture, porosity and viscosity with the advantages of single-side access, adjustable signal strength and tomography capability.
- A PCB type interdigital capacitive sensor was designed for detecting cross-linked polyethylene (XLPE) power cable insulation damage. The structure parameters are optimized and Sensitive field distribution are improved.
- The results show different damage can be detected effectively.



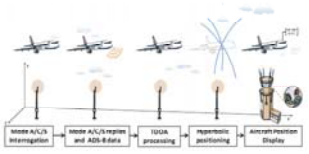
Measured capacitance profile of No.1-5 cables

TP2-6(3) 15:45-16:00

A MLAT Algorithm Based on Target Pressure Altitude

Zili Xu, Donglin He, Yong Tang and Jing Li
The 2nd Research Institute of Civil Aviation Administration of China(CAAC)
Chengdu, Sichuan Province, China

- Introduction and MLAT(Multilateration) positioning scheme
- MLAT positioning algorithm based on target altitude information
- Algorithm testing and result analysis
- Conclusions



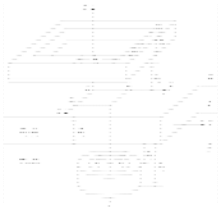
Position determination with MLAT technique

TP2-6(4) 16:00-16:15

Calculation Model for the Induced Voltage of Pick-up Coil Excited by Rectangular Coil above Conductive Plate

Siquan Zhang, Jiangfeng Tang and Weihua Wu
Department of Electrical Automation., Shanghai Maritime University
Shanghai, China

- Obtain the pick-up coil induced voltage using double Fourier transform method.
- Calculate through wall transmitted magnetic flux density.
- Rectangular coil is more useful than a circular coil.



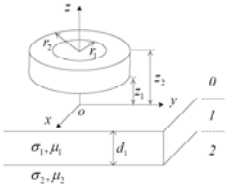
Rectangular excitation coil and cylindrical pick-up coil

TP2-6(5) 16:15-16:30

Comparison the Impedance Calculation Models of Coil Above Conductive Plates

Siquan Zhang, Jiangfeng Tang and Weihua Wu
Department of Electrical Automation., Shanghai Maritime University
Shanghai, China

- Obtain the coil impedance using double Fourier transform method.
- Compare with domain truncation method and FEM.
- The advantages of the methods about computation speed and computation accuracy are discussed.



Cylindrical coil above conductor

TP2-6(6) 16:30-16:45

Reconfigurable Control of Pipe-Laying Vessels after Sensor Faults

Mingyu Fu, Mingyang Li, Lingling Yu, and Chenglin Ni
Department of Automation, Harbin Engineering University
Harbin, China

- This paper presents a new automatic control reconfiguration method after sensor faults for pipe-laying vessels.
- Pipe-laying vessel is a kind of special operation vessel coordinated with dynamic positioning system.
- The new reconfiguration approach uses a virtual sensor that permits to keep the nominal controller in the loop.
- The main idea of a virtual sensor consists in augmenting the control loop with a reconfiguration block between nominal controller and faulty plant.

Pipe-Laying Vessel

TP2-7: OS33: Robot Dynamics, Vibration Analysis and Vibration Control II

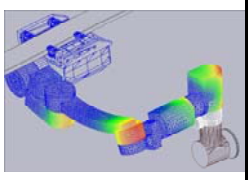
Session Chairs: Jun liu, Tianjin University of Technology
Zhaoheng Liu, Ecole de technologie superieure, Universite du Quebec
Conf. Room 7, 15:15-16:45, Tuesday, 4 August 2015

TP2-7(1) 15:15-15:30

Study and validation testing of the dynamics of a robotic system with flexible links and joints

Thomas Santos, Zhaoheng Liu
École de technologie supérieure, Université du Québec, Montreal, QC, Canada
Bruce Hazel
Institut de recherche d'Hydro-Québec, Varennes, QC, Canada

- Dynamic modeling of the time-varying robotic system.
- The flexibilities in joints and links are considered.
- Finite Element Method are used in modeling of links.
- Natural frequencies and mode shapes can be determined.
- Model validation using a laser tracker .

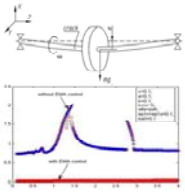


SCOMPI Robot

TP2-7(2) 15:30-15:45

Research of the Crack Propagation Control in a Nonlinear Rotor

Jun Liu, Yong Fan, Jianen Chen, Xiaofeng Wang and Hongbiao Xiang
Tianjin key laboratory of the Design and Intelligent control of the Advanced Mechanical system
School of Mechanical Engineering
Tianjin University of Technology
Tianjin, China



$$\ddot{x}-\alpha\dot{x}-x-\beta\left[\cos^2\theta-\varphi\right]\dot{x}-\sin\theta-\varphi\cos\theta-\varphi\dot{y}$$
$$-N_x=1-\omega^2\cos(\omega t-\varphi_x)-f_{wx}$$
$$\ddot{y}-\alpha\dot{y}-y-\beta\left[\sin^2\theta-\varphi\dot{y}-\sin\theta-\varphi\cos\theta-\varphi\dot{x}\right]$$
$$-N_y=\omega^2\sin(\omega t-\varphi_y)-f_{wy}$$

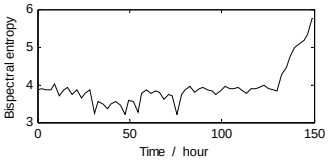
- The System Model and Dynamic Equations of a Cracked Rotor
- Numerical Simulation
- Crack propagation Control

TP2-7(3) 15:45-16:00

Feature Extraction Based on Bispectral Entropy for Gear Weak Fault

Yanbing Zhou, Yue Pan, Nan Wang, Hongwei Wang and Dong Liu
College of Mechanical and Electrical Engineering, Hebei University of Engineering, Handan, Hebei Province, China

- Gear crack fault will lead to changes in the non-Gaussianity of vibration signal.
- Power spectral entropy based on energy is not ideal to extract weak fault, because it has a great effect on non-fault factors.
- Bispectral entropy is extremely sensitive to non-Gaussian changes caused by weak gear fault. The acquired fault trend is accurate and effective.



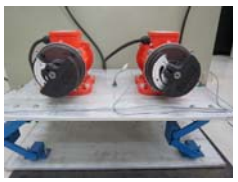
The trend lines of bispectral entropy

TP2-7(4) 16:00-16:15

Verification of Self-Synchronism of a Nonlinear Oscillatory System with Double Homodromy Rotors

Ye Li, He Li, Xiaopeng Wei, and Bangchun Wen
Department of Mechanical Design and Theory, Northeastern University
Shenyang, China

- This paper proposes and investigates the self-synchronism theory of a nonlinear oscillatory system with two rotors.
- The Hamilton principle is mainly applied to deduce the conditions of self-synchronism realization and stability.
- Simulation and experimental results have verified the accuracy of the proposed theory.



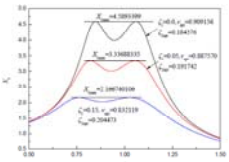
Synchronous vibration test platform

TP2-7(5) 16:15-16:30

Calculation of the Optimal Parameters of Dynamic Vibration Absorber in Consideration of the Damper of Primary Vibration System

Zhang Xiaolong, Dong Yabin and He Yumin
School of mechanical & electrical engineering, Xian University of Architecture & Technology
Xian, China

- A two degree of freedom dynamic model for the primary system.
- The frequency ratio and the damping ratio of the absorber.
- The analytic equations which describe the relations among the optimal frequency ratio, the optimal damping ratio and the maximal values in the amplitude-frequency curve are derived to testify the reliability of the optimal parameters.



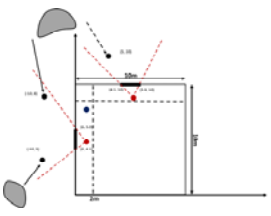
curves of amplitude amplification ratio

TP2-7(6) 16:30-16:45

Optimal Multi-objective Urban Tactical Position Selection

Kai Xu, Lin Sun, Long Qin, QuanJun Yin
College of Information System and Management, NUDT, Changsha

- Apply Multi-objective Genetic Algorithm to study Urban Tactical Defensive Position Selection Problem.
- Modeling
  - Objectives, Tactical Requirements
  - Multi-objective optimization
- Pareto Fronts & multiple force deployment plans are generated for urban defensive missions.



Case Study for TPS

Wednesday
August 5, 2015

Morning Sessions

WA1-1	Intelligent Mechatronics and Application III
WA1-2	Modeling and Control of Mobile Robot
WA1-3	Biomedical Technology
WA1-4	Sliding Mode Control Based System
WA1-5	Signal and Image Processing III
WA1-6	Manufacturing
WA1-7	Gripper, Legged and Wheeled Robots

Wednesday
August 5, 2015

Afternoon Sessions

WP1-1	Intelligent Mechatronics and Application IV
WP1-2	Underwater Robot
WP1-3	Biomimetic Robot System
WP1-4	Optimal Systems
WP1-5	Image Processing and Application
WP1-6	Industrial, Manufacturing Process and Automation I
WP1-7	Computer Vision
WP2-1	Analysis of Mechatronic System
WP2-2	Human-System Interaction and Interface
WP2-3	Mobile Robot Navigation
WP2-4	Design and Optimization of Systems
WP2-5	Vision and Image Proceeding
WP2-6	Industrial, Manufacturing Process and Automation II
WP2-7	Robot Vision

WA1-1: Intelligent Mechatronics and Application III

Session Chairs: Nan Xiao, Beijing Institute of Technology
Jigang Tong, Tianjin University of Technology
Conf. Room 1, 10:30-12:00, Wednesday, 5 August 2015

WA1-1(1) 10:30-10:45

Jerk-Optimal Trajectory Planning for Stewart Platform in Joint Space

PingWang, HengYang and KaiXue
College of Mechanical Electrical Engineering, Harbin Engineering University
Harbin , China

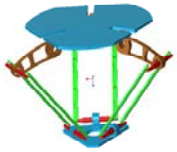
- Jerk-Optimal trajectory planning for Stewart platform in joint space
- Cubic spline is chosen to define the trajectory and solve the optimization problem
- Simulation is taken to verify the effectiveness of the algorithm
- Experiment is taken to compare the effect of jerk-optimal trajectory and traditional trajectory

WA1-1(2) 10:45-11:00

Neural Network Based Dynamic Trajectory Tracking of Delta Parallel Robot

Yuancan Huang, Zonglin Huang
School of Mechatronical Engineering, Beijing Institute of Technology
Beijing, China

- Introduction and background illustration for Delta parallel robot.
- The kinematics and dynamics of the Delta parallel robot and workspace analysis.
- Compensator designing based on Neural Network.
- The simulation results and inclusion .



Delta Parallel Robot

WA1-1(3) 11:00-11:15

Development and Experiment of Facial Robot SHFR-III

Yang Yang, Xianxin Ke, Jizhong Xin, Kongbi Lu
School of Mechatronics Engineering and Automation,University of Shanghai
Shanghai, China

- SHFR-III is a humanoid robot with a complete facial expression system
- The robot's head is consist of eyebrow mechanism, eyeball mechanism, lid mechanism, jaw mechanism and neck mechanism.
- The robot could achieve 8 basic facial expressions vividly.

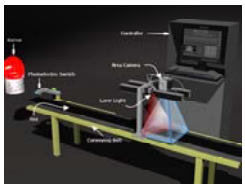
SHFR-III Robot

WA1-1(4) 11:15-11:30

Automatic Inspection of Tire Geometry with Machine Vision

Junfeng Li, Yuchun Huang
School of Remote Sensing and Information Engineering, Wuhan University
Wuhan, China

- Use a sequential line matching algorithm with the Line Detection with a Priori(LDP),to detect all the lines in an image accurately.
- Use laser lighting to robustly and accurately measure the tire geometry.Laser light is cast to the tire surface from a small incident angle.which can robustly refine the location of the tire edge in an image.



Automatic Inspection of Tire Geometry

WA1-1(5) 11:30-11:45

Development of an In-pipe Robot with Two Steerable Driving Wheels

Changlong Ye, Li Liu, Xiujun Xu, and Jun Chen
School of Mechatronic Engineering, Shenyang Aerospace University,
Shenyang, China

- An in-pipe robot with two helix-angle-adjustable driving wheels is introduced.
- The concept of triangular crossing section is proposed which solves the geometric constraint problems of the elbow pipe and the T-branch.
- The robot can realize three locomotion modes: double helix mode, rectilinear mode and steering mode.
- The validity of this robot is tested by performing experiments in various types of pipelines.

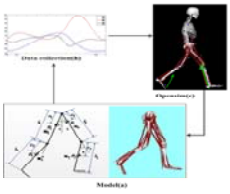
The In-pipe Robot with Two Steerable Driving Wheels

WA1-1(6) 11:45-12:00

Model and Dynamic Analysis in the Process of Walking

Jigang Tong[1], Shili Sheng[2], Wennan Chang[2] and Enzeng Dong[1]
[1] *Tianjin University of Technology* [2]*Nan kai University*

- Introduction.
- The strure of our work
- Opensim and Its use
- The establishment of dynamic model of walking assistant robot
- The gait experiment and verification
- Conclusion



The system structure diagram

WA1-2: Modeling and Control of Mobile Robot

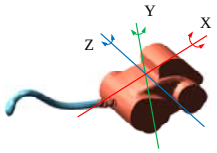
Session Chairs: Liwei Shi , Beijing Institute of Technology
Xiaoxiang Gong, Nanjing University of Science & Technology
Conf. Room 2, 10:30-12:00, Wednesday, 5 August 2015

WA1-2(1) 10:30-10:45

Dynamic Stability Control for a Bio-robot with Primates-Inspired Active Tail

Li Xiaoyun, Jiang Zhihong, Li Hui*, Mo Yang, Zou Mingjie and Huang Qiang
The Key Laboratory of Biomimetic Robots and Systems, Beijing Institute of Technology
Beijing, China

- Find suitable robot parameters.
- Derive a two-link rigid body model to inform the design of the robot.
- Implement a dynamic feed-forward controller combining with a proportional-derivative (PD) controller to control the robot.
- The robot can enable rapid air-reorientation, improve fall survivability, and stability over a big perturbation.



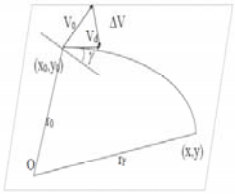
The robot with Primates-Inspired Active Tail

WA1-2(2) 10:45-11:00

A Study on Re-planning Orbit of Exoatmospheric Vehicle

Qian Wei and Yuanli Cai *
School of Electronic and information Engineering
Xi'an Jiaotong University, Xi'an, China

- The re-planning orbit method bases on a popular solution of Lambert question, minimizing the fuel consumption.
- According to the main cause of distance error, the method makes optimization under two in-dependent parts.
- Virtual terminal position is using to compensate error.



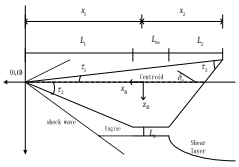
The vehicle's geometry

WA1-2(3) 11:00-11:15

Nonlinear Control Design for High-Speed Unmanned Aerial Vehicle with Unstable Zero Dynamics

Zeng Fanlin, Li Jigong, and Li Junfang
Tianjin Key Laboratory of Information Sensing and Intelligent Control, School of automation and electric engineering, Tianjin University of Technology and Education, Tianjin, China

- We presents a description of the vehicle model and elaborates on the non-minimum phase phenomena of the system model.
- An auxiliary model is presentedn.
- The robust nonlinear controller is presented together with the stability analysis.
- Finally, simulation results are discussed



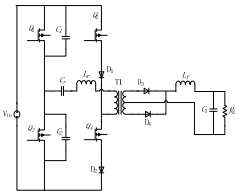
Scramjet powered Unmanned Aerial Vehicle

WA1-2(4) 11:15-11:30

Based on UCC3895 phase-shift full bridge ZVZCS with average current control closed loop simulation and design

jie zou, chengnin zhang
Electric Lab., Beijing Institute of Technology
Beijing, China

- Based on UCC3895 chips for the lagging arm series diode ZVZCS converter's phase shifting control
- Combined with a average current control part
- The purpose is realize soft switch so that reduce the switching loss and improve the efficiency
- The simulation is closed simulate



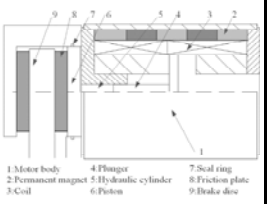
The main circuit

WA1-2(5) 11:30-11:45

Research on regenerative technology of EV based on direct-drive electric-hydraulic brake unit

Xiaoxiang Gong Siqin Chang Lichen Jiang Xiaopan Li
School of Mechanical Engineering,Nanjing University of Science&Technology, Nanjing, China

- Electric vehicle battery supplies electric energy to DDEHB directly.
- DDEHB is able to regulate wheels braking force independently.
- DDEHB avoid distribution restriction of braking force between axles completely.
- The designed regenerative strategy is able to recover braking energy as much as possible.



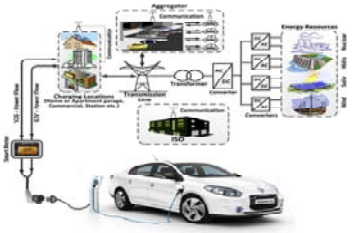
Structure of DDEHB unit

WA1-2(6) 11:45-12:00

An Overview on Impacts of Electric Vehicles Integration into Distribution Network

Youjie Ma, Bin Zhang and Xuesong Zhou
Key Research Laboratory for Control Theory & Applications in Complicated Systems
Tianjin University of Technology
Tianjin, China

- •Electric Vehicles
- •Distribution Network
- •Coordinated Charging
- •V2G



Electric Vehicle Charging

WA1-3: Biomedical Technology

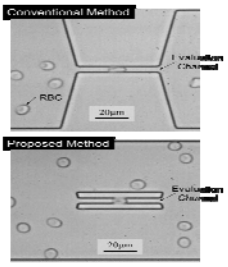
Session Chairs: Chia-Hung Tsai, Osaka University
Xiujun Li, Changchun University of Science and Technology
Conf. Room 3, 10:30-12:00, Wednesday, 5 August 2015

WA1-3(1) 10:30-10:45

Novel Microfluidic Chip for Extracting Cell Deformability

Chia-Hung Dylan Tsai[1], Kouji Mizoue[1], Makoto Kaneko[1], Shinya Sakuma[2] and Fumihito Arai[2]
[1] Dept. of Mechanical Engineering, Osaka University, Suita, Japan
[2] Dept. of Micro-Nano Systems Engineering, Nagoya University, Nagoya, Japan

- A new microfluidic design for evaluating cell deformability is fabricated and tested.
- The proposed design effectively improve the evaluation by stabilizing local pressure.
- The method is confirmed by theoretical analysis using electric circuit analogy.
- The correlation between cell size and velocity is improved 150%



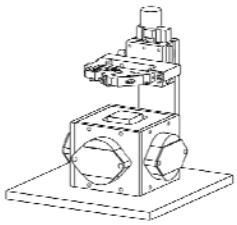
Cell Deformability Evaluation

WA1-3(2) 10:45-11:00

Development of Electromagnetic Scanning Stage for Astigmatic Profilometer

Biing-Chwen Chang, Ren-Feng Ding, Bo-Jing Juang, and Kuang-Yuh Huang
Department of Mechanical Engineering, National Taiwan University
Taipei, Taiwan

- The electromagnetic actuator is designed by using moving coil.
- A biaxial coplanar electromagnetic scanning stage is developed.
- A profilometer is constructed by combining scanning stage with astigmatic pickup head, and a IC sample and the epidermis tissue are measured.



The Astigmatic Profilometer

WA1-3(3) 11:00-11:15

A novel device for cell washing, lysis and efficient extraction of intracellular proteins in a continuous automatic mode

Shi Yu, Liu Xiujie, Chen Yuedong, Deng Yulin and Dai Rongji
School of Life Science, Beijing Institute of Technology
Beijing, China

- By simultaneously subjecting cells to lysis buffer and vibration of the cell suspension fluid, effective release of intracellular contents was obtained.
- The cell pretreatment chamber employs a membrane separation device which provided an effective area for the cell retention, washing and lysis by peristaltic pumps and solenoid valves.

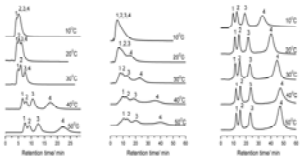
Block diagram of the device system

WA1-3(4) 11:15-11:30

The Influence of Grafting Chain Length on The Temperature Response and Separation Performance of Stationary Phase with Temperature Response

Yanli Liang, Dandan Yang, Rongji Dai*, Yulin DengThe school of life science, Beijing institute of technology, Beijing 100081, China

- bigger grafting density shorter chain
- lower temperature response
- alonger retention time.



WA1-3(5) 11:30-11:45

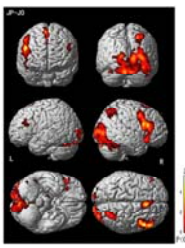
Function Neuroimaging Studies of Japanese- Chinese Bilinguals Phonological Processing for Language Education

Xiujun Li and Jingjing Yang
The School of Computer Science and Technology Changchun University of Science and Technology
7089 Weixing Road, Changchun
Jilin, China
lixiujun7897@ qq.com;

Qiyong Guo; Jinglong Wu
Department of Radiology, Shengjing Hospital of China Medical University; The Graduate School of Natural Science and Technology
China Medical University; Okayama University
Liaoning, China; Okayama, Japan
guoqy@sj-hospital.org; wu@mech.okayama-u.ac.jp

• In this study, we used functional magnetic resonance imaging to visualize Japanese Chinese bilinguals' brain activity in phonological processing of Chinese and Japanese characters.

• Reading in a second language (L2) is a complex processing that involves an interaction between L2 and the native language (L1). We investigate brain activations in processing Japanese phonological and font size by visual judgment tasks in fifteen Japanese subjects. Different activation patterns were observed between Chinese phonological and Japanese phonological judgment processing. We conclude that constellation of neural substrates was different for phonological processing.

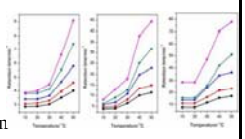


WA1-3(6) 11:45-12:00

Effects of Graft Density on the Separation Performance of Temperature-responsive Materials under the Same Graft Chain Length

Dandan Yang, Yanli Liang, Rongji Dai, Yulin Deng
School of Life Science of Beijing Institute of Technology
Beijing, China

- In the separation of steroids by PNIPAAm-modified silica having same graft length, the elution time of each analyte was prolonged by increase in column temperature. Furthermore Column efficiency was poor when graft amount of NIPAAm was too high. Therefore, for good separation effect and column efficiency, the graft density of NIPAAm should be in between 30% ~ 50%.



Retention time of steroids on PNIPAAm-modified silica with various graft densities of SIN10, SIN30, SIN50

WA1-4: Sliding Mode Control Based System

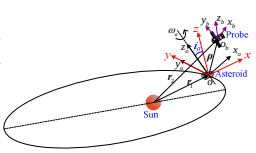
Session Chairs: Guoqing Xia, Harbin Engineering University
Juan Li, Harbin Engineering University
Conf. Room 4, 10:30-12:00, Wednesday, 5 August 2015

WA1-4(1) 10:30-10:45

6-DOF Adaptive Sliding Mode Control of Probe Hovering in the Irregular Gravity Field

Xiaosong Liu[a], Keping Liu[b], Yuanchun Li[a,b]
[a] Jilin University, Changchun, Jilin Province, China
[b] Changchun University of Technology, Changchun, Jilin Province, China

- This paper investigates a coordinate control of relative attitude and orbit for probe hovering in the asteroid orbital frame.
- An adaptive sliding mode control law is designed to guarantee the convergence of the state error in the presence of model uncertainties and external disturbances.
- Simulation results demonstrate the effectiveness of the designed control law.



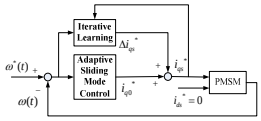
Schematic representation of the relative motion between probe and asteroid.

WA1-4(2) 10:45-11:00

A Low Speed Servo System of CMG Gimbal Based on Adaptive Sliding Mode Control and Iterative Learning Compensation

Zhao Lei , Zhai Baichen, Wu Dengyun , Lu Ming
Beijing Institute of Control Engineering
Beijing, China

- An adaptive sliding mode controller combined with iterative learning compensation strategy is proposed for the low speed servo system of control moment gyro (CMG) gimbal.
- The experimental results show that the proposed controller performs is better than conventional PID controller in speed stability, response speed and robustness.



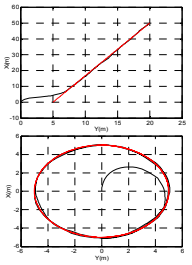
The principle block diagram of composite controller

WA1-4(3) 11:00-11:15

DRFNN Adaptive Observer Based Sliding Mode Tracking Control of an Underactuated Surface Vehicle

Guoqing Xia, Guoqing Wang, Xinghua Chen, Ang Zhao, Chengcheng Pang
College of Automation, Harbin Engineering University
Harbin, China

- This paper address the problem of trajectory tracking control of an USV.
- A dynamic recurrent fuzzy neural network observer is proposed, and a new sliding mode manifold definition is presented.
- Simulation results with two different reference trajectories show that the new controller yield fast and robust trajectory tracking.



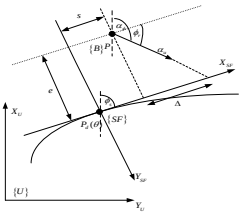
Designed and actual trajectories

WA1-4(4) 11:15-11:30

Path Following of Underactuated Surface Vessels Based on Neural Sliding Mode

Lei Yang, Jianpei Zhang and Zhen Yang
College of Computer Science and Technology, Harbin Engineering University
Heilongjiang, China

- Using the visual distance idea to design the surface vessels longitudinal speed reference and the reference Yaw angle. Think of it as a position error virtual controllers.
- Put the path tracking problem into a stabilization problem of the longitudinal velocity and the yaw angle.
- Combined the neural network and sliding mode design a nonlinear feedback robust controller, to realize the tracking control of the virtual control law.



Path following diagram based on visual distance

WA1-4(5) 11:30-11:45

Path Following Backstepping Control of Underactuated UUV

Juan Li, Qingyan Zhang and Xinghua Cheng
Department of Automation, Harbin Engineering University
Harbin, China

- The paper aims at studying the UUV's ability of following a desired path problem.
- By introducing the Serret-Frenet frame we build the UUV error model.
- Using this error model as well as connecting the backstepping control law an UUV controller is achieved .
- This controller can make the following error approach to zero in arbitrarily petite area effectively.

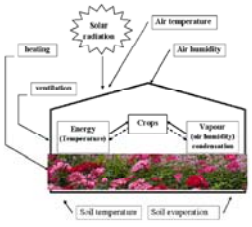
The R2D4 UUV

WA1-4(6) 11:45-12:00

Tracking Time-Discrete Quasi-Sliding Mode Variable Structure Controller for Temperature and Humidity of Greenhouse

Nansi He, Guoju Yi, Shuyang Liang
Department of Computer and Information Engineering, Chengde Petroleum College
Chengde, Hebei Province, China

- Make a mechanism model of temperature and humidity of greenhouse environment.
- Design a tracking time-discrete quasi-sliding mode variable structure controller based on exponential approach law .
- Analyze the stability and invariability by theory and simulation experiment.



climate model structure

WA1-5: Signal and Image Processing III

Session Chairs: Baofeng Gao, Beijing Institute of Technology
Xiaojun Wu, Harbin Institute of Technology
Conf. Room 5, 10:30-12:00, Wednesday, 5 August 2015

WA1-5(1) 10:30-10:45

Research on Calibration Method of The Panoramic Stereo Sphere Vision System

Junchao Zhu, Yongchen Li, Chang liu, Zhijun Ma, Baofeng Zhang
Tianjin Key Laboratory for Control Theory & Applications in Complicated Systems, Tianjin University of Technology, Tianjin, China
School of Electrical Engnieering, Tianjin University of Technology, Tianjin, China

- An effective calibration method and test system are explored to solve the calibration problem of multi-channel image acquisition system.
- The final experimental results confirm it is indeed feasible to this method.

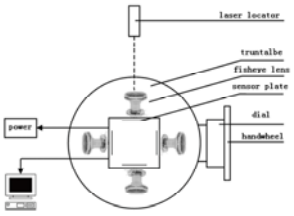


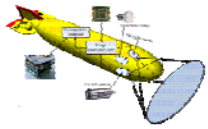
Diagram of Calibration Device

WA1-5(2) 10:45-11:00

Compensation Method of Binocular Vision Image with UUV Roll and Pitch

Yupeng Li, Ying Liu and Ping Huang
College of Automation, Harbin Engineering University, Harbin, China

- The applicaton of virtual image affine transformation.
- Test of tank simulation to demonstrate the feasibility and effectiveness of the proposed method.
- using Time New Roman fonts of size 24pt.



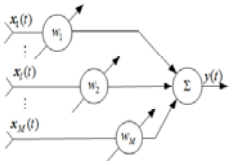
The structure of UUV bincolar vision system

WA1-5(3) 11:00-11:15

An Modified Hybrid Invasive Weed Optimization for Array Antenna Beamforming

Yupeng Li, Ying Liu, and Ping Huang
College of Automation, Harbin Engineering University, Nangang District, Harbin, China

- Antenna array beamforming always exists signal cancellation.
- An modified hybrid invasive weed optimization(MHIWO) is proposed to improve the convergence precision.
- MHIWO can obtain high output signal to interference plus noise ratio(SINR) in a large range of input signal to noise rate(SNR).



The Array Antenna

WA1-5(4) 11:15-11:30

Texture Mapping based Digital Rubbing Method

Xiaojun Wu[1], Hongyu Zhong[1], and Peizhi Wenr[2]
1.School of Mechanical Engineering and Automation, Harbin Institute of Technology Shenzhen Graduate School. Shenzhen University Town, Guangdong, China
2. School of Computer Science and Engineering, Guilin University of Electronic Technology, Guilin, Guangxi Province, China

- Taking rubbing is an ancient skill to preserve stone carvings. It is a kind of special literature in the Chinese traditional culture (right top).
- we propose a digital method to create rubbing images using photos of cliff inscriptions based on texture mapping based method.
- Experiments reveal the mimic simulation rubbing effects (right bottom)

The eroded cliff inscription and traditional rubbing method. Image and digital rubbings

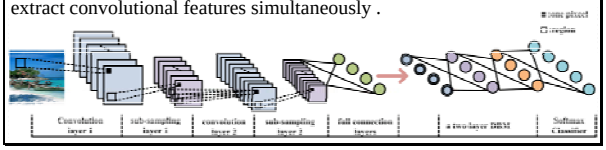
WA1-5(5) 11:30-11:45

Natural Scene Recognition Based on Convolutional Neural Networks and Deep Boltzmann Machines on ICMA 2015

Jingyu Gao[1], Jinfu Yang[*1,2], Jizhao Zhang[1] and Mingai Li[1,2]
1.Department of Control & Engineering Beijing University of Technology, NO.100 Chaoyang district, Beijing, 100124, P.R.China.
2.Beijing Key Laboratory of Computational Intelligence and Intelligent System, Beijing, P.R.China

(1) The introduced method based on DBM can be used to recognize natural scene images for large images.

(2) CNN is used as preprocessing method for DBM, and is employed to extract convolutional features simultaneously .

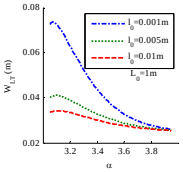


WA1-5(6) 11:45-12:00

Long-Term Spreading of Gaussian Beam Using Generalized Modified Atmospheric Spectrum

Chao Gao, Lingling Su, and Wanke Yu
University of Electronic Science and Technology of China, Chengdu, China
Beijing Institute of Technology, Beijing, China
Beihang University, Beijing, China

- The long-term spreading is more sensitive to the inner scale than to the outer scale.
- Larger inner scale could lead to smaller long-term spreading radius.
- Future work would focus on the short-term spreading radius of Gaussian beam.



The effects of l0 and α on the long-term spreading

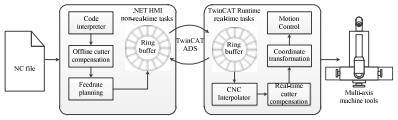
WA1-6: Manufacturing

Session Chairs: Yili Fu, Harbin Institute of Technology
Zhufeng Li, Transportation and Economics Research Institute, China Academy of Railway Science
Conf. Room 6, 10:30-12:00, Wednesday, 5 August 2015

WA1-6(1) 10:30-10:45

Development of an open CNC system for multi-axis machine tools based on TwinCAT and .NET

Huan Liu, and Qiang Liu
School of Mechanical Engineering and Automation, Beihang University
Beijing, China



System architecture

- Developed based on TwinCAT and .NET on Windows OS.
- Open to users, extensible modules and efficient computing.
- Easy to implement and upgrade for developers.
- Feasibility and applicability are Verified by experiments.

WA1-6(2) 10:45-11:00

An Interval Evaluation Method for Science Popularization Level of New Energy with Incomplete Index Weights

Tianlei Zang, Jianwei Yang, Zhengyou He, and Qingquan Qian
School of Electrical Engineering, Southwest Jiaotong University
Chengdu, China

- Evaluation index system for new energy science popularization.
- Interval evaluation model for new energy science popularization level.
- The 2013 operating data of 5 science popularization bases were collected.
- The proposed interval evaluation method reflects the idea of democratic evaluation of "highlight the advantages and shade the disadvantages".

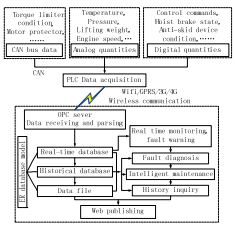
New Energy
Science Popularization

WA1-6(3) 11:00-11:15

Data Acquisition and Management of Remote Crane Monitoring System Based on CAN Bus

Zhufeng Li, Guangquan Yang, Xusheng Du and Xin Liu
Transportation and Economics Research Institute, China Academy of Railway Sciences
Beijing, China

- Sorted data acquisition method is designed based on CAN bus.
- E-R database model and data management structure is established.
- Real-time database and CMS gateway are designed to ensure the data continuity during wireless network break.
- On the basis of this study, further fault diagnosis, performance prediction and none downtime intelligent maintenance of cranes are much more prone to implement.



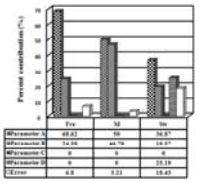
RCMS data flow architecture

WA1-6(4) 11:15-11:30

The Vibration Suppression Optimization of Electronic Apparatus RackBased on the Design of Experiment Method

Bo Yuan, Limei Xu
Technical and Service Center, Westeast Pipline Company,Xinjiang, China
Institute of Astronautics and Aeronautics , University of Electronic Science and Technology ,Sichuan.China

- Electronic equipment may be subjected to many different forms of vibration during their service life, which may cause many different types of failures
- DOE method is used to deal with the issues of vibration measurement and suppression control design , improve the dynamic vibration performance of the electronic apparatus rack



Contribution of each factor
on the performance statistics

WA1-6(5) 11:30-11:45

Research on the Relationship between Characteristic Parameters and Transformer Life

Li Sheng[1], Song bin and Li en wen
1.Department of Operation and maintenance, State Grid Hubei Electric Power Company Wuhan, China;
2. School of Electrical Engineering, Wuhan University, Wuhan, China

- The Method Of Linear Regression And Hypothesis Testing
- Analysis For Electrical Characteristic
- Analysis For Oil Chromatographic Data

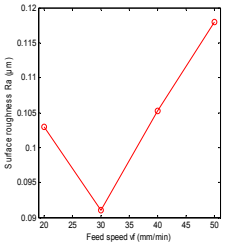
Transformer

WA1-6(6) 11:45-12:00

Experiment Research on Surface Quality of High Speed Micro-milling Stainless Steel

Xinxin Zhang, Jinkai Xu, Zhanjiang Yu, Zhichao Wang and Huadong Yu
School of Mechatronical Engineering, Changchun University of Science and Technology, Changchun City, Jilin Province, China

- This article primarily researched the surface quality of micro grooves on 304 stainless steel processed by high speed micro-milling machining.
- Feed speed is the most important influence factor on the surface quality of micro grooves.
- There exist less burr on the bottom of micro grooves, burr mostly distribute in the top edge of trenches. And burr quantity and height of down milling side is greater than reverse milling side.



Influence of feed speed
on surface roughness

WA1-7: Gripper, Legged and Wheeled Robots

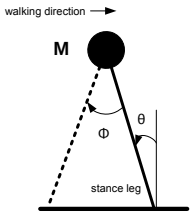
Session Chairs: Jian Guo, Tianjin University of Technology
Hakan Temeltas, Istanbul Technical University
Conf. Room 7, 10:30-12:00, Wednesday, 5 August 2015

WA1-7(1) 10:30-10:45

Sliding Mode Control of the Simplest Walking Model

Osman Darıcı, Hakan Temeltas
ControlEngineering Dept., Istanbul Technical Univ., Istanbul, Turkey.

- Bipedal walking is perhaps the most complex type of legged locomotion seen in nature.
- This paper presents an application of a robust control method, the sliding mode control, to an irreducibly simple model of passive dynamic walking known as the simplest walking model.
- we showed that using sliding mode control, the model was able to start walking from different initial conditions



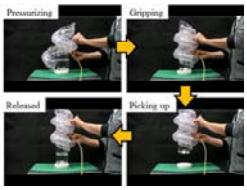
The simplest walking model

WA1-7(2) 10:45-11:00

Mechanism and Basic Characteristics of a Helical Inflatable Gripper

Hideyuki Amase, Yasutaka Nishioka, Toshihiko Yasuda
Mechatronics Lab., University of Shiga Prefecture
Shiga, Japan

- It is composed of an inflatable soft actuator by utilizing plastic films with pleated structures.
- By folding pleats at a slant, helical motion can be generated easily
- The gripping forces of both grippers are more than 10 N at the air pressure of about 10kPa.
- It is considered that this gripper may be ensure the intrinsic safety



WA1-7(3) 11:00-11:15

Design of landing platform on climbing robot for a small unmanned aerial vehicle

Zhaoyang Cai, Zhi Tao, Jialin Bai, Gaomeizhu Qu, and Si Zhang
Beijing Institute of Technology
Beijing, China

- The payload of the climbing robot is about 3KG.
- A small unmanned aerial vehicle can be fixed on the landing platform steadily and take off well from the platform.
- The landing platform has a magnet which can move up and down.
- It can be use in some aspects such as reconnaissance, rescue, etc.

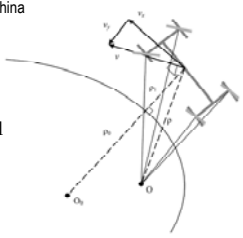
The climbing robot

WA1-7(4) 11:15-11:30

Receding Horizon Following Control of Wheeled Mobile Robots: A Case Study

Yang Liu[2], Shuyou Yu[2], Bingzhao Gao[1,3], and Hong Chen[1,2]
1.State Key Laboratory of Automotive Simulation and Control, Jilin University;
2.Department of Control Science and Engineering, Jilin University;
3. Department of Automotive Engineering, Jilin University.
Changchun, China

- Motivation by the Recent Progress
- The Kinematics Model of Wheeled Mobile Robot
- Receding Horizon Following Control Based on Zero Terminal Region
- Simulation Implementation and Analysis



The Model of a Wheeled Mobile Robot

WA1-7(5) 11:30-11:45

Analysis on Coupled Optimization Control for a Wheel-Legged Robot

Jianying Tian[1], Honghua Zhao[1,*]
[1]Department of Mechtronical Engineering, Shandong Institute of Commerce and Technology
[2]School of Mechanical Engineering, University of Jinan
Jinan, China

- Introducion.
- Stability analysis.
- Traction analysis.
- Control for couplied optimization.
- Experiment.
- Discuss and outlook.

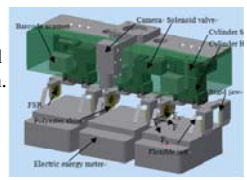
Robot platform

WA1-7(6) 11:45-12:00

The Design and Implement of A Manipulator End-effector with Parallel Pneumatic Grippers and Vision Positioning

Qixin Cai, Xuesong Shao, Jian Liu,Zhongdong Wang,
State Grid Key Laboratory of Electric Energy Measurement, Nanjing State Grid Jiangsu Electric Power Research Institute, Nanjing, China
Wei Xiao, Wei Wang and Chunlong Xing
Institute of Automation, Chinese Academy of Sciences, Beijing, China

- This paper proposes the development of a manipulator end-effector with three parallel pneumatic grippers used for the electric energy meter detection.
- We employ barcode scanner for reading code and camera for positioning.
- The end-effector has been put into use in factory.



The CAD model of the End-effector

WP1-1: Intelligent Mechatronics and Application IV

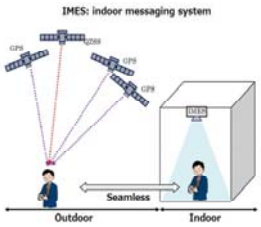
Session Chairs: Wei Wang, Waseda University
Bin Liu, ABB Corportate Research
Conf. Room 1, 13:30-15:00, Wednesday, 5 August 2015

WP1-1(1) 13:30-13:45

Accurate Indoor Positioning using IMES Radio

Kenjiro Fujii1, Wei Wang, Yuto Kaneko, Yoshihiro Sakamoto, Hiroaki Arie, Shigeki Sugano
Department of Modern Mechanical Engineering, Waseda University
Tokyo, Japan

- Use IMES radio for high accuracy indoor positioning.
- Signal propagation model of IMES radio has been created through experimental data.
- Triangulation algorithm has been developed for static position estimation.
- Kalman filter has been developed for dynamic position estimation.



IMES for indoor positioning

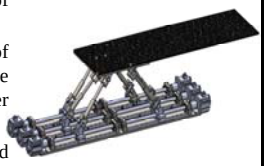
WP1-1(2) 13:45-14:00

The Research of Structure Parameter Optimization Process for A Novel Parallel Radiotherapy Bed

Qiang Guo, Zhijiang Du
State Key Laboratory of Robotics and System
Harbin Institute of Technology
Harbin, Heilongjiang,China

Fengfeng Zhang, Licheng Fan, Shaolong Kuang, Lining Sun
Jiangsu Key Laboratory for advanced robotcics technologies, Soochow University
Suzhou, Jiangsu,China

- A parallel structure radiotherapy bed was designed to cover the shortage of the conventional radiotherapy bed.
- In order to meet the requirements of stability and security of the radiotherapy bed, a new parameter optimization process was proposed.
- The simulation analysis demonstrated that the overall performance of the radiotherapy bed was improved.



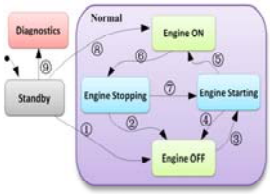
The Radiotherapy Bed

WP1-1(3) 14:00-14:15

Study on Engine Start-Stop Control Strategy for Series-Parallel Hybrid Vehicle

Wang Hongyu, Qiao Yunqian, Fang Yong and Li Zhiming
Weichai Power CO.,LTD
Weifang, China

- Introduce Series-Parallel hybrid system and torque transfer path in hybrid vehicle
- Start-Stop control algorithm
- Generate C code generation
- Real vehicle validation



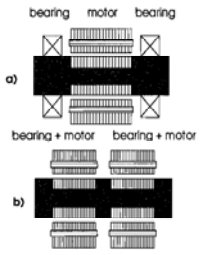
Start-Stop Control Strategy

WP1-1(4) 14:15-14:30

Survey of Bearingless Motor Technologies and Applications

Bin Liu
ABB Corporate Research
Västerås, Sweden

- A bearingless motor is a motor with magnetically integrated bearing function.
- A comprehensive overview on bearingless motor technologies and applications is given.
- Consequent pole and slice motors have been intensively developed because their features suit for applications.
- Design, modeling and control of bearingless motors are the main focus.



Principle of bearingless motors

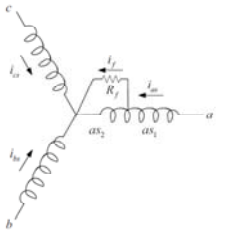
WP1-1(5) 14:30-14:45

Prognosis of Induction Motor with Stator Winding Shorted Turn Fault

Ming Yu and Juan Xu
Hefei University of Technology
Hefei, China

Danwei Wang and VietHung Nguye
Nanyang Technological University
Singapore

- The induction motor model with stator winding shorted turn fault is developed using reference frame transformation theory.
- A particle filter method is proposed to identify the true degradation dynamics of the insulation resistance.
- Simulation studies are carried out and the results validate the developed method.



Induction Motor with Stator Winding Shorted Turn Fault

WP1-1(6) 14:45-15:00

Research of experiments of the spacesuit rod tension based on installation processes

Shuai Xing, Guancheng Liu
China Academy of Space Technology, Beijing Institute of Technology
Beijing, China

- Two experiment methods based on strain and torque of the tension rod are put forward to realize quantitative control of it.
- The impact of each factor that might affect the accuracy of the installation can be determined by experiments.
- Analysing the text result and the installation processes, we have gained the two methods' own advantages and application value in practical project.

The installation state of tension rod

WP1-2: Underwater Robot

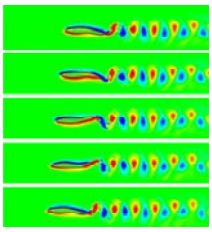
Session Chairs: Liwei Shi , Beijing Institute of Technology
Weishan Chen, Harbin Institute of Technology
Conf. Room 2, 13:30-15:00, Wednesday, 5 August 2015

WP1-2(1) 13:30-13:45

Numerical Analysis on Fishlike Swimming with Immersed Boundary Method

Kai Zhou, Junkao Liu and Weishan Chen
Harbin Institute of Technology
Harbin, China

- The immersed-boundary method is adopted to simulate the fluid-structure interaction problems in this paper.
- Flow around a circular cylinder and moving cylinder in stationary flow are simulated to verify validity and feasibility of algorithms.
- The modeling and simulation of fishlike swimming are conducted to reveal the mechanisms that lead to the thrust force.



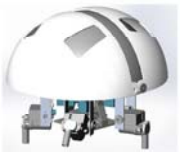
Vortex pattern in the wake

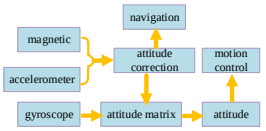
WP1-2(2) 13:45-14:00

An Attitude Estimation System for Amphibious Spherical Robot

Liwei Shi, Rui Xiao, Shuxiang Guo, Ping Guo, Shaowu Pan and Yanlin He
The Institute of Advanced Biomedical Engineering System, School of Life Science, Beijing Institute of Technology

- In this paper, we improved the mechanical structure and control system by using an attitude estimation system for a amphibious robot.
- Quaternion was adopted to calculate attitude based on MEMs inertial sensors.
- Attitude correction was acceptable with accelerometer and magnetic sensors.



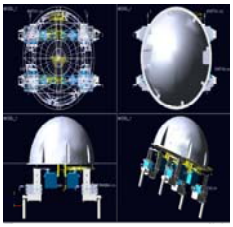


WP1-2(3) 14:00-14:15

Kinematic Analysis on Land of an Amphibious Spherical Robot System

Lin Bi*1, Jian Guo*1, Shuxiang Guo*1*2, and Zhendong Zhong*1
*1 Tianjin Key Laboratory for Control Theory & Application in Complicated Systems and Biomedical Robot Laboratory Tianjin University of Technology Binshui Xidao 391, Tianjin, China
*2 Intelligent Mechanical Systems Engineering Department Faculty of Engineering Kagawa University Takamatsu, Kagawa, Japan

- To establish a kinematic model by using Denavit-Hartenberg parameters method.
- To conduct the kinematic simulation in ADAMS using the planned crawling gait.
- To carry out the walking experiments on the flat ground
- The experimental results indicate that the kinematic simulation result in ADAMS is accurate to describe the kinematic characteristics of the robot.



The kinematic simulation model of the spherical robot in ADAMS platform

WP1-2(4) 14:15-14:30

Characteristic Analysis in Water for an Amphibious Spherical Robot

Zhendong Zhong*1, Jian Guo*1, Shuxiang Guo*1*2, and Lin Bi*1
*1 Tianjin Key Laboratory for Control Theory & Application in Complicated Systems and Biomedical Robot Laboratory Tianjin University of Technology Binshui Xidao 391, Tianjin, China
*2 Intelligent Mechanical Systems Engineering Department Faculty of Engineering Kagawa University Takamatsu, Kagawa, Japan

- We proposed the structure design of the spherical amphibious robot and did the characteristic analysis .
- Many underwater experiments were conducted to evaluate the performance. The experimental results indicated that the robot had a good performance.
- The robot had a maximum forward speed of 9.6 cm/s. The maximum angular velocity was 0.378 rad/s.

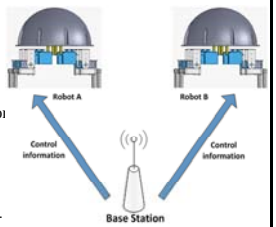
The prototype of the Robot

WP1-2(5) 14:30-14:45

OFDM-based Micro-Signal Communication Method for the Spherical Amphibious Underwater Vehicle

Xin Li*1, Jian Guo*1 and Shuxiang Guo*1*2
*1 Tianjin Key Laboratory for Control Theory & Application in Complicated Systems and Biomedical Robot Laboratory, Tianjin University of Technology, Binshui Xidao 391, Tianjin, China
*2 Intelligent Mechanical Systems Engineering Department, Faculty of Engineering Kagawa University, Takamatsu, Kagawa, Japan

- This paper proposed a kind of OFDM modulation for spherical amphibious robot.
- Based on the OFDM modulation, we carried out two simulation experiments, with LS(Least-square) channel estimation and without LS channel estimation. The simulation experiments indicated that LS channel estimation could decrease the BER(Bit error rate) effectively than without LS channel estimation.
- OFDM modulation method is a special multi-carrier transmission scheme, and it could maintain the signals transmission.



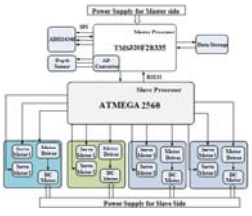
The conceptual diagram for multi-robot communication

WP1-2(6) 14:45-15:00

Study on the Control System of a Novel Spherical Underwater Robot

Yaxin Li*1
*1 Graduate School of Engineering, Kagawa University
Kagawa, JAPAN
Shuxiang Guo*2,*3 and Chunfeng Yue*1
*2 School of Life Science, Beijing Institute of Technology, China
*3 Faculty of Engineering, Kagawa University
Kagawa, JAPAN

- The two-level architecture control system is employed to realize sensor data collection, control algorithm realization, control command transmission, motor actuation and etc.
- TMS320F28335 and ATMEGA 2560 are taken as the master and slave processors respectively.
- Depth sensor and MEMS IMU are utilized to realize closed-loop control.
- The experimental results show that the propulsion system can complete the action based on the direction controlling of the thruster.



Block diagram of the control circuit

WP1-3: Biomimetic Robot System

Session Chairs: Baofeng Gao, Beijing Institute of Technology
Yi Wang, Tianjin University of Technology
Conf. Room 3, 13:30-15:00, Wednesday, 5 August 2015

WP1-3(1) 13:30-13:45

An Embedded Controller for a Quadruped Robot

Xiaoqi Li, Wei Wang and Jianqiang Yi
Institute of Automation, Chinese Academy of Sciences
Beijing, China

- We present an embedded controller scheme, with ARM and DSP processors, to control the locomotion of a quadruped robot.
- The ARM board plans about switching among gaits and the locomotion speed, and communicates with the DSP board via SPI.
- The DSP board receives ARM command, calculates to generate the motor command, and communicates with DC motor drivers via CAN bus.

The on-going developed quadruped robot QR-I at our lab

WP1-3(2) 13:45-14:00

A Review over State of the Art of In-Pipe Robot

Lei Shao, Yi Wang, Baozhu Guo
Tianjin Key Laboratory for Control Theory & Applications in Complicated Systems ., Tianjin University of Technology
Tianjin, China

- To explain the reasons why in-pipe robots play a very important role in the rapid development of modern industry .
- To generalize the type and feature of the traditional in-pipe robots .
- To clarify and analyse the latest conception and design of in-pipe robot .
- To draw a conclusion about advantage and disadvantage of in-pipe robot .

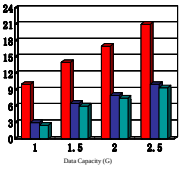
In-pipe inspection robot

WP1-3(3) 14:00-14:15

A fast and accurate SNP Detection Method on the Cloud Platform

Meng Cao, Dongyue Wu, Qiang Gao, Wei Wei, Fuli Yu
Tianjin Key Laboratory of Control Theory & Application in Complicated System., Tianjin University of Technology
Tianjin, China

- Introduction of the method for detecting SNPs
- Comparing the advantages of the proposed method for detecting SNPs with the popular methods
- The implement of the proposed method on the cloud platform
- Figures of the experiment and conclusion



The figure of the experiment

WP1-3(4) 14:15-14:30

Lateral Dynamic Modelling and Control of a Single Wheel Robot Based on Airflow Flywheel

Xiaogang Ruan, Wei Xie
Artificial Intelligence and Robot Institute,Beijing University of Technology
Beijing, China

- This paper proposes a single wheel robot applying airflow flywheel to maintain lateral balance.
- The dynamic model on the lateral direction according to the Lagrange equation is derived and the simulation results using Simulink tools show that the proposed mathematical model is believable.
- PID and LQR controllers are designed and performed in simulation prototype.
- The simulation results verify the proposed mechanism is feasible and more energy efficient.

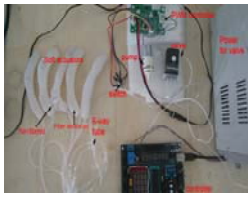
The Unicycle Robot

WP1-3(5) 14:30-14:45

Soft Actuator for Hand Rehabilitation

Shuxiang Guo*2*3, Fang Zhao*1*2, Wei Wei*4, Jian Guo*2, Xin Zhao*2, and Weijie Zhang*1*2
*1 Tianjin Key Laboratory of the Design and Intelligent Control of the Advanced Mechatronical System
Tianjin University of Technology Binshui Xidao 391, Tianjin, China
*2 Tianjin Key Laboratory for Control Theory & Application in Complicated Systems and Biomedical Robot Laboratory
Tianjin University of Technology Binshui Xidao 391, Tianjin, China
*3 Intelligent Mechanical Systems Engineering Department Faculty of Engineering
Kagawa University Takamatsu, Kagawa, Japan
*4College of Physics, Optoelectronics and Energy, Soochow University
1, Shizi Street, Suzhou 215006, a Jiangsu, P. R. China

- In this paper, a new kind of actuator for hand rehabilitation robot is proposed.
- The actuator is actuated by vacuum pump and the airflow direction is changed by valve.
- The process of design and manufacture of the soft actuator is introduced in detail.
- Both simulations by ABAQUS and experimental platforms are developed to prove that the system is feasible.



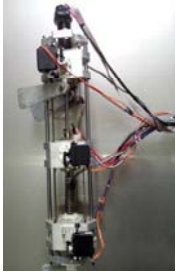
The whole system after being inflated

WP1-3(6) 14:45-15:00

Hopping Movement Simulation of Elastic Actuator

Han Yali, Zhu Songqing, Shi Yu, Hao Dabin, Gao Haitao
School of mechanical engineering, Nanjing institute of technology
Nanjing, China

- Design of Elastic Actuator
- Modeling of the Elastic Actuator
- Analysis and Simulation of Hopping Movement
- Conclusions



WP1-4: Optimal Systems

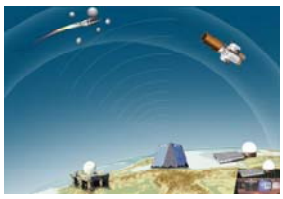
Session Chairs: Xingyu Lai, Guangdong Institute of Science and Technology
Lijun Yu, Harbin Engineering University
Conf. Room 4, 13:30-15:00, Wednesday, 5 August 2015

WP1-4(1) 13:30-13:45

Design of an Optimal Midcourse Guidance Law to Enhance the Probability of Target Acquisition

LIU Xiaoma and LV Ming
College of Mechatronic Engineering and Automation
National University of Defense Technology
Changsha P. R. China

- Introduction
- Analysis of radar error
- Modeling of the target acquisition probability
- Design of midcourse guidance law
- Simulation results



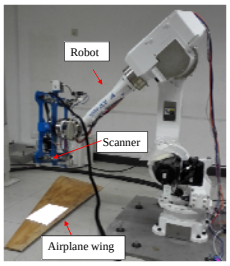
Target Acquisition of Interceptor

WP1-4(2) 13:45-14:00

Path Planning for Surface Inspection on a Robot-Based Scanning System

Qian Wu, Jinyan Lu, Wei Zou, and De Xu
Institute of Automation, Chinese Academy of Sciences
Beijing, China

- This paper proposes an automatic model-based path planning method for surfaces inspection on a robot-based scanning system.
- The scanning system consists of a 6 degree of freedom robot and a coded structured light scanner.
- The proposed path planning method consists of four steps: model framework extraction, scan region segmentation, viewpoint generation, and scan path generation.



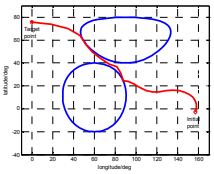
Robot-based scanning system

WP1-4(3) 14:00-14:15

Autonomous attitude maneuver planning in asteroid exploration missions

Changqing Wu, Rui Xu and Shengying Zhu
Institude of deep space exploration, Beijing Institute of Technology
Beijing, China

- The attitude maneuver planning problem in 3-dimensional space can be described as path planning in 2-dimentions plane.
- The attitude path planning algorithm based on the genetic algorithm was proposed to promote the attitude maneuver efficiency and decrease the time cost.



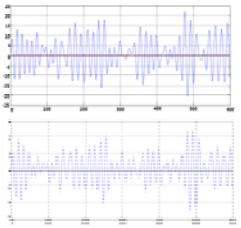
The trace of sun on celestial sphere

WP1-4(4) 14:15-14:30

The Application of Vibration Theory in Coupling Analysis and Signal Optimization of Integrated Stabilization System

Lijun Yu, Zhengkun Wang, Hui Wang, and Chao Che
College of Automation, Harbin Engineering University, Harbin, China

- The vibration theory equation modal method is introduced into integrated anti-rolling system.
- Analyze the modal frequency response of its vibration equation.
- Using the least square method and eliminate the polynomial trend method to optimize the input signal.
- Weaken glitches and malformations on the original signal.



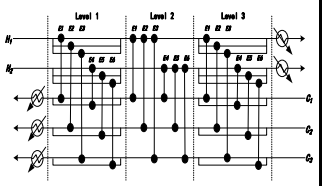
The Roll Angle

WP1-4(5) 14:30-14:45

Optimization Research of the Circulating Water Consumption Based on Stage-wise Superstructure Algorithm

Chao Dong[1],Dan Luo[1],Junfang Li[1],Chenguang Li[2]
1.Tianjin Key Laboratory of Control Theory & Application in Complicated System., Tianjin University of Technology,Tianjin, China;2.SINOPEC Tianjin Company.,Tianjin , China

- Stage-wise super structure method
- The water optimization of circulating water system in a petrochemical enterprises



The heat exchanger with no shunt stage-wise superstructure

WP1-4(6) 14:45-15:00

Machining Parameters Optimization on Micro Hole Vibration Drilling Using Grey System Theory

Xingyu Lai1, Chunyan Yan1, Chunyi Zhan1, Bangyan Ye2, and Weiguang Li2
1. School of Mechatronic Engineering, Guangdong Institute of Science and Technology
Zhuhai, China
2. School of Mechanical and Automobile Engineering, South China University of Technology
Guangzhou, China

- The grey system theory was used to optimize the machining parameters in micro hole vibration drilling.
- Optimal machining parameters were determined by the grey relational grade.
- The vibration frequency is the most significant factor which affects the micro hole vibration drilling.
- The optimal combination of the vibration drilling parameters can reduce the positional error, the aperture error, and the burr height.

Vibration Drilling Equipment

WP1-5: Image Processing and Application

Session Chairs: Han Xiao, Institute of Automation Chinese Academy of Science
Jian Guo, Tianjin University of Technology
Conf. Room 5, 13:30-15:00, Wednesday, 5 August 2015

WP1-5(1) 13:30-13:45

Real-time Shape and Pedestrian Detection with FPGA

Han Xiao, Haitao Song, Wenhao He and Kui Yuan
Institute of Automation, Chinese Academy of Sciences, Beijing, China

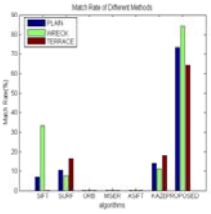
- Rigid object detection under different rotation angles and viewpoints
- Pedestrian (nonrigid object) detection from infrared images
- Hardware implementation with FPGA resulting in real-time performance

WP1-5(2) 13:45-14:00

Fully Affine Invariant Matching Algorithm Based on Nonlinear Scale Space For Side Scan Sonar Image

Xiufen Ye, Peng Li and Jianguo Zhang
Lab. of Biomimetic Micro Robotics, Harbin Engineering University
Harbin, China

- Nonlinear Affine Inva-Riant feature ——NAIR feature.
- It makes full use of the advantage of affine invariant of ASIFT algorithm and feature distinctiveness in nonlinear scale space.
- The proposed method has better anti-noise performance and higher accuracy compared with the state of art feature matching algorithms.



Match rate of different methods

WP1-5(3) 14:00-14:15

The Research of Facial Features Localization Based on Posterior Probability Deformable Model

Hui Wang, Lifeng Tong, Lijun Yu, Haoran Ben
College of Automation, Harbin Engineering University, Harbin 150001, China

- The proposed algorithm uses obtaining posterior probability based on probability distribution to improve the original deformable model location algorithm for facial features localization.
- Compared original algorithm, the improved algorithm can overcome the defect that the model is sensitive to initial position.
- The improved algorithm improved the robustness and the speed of location.

The Original Algorithm

The Improved Algorithm

WP1-5(4) 14:15-14:30

The Ship Target Detection Based on Panoramic Images

Wenkun Bian and Qidan Zhu
College of Automation ,Harbin Engineering University
Harbin, Heilongjiang Province, China

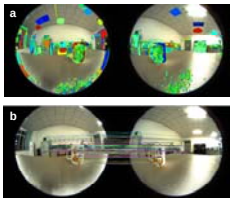
- extract the sea-sky-line
- Adaptive threshold partition Canny edge detection
- Double amplitude threshold gradient direction filtering
- The Sea-sky-line on the basis of the longest curve method
- The sea-sky-line ship target detection

WP1-5(5) 14:30-14:45

Research on Image Matching Technology for the Spherical Stereo Vision

Baofeng Zhang[1], Na Liu[2], Yingkui Jiao[1], Yongchen Li[1], Junchao Zhu[1]
1. Tianjin Key Laboratory for Control Theory & Applications in Complicated Systems, Tianjin University of Technology, Tianjin, China
2. Key Laboratory of Computer Vision and System, Ministry of Education of China, School of Computer and Communication Engineering, Tianjin University of Technology, Tianjin, China

- A stereo matching algorithm based on maximally stable extremal regions (MSER) and affine scale invariant feature transform (ASIFT).
- The algorithm can be applied in stereo matching of fish eye image without distortion, and the results meets the need of 3D reconstruction.

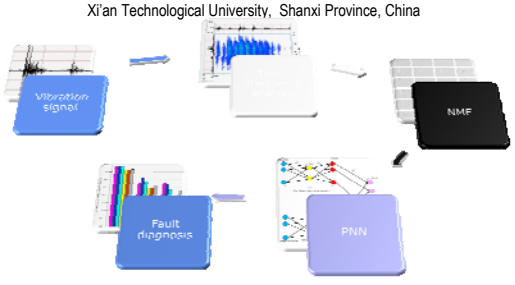


a. Feature extraction by MSER
b. The results of matching

WP1-5(6) 14:45-15:00

Automatic Recognition for Mechanical Images Based on Sparse Non-negative Matrix Factorization and Probabilistic Neural Networks

Wang Qinghua, Yu Hongtao, Deng Donghua
Xi'an Technological University, Shanxi Province, China



WP1-6: Industrial, Manufacturing Process and Automation I

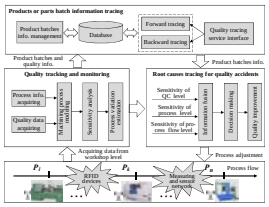
Session Chairs: Youjie Ma, Tianjin Unversity of Technology
Guangrui Wen, Xi'an Jiaotong University
Conf. Room 6, 13:30-15:00, Wednesday, 5 August 2015

WP1-6(1) 13:30-13:45

A framework for integrated quality tracing system oriented to discrete manufacturing workshop

Xueliang Zhou, Pingyu Jiang, and Yan Wang
Xi'an Jiaotong University
Xi'an, China

- A conceptual framework for IQTS.
- Key enabling technologies for IQTS.
- A prototype system and its application case.

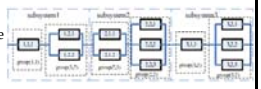


WP1-6(2) 13:45-14:00

Selective Maintenance Model based on Different Mission Duration Time

Jinxin Hou1, and Yanling Qian2
1. Department of System Engineering, 2. Key Laboratory of Science and Technology on Integrated Logistics Support
National University of Defence Technology, Changsha, China

- Because of the limited time of the break, it is not possible to perform all maintenance actions. In this situation, the selective maintenance policy would be confirmed.
- In this paper, we propose a selective maintenance model considering the different mission duration time for different subsystems.
- We formulate the selective maintenance model as a non-linear 0-1 programming problem. The maximum reliability of the next mission is formulated as objective.
- The effectiveness is demonstrated via a numerical example.

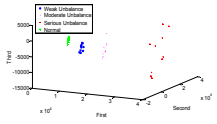


WP1-6(3) 14:00-14:15

Research on Rotor Startup Condition Estimation by Using FRFT Combined with PCA

Guangrui Wen, Zaichao Ma, Yanhui Ren, and Riwei Luan
School of Mechanical Engineering, Xi'an Jiaotong University
xi'an, China

- FRFT can solve the linear frequency modulation problem of a rotor startup signal.
- Piecewise linearization idea can be used to eliminate the non-linear amplitude modulation problem.
- Dimension reduction of a fault feature data set by PCA can represent a certain rotor startup condition.
- A speed feature data set can be compressed with PCA either to identify status or to estimate the conditions of a startup rotor.



Visualization of different running conditions

WP1-6(4) 14:15-14:30

An Improved Direct-Self Control for High-Speed Permanent Magnet Synchronous Motor

Cong Gu, Xiaolin Wang, Tiantian Sheng
Department of Automation Engineering, Nanjing University of Aeronautics and Astronautics
Nanjing, China

- Direct-Self Control(DSC) is introduced to high-speed permanent magnet synchronous motor(PMSM).
- An improved DSC is proposed to suppress the serious torque ripple of conventional DSC.
- Proposed algorithm is characterized by low switching frequency, low torque ripple, robustness and sensorless.
- Proposed algorithm possesses great prospect in high-speed occasion.

High-Speed Permanent Magnet Synchronous Motor

WP1-6(5) 14:30-14:45

An Overview on Wind Power Generation

Xuesong Zhou, Zhenwei Qin and Youjie Ma
Key Research Laboratory for Control Theory & Applications in Complicated Systems, Tianjin University of Technology
Tianjin, China

- Background of wind power generation.
- Reasearch Status on Wind power .
- Key Challenges Of Wind Power.
- Development trend of wind power.

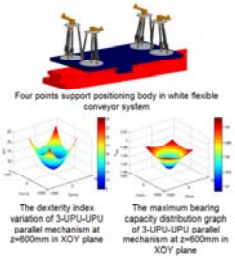
Wind Power Generation

WP1-6(6) 14:45-15:00

The Research of Kinematic Performances of 3-UPU-UPU Parallel Mechanism for Automobile Assembly Line

Guohua Cui, Muyuan Sun, Weijian Meng, Haiqiang Zhang, and Chuanrong Sun
Hebei University of Engineering
Handan, China

- A four points support positioning body in white flexible conveyor system based on the 3-UPU-UPU parallel mechanism was designed.
- The workspace feasible points, global dexterity and the global maximum bearing capacity were selected as the performance indices.
- The results prove that this parallel mechanism can be used as the body in white positioning support body to complete positioning convey between the various processing stations.



WP1-7: Computer Vision

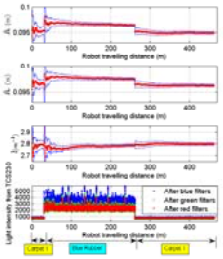
Session Chairs: Yanming Pei, Monash University
Jie Hong, Northwest Polytechnical University
Conf. Room 7, 13:30-15:00, Wednesday, 5 August 2015

WP1-7(1) 13:30-13:45

Online Robot Odometry Calibration over Multiple Regions Classified by Floor Colour

Yanming Pei and Lindsay Kleeman
Department of Electrical and Computer Systems Engineering, Monash University
Melbourne, Australia

- Use a colour sensor to classify and segment the floor surfaces based on a Support Vector Machine (SVM).
- Apply an Extended Kalman Filter (EKF) and correlative laser scan matching to calibrate odometry.
- Correct the systematic odometry errors of a differential drive robot to improve SLAM quality.
- Simulation and real experimental results validate our novel method to do region based odometry calibration.



Odometry calibration results

WP1-7(2) 13:45-14:00

Spherical FAST Corner Detector

Richi Kitamura , Shigang Li , Isao Nakanishi
Graduate School of Engineering Tottori University
Tottori, Japan

- The spherical image is used for representing of full view image.
- The spherical image avoid distortion of raw full view image.
- We directly detect corners in spherical image by spherical FAST.
- The spherical FAST realize correct corner detection results in full view image.

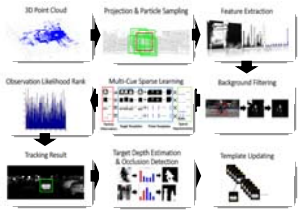
A spherical image which represented by planar image

WP1-7(3) 14:00-14:15

Object Tracking with 3D LIDAR via Multi-Task Sparse Learning

Shiyang Song, Zhiyu Xiang and Jilin Liu
College of Information Science and Electronic Engineering, Zhejiang University
Hangzhou, 310027, China

- Efficient appearance model for LIDAR data.
- Multi-cue sparse learning algorithm first time used in LIDAR based tracking.
- Improved with background filtering and occlusion detection.

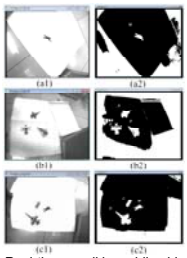


WP1-7(4) 14:15-14:30

A Real-time Small Immobile Object Recognition System Using Wavelet Moment Invariants

Jiaojiao Gu, Zhao Wang, Haitao Song, Han Xiao, Wenhao He and Kui Yuan
Institute of Automation, Chinese Academy of Sciences
Beijing, China

- Introduce an image acquiring and processing board developed by our research team.
- The realization of a real-time small immobile object recognition system using wavelet moment-based back-propagation(BP) neural network classifier.
- Experiments and results.



Real-time small immobile object recognition result: C represents car, M represents man, P represents plane.

WP1-7(5) 14:30-14:45

Person Localization and Tracking for a Leader Following Vehicle by Wireless Sensors

Wei Zhao, Jun Tan, Xiangjing An and Peidong Wang
National University of Defense Technology
Changsha, China

- The Ultra-Wideband sensors are used to build the wireless sensors network for its accuracy and robustness.
- The position of the anchor nodes on the vehicle are optimised to reduce the localization error by Genetic Algorithm.
- A responsive node is carried by the leading person. Combined with an Extended Kalman filter, the position of the leader is estimated real-timely.

The Leader Following System

WP1-7(6) 14:45-15:00

A combined feature extraction method for left-right hand motor imagery in BCI of My Paper on ICMA 2015

Jie Hong, Xiansheng Qin, Jing Bai, Peipei Zhang and Yan Cheng
School of mechanical Engineering, Northwestern Polytechnical University,Xi'an, China

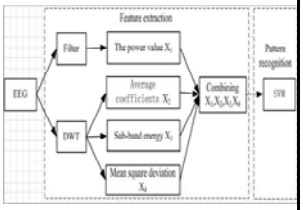
- Experiment data:

Some of the datasets 1 from the BCI Competition IV.

- Feature consideration:

ERD in the C3 and C4 channels .

- Feature : 1.The power (8-30Hz).
  2.average coefficients;
  sub-band energy ;
  mean square deviation.
- Classification: SVM



The processing of EEG data

WP2-1: Analysis of Mechatronic System

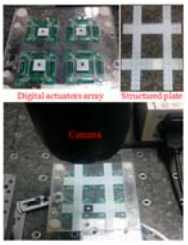
Session Chairs: Xianxin Ke, Shanghai University
Fanlin Zeng, Tianjin University of Technology and Education
Conf. Room 1, 15:15-16:45, Wednesday, 5 August 2015

WP2-1(1) 15:15-15:30

Design and characterization of a digital actuators array with a structured plate for conveyance application

Jing Xu, Laurent Petit and Christine Prelle
Roberval, Sorbonne universités & Université de technologie de Compiègne,
Compiègne, France

- Digital actuators array composed of four electromagnetic elementary actuators (2 × 2 matrix).
- Planar conveyance device with a structured plate.
- Prototype manufactured by laser cutting and 3D printer machines
- Comparision between experimental and theoretical results



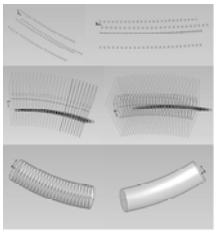
Planar conveyance device

WP2-1(2) 15:30-15:45

Intelligent Dynamic Testing System of Three-Dimensional Network

Xuesong Li, Zhe Wang,Fenglong Li
School of Mechanical EngineeringTianjin University
Tianjin, China

- Test the parameters of pipe to get data .
- Process the data use MATLAB, and read the processed data use SolidWorks to draw a 3D sketch.
- Setting the reference plane through the centers and perpendicular to the fitting curve and draw sectional circles in the reference plane.
- Lofting to get what we need .



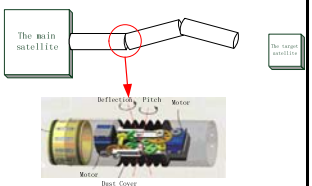
steps to produce 3D pipeline

WP2-1(3) 15:45-16:00

Modeling and Dynamic Simulation Analysis of the Space Soft Capture Mechanism

Jue Wang, Zhenghong Dong, Chao Wang, Shucai Zhang and Fan Yang
Academy of Equipment
Beijing, China

- In order to solve impulse-momentum transfer problem upon two satellites contact, the SSCM model is proposed.
- The SSCM has the property of conversion from pulse transfer to harmonic transfer.
- Simulation results have verified that flexible devices and more joints can unload impulse-momentum effectively.



The Space Soft Capture Mechanism (SSCM) model

WP2-1(4) 16:00-16:15

Fluid Dynamics Analysis of Passive Oscillating Hydrofoils for Tidal Current Energy Extracting

XU Jian-an, SUN Hong-yu
College of Mechanical and Electrical Engineering , Harbin Engineering University
Harbin, China

- Energy extracting technology based on oscillating hydrofoil is presented , as an alternative to conventional rotating blades turbine.
- Simulation analysis are carried out under the condition of 1.8m/s water velocity by using fluid simulation software FLUENT.
- The Simulation results show the highest power extraction efficiency can reach 34.7%.

Energy extraction device based on oscillating hydrofoil

WP2-1(5) 16:15-16:30

Development of Circumference Oscillation Mechanism with Adjustable Amplitude

Xianxin Ke, Jizhong Xin, and Yang Yang
School of Mechatronic Engineering and Automation, Shanghai University
Shanghai, China

- Mechanical structure: an eccentric motion mechanism and adaptive dynamic balance mechanism.
- Performance evaluation: 0-ϕ50mm adjustable amplitude and 20-350RPM adjustable oscillation frequency in the meantime.
- Characteristic :Its amplitude can be changed simply, conveniently and fast.
- Application: in the field of biological engineering.

The circumference oscillation Mechanism with adjustable amplitude

WP2-1(6) 16:30-16:45

Finite Element Analysis of Large-Belt Width Conveyor Driving Roller

Ning Cao[1], Guofu Gao[2], Chongyang Zhao[1,2], Jiqing Chen[1], Hengyu Li[1] and Yi Yang[1]
[1]School of Mechatronics Engineering and Automation, Shanghai University, Shanghai, China
[2]School of mechanical and power engineering, Henan Polytechnic University, Henan, China

- MECHANICAL ANALYSIS
- FINITE ELEMENT ANALYSIS
- ANALYSIS OF CALCULATION RESULTS

Mises stress of large-belt width driving pulley

WP2-2: Human-System Interaction and Interface

Session Chairs: Arakawa Toshiya, Aichi University of Technology
Enzeng Dong, Tianjin University of Technology
Conf. Room 2, 15:15-16:45, Wednesday, 5 August 2015

WP2-2(1) 15:15-15:30

Probability of Driver's State Detection Based on Systolic Blood Pressure

Toshiya Arakawa*, Masayasu Tanaka**, Fumiaki Obayashi*,
Shinji Kondo*** and Kazuhiro Kozuka*
*Aichi University of Technology, Aichi, Japan
**Toyota Technical College Nagoya, Aichi, Japan ***KANDS Inc., Japan

- We attempted to detect a typical driver's surprised state based on blood pressure using a driving simulator.
- Driver's systolic blood pressure after traffic near-miss event on the road is higher than that before child and bicycle rushed out.
- Systolic blood pressure is adequate index to detect driver's surprised state.

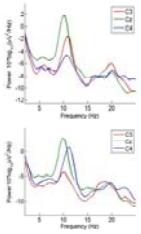
Experiment image

WP2-2(2) 15:30-15:45

Improved Common Spatial Pattern for Brain-Computer Interfacing

Enzeng Dong, Liting Li, Chao Chen
School of Electrical Engineering, Tianjin University of Technology (TJUT)
Tianjin, China

- Signal processing of electroencephalography (EEG).
- Signal acquisition(Experimental paradigm design).
- Feature extraction(Common spatial patterns)
- Feature classification(Support vector machine)
- Algorithm comparison



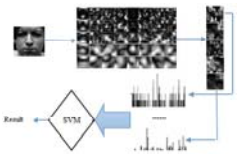
power distribution when imaging left or right hand motor

WP2-2(3) 15:45-16:00

Facial Expression Recognition based on Gabor Wavelet Transform and Histogram of Oriented Gradients

Xiaoming Xu, Changqin Quan and Fuji Ren
School of Computer and Information, Hefei University of Technology
Hefei, China

- Using Gabor Wavelet Transform to get expression feature information.
- Binary Coding will be choose to get 5 different Gabor feature graph. Then we use local Histogram of Oriented Gradients to get expression feature vectors.
- Finally Support vector machine classifier is used for expression classification



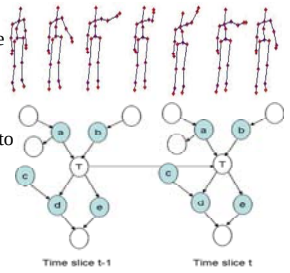
Experimental flow chart

WP2-2(4) 16:00-16:15

A Markov Blanket Feature Selection Approach for HMMs in Human Motion Recognition Application

Chao Zhuang, Hongjun Zhou, and Mingyu You
Tongji University, Shanghai China

- We propose a novel Markov blanket method for HMM feature selection that is based on a dynamic Bayesian network (DBN) structure learning.
- The proposed method is applied to the MSR Action3D data set. Results show that the proposed method yields better recognition accuracy than traditional feature selection methods.



WP2-2(5) 16:15-16:30

Passivity Analysis and Design of a Haptic Interface

Yanwen Liu, Xiaoxue Liu, Zhigang Qi, Yuanhui Wang
College of Automation, Harbin Engineering University
Harbin, China

- The haptic interface provides the virtual environment for the remote servo manipulator, and it can make the operator feel and manipulate the remote or virtual environment. The passivity conditions for haptic interface systems with position sampling are given in existing works, but the parameters scope for passivity design is very small. In view of this, velocity of the haptic device is used for the sampling signal in this paper, and a wider passive region is derived based on the frequency response of a sampled-data control system. At last, through overall consideration of the bandwidth, damping ratio and passivity requirements, a reasonable design result is given in the paper.

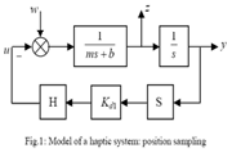


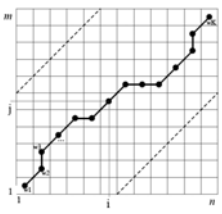
Fig.1: Model of a haptic system: position sampling

WP2-2(6) 16:30-16:45

Dynamic Gesture Recognition Based on Improved DTW Algorithm

Xiaogang Ruan, Chongyang Tian
School of Electronic Information and Control Engineering, Beijing University of Technology
Beijing, China

- Introduction of Kinect sensor.
- Pretreatment of dynamic gestures.
- The establishment of gesture model.
- Introduction of improved DTW algorithm.
- The process of recognition and results.



DTW Algorithm

WP2-3: Mobile Robot Navigation

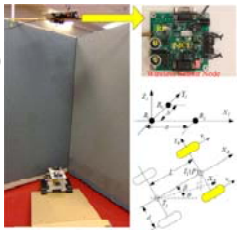
Session Chairs: Dongxiang Zhang, The University of Science and Technology of China
Juzhong Zhang, The 713th Research Institute of China Ship Building Industry Corporation
Conf. Room 3, 15:15-16:45, Wednesday, 5 August 2015

WP2-3(1) 15:15-15:30

3D localization and Pose Tracking System for an Indoor Autonomous Mobile Robot

Juzhong Zhang and Kai Zhao
The 713th Research Institute of China Shipbuilding Industry Corporation
Zhengzhou, China

- Ultrasonic localization.
- Passive Mobile Architecture (PMA) and Active Mobile Architecture (AMA).
- Static localization.
- Dynamic localization (EKF).



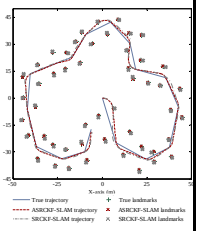
3D localization system

WP2-3(2) 15:30-15:45

An Adaptive Square Root Cubature Kalman Filter based SLAM Algorithm for Mobile Robots

Jun Cai, Xiaolin Zhong
School of Automation, Chongqing University of Posts and Telecommunications
Chongqing, China

- This paper proposes an adaptive square root cubature Kalman filter based SLAM algorithm for mobile robots.
- The main contribution lies that: 1) Square root factors are used to improve the calculation efficiency by avoiding Cholesky decompositions. 2) The adaptive Sage-Husa estimator is used to solve the large estimation errors or even divergence problem.
- Simulation results obtained demonstrate the estimation accuracy and computational efficiency of the proposed algorithm.



Simulation Results

WP2-3(3) 15:45-16:00

Design and Implementation of an ROS based autonomous navigation system

Qunshan Xu,Jianghai ZHAO,Chunxia Zhang and Feng He
Department of Automation,University of Science and Technology of China
Hefei,China

- Introduce the architecture of hardware devices and software system for our robot
- Odometry model building for four wheels differential drive robot
- SLAM and path planning in autonomous navigation based on robot operating system
- Experimental results

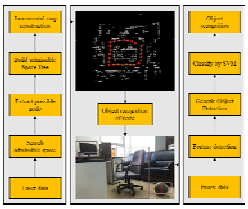
service robot : YFW

WP2-3(4) 16:00-16:15

Environment Exploration and Recognition for Mobile Robot using Immune Algorithm and Objectness Measure

Wenbin Qu, Songmin Jia , Xue Zhao
Beijing University of Technology, Beijing, China

- Immune algorithm is applied for its advantages such as diversity, dynamic, parallel management and self-adaptation to select optimal path.
- Normed gradients feature is extracted to describe the object windows. SVM are respectively used for objectness estimation and object types detection.



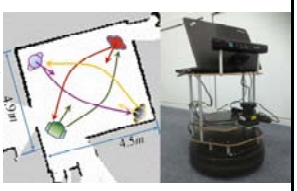
Mapping process

WP2-3(5) 16:15-16:30

Real-Time Navigation in Dynamic Human Environments Using Optimal Reciprocal Collision Avoidance

Dongxiang Zhang, Zongjun Xie, Pengfei Li, Jiahui Yu, Xiaoping Chen
Multi-Agent Systems Lab., University of Science and Technology of China
Hefei, China

- A robot navigation strategy based on first-person perspective is proposed.
- The reciprocal navigation model between humans and a service robot is introduced based on optimal reciprocal collision avoidance.
- The uncertainties of state estimation are represented by particles' distribution and reduced by the proposed encircling-particles method.



Experimental settings

WP2-3(6) 16:30-16:45

An Algorithm for Mobile Robot Path Planning Using Wireless Sensor Networks

Jian Kong[1], Mingli Ding[2], Xian Li[2], Changsen Li[3], and Shuo Li[3]
1.Beijing Institute of Technology, Beijing, China. 2.Harbin Institute of Technology, Harbin, China
3. Beijing Aerospace Automatic Control Institute, Beijing, China

- This paper proposes a novel method for robot navigation based on WSN.
- The robot is positioned by RSSI information between two nodes of WSN and network topology, and it is cheap and easy to implement for robot navigation.
- The experimental results confirm that the navigation system based on WSN successfully achieved their assigned tasks and accuracy of navigation is within 1m.

The Mobile Robot

WP2-4: Design and Optimization of Systems

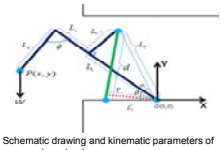
Session Chairs: Chuan Wang, Naval Medican Research Institute
Goib Wiranto, Indonesian Institute of Sciences
Conf. Room 4, 15:15-16:45, Wednesday, 5 August 2015

WP2-4(1) 15:15-15:30

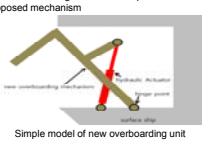
Design and Optimization of an Efficient Overboarding Mechanism for the Drop/Lift Automation of an Active/Passive Sonar System in a Surface Ship

Seong Hak Park, Won Jee Chung, HYo Gon Kim, Jong Kap Choi, Jin Woong Sa
Robotics & System Lab., National University of Changwon
Changwon, Korea

- This paper deals with a new overboarding machanism, which is an automated equipment to drop the active/passive sonar system into the deep sea from the surface ship and then lift it.
- Developing an overboarding unit which can be installed indoors without a structural change of the hull and has a small number of actuators can highly improve efficiency of operation and maintenance.



Schematic drawing and kinematic parameters of proposed mechanism



Simple model of new overboarding unit

WP2-4(2) 15:30-15:45

Vibration-induced Energy Harvesting System Using Terfenol-D

Tianyu Fan
Graduate School of Engineering
Yoshio Yamamoto
Department of Precision Engineering
Tokai University, Hiratsuka, Japan

- The introduction of giant magnetostrictive materials
- Giant magnetostrictive electric power generators (GMEG & GMEG-A)
- Experimental results of GMEG
- Energy harvesting in shoes

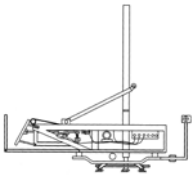
Energy harvesting from mechanical vibrations

WP2-4(3) 15:45-16:00

A Novel Measurement and Control Method for Automatic Plastering Machine

Teng Long, En Li, Zaojun Fang, Weiqing Zhao and Zize Liang
Institute of Automation, Chinese Academy of Sciences
Beijing, China

- Utilizing the laser sensor to measure the distances between the plaster board and the wall.
- the principle of laser triangulation is analyzed and the oblique measurements is selected through the experiment.
- Compensating the error of the bracing pieces perpendicularity and the deflection angle by trajectory planning.
- The trajectory planning is based on a two nested loops structure.



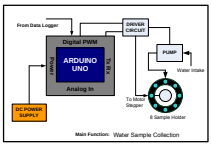
The Plastering Machine

WP2-4(4) 16:00-16:15

Design of Online Data Measurement and Automatic Sampling System for Continuous Water Quality Monitoring

Goib Wiranto, Grace A Mambu, Hiskia, I Dewa Putu Hermida, Slamet Widodo
Sensor Research Group
Research Center for Electronics and Telecommunications
Indonesian Insttitute of Sciences (LIPI)
Bandung, Indonesia

- Aimed to design a simple but automated sample collection unit based on an online water quality measurement.C
- Consists of sensors for measuring Dissolved Oxygen (DO) and pH, data acquisition based on a PCDuino microcontroller, a sample collection unit, and PC based graphical display
- The main part of the system is the PCDuino microcontroller, that has a function of controlling the data transmission and the operation of the automatic sampling unit based on comparison of the measured parameter values against certain threshold
- This prototype system is expected to find wide applications in the field of environmental and aquaculture monitoring



Schematic of the automatic sampling unit consisting of Arduino Uno Rev.3, sample holder, water pump, driver circuits, and DC power supply

WP2-4(5) 16:15-16:30

Study on Droplets Characteristics Used for Infrared Spectrum Suppression

Wang Chuan, DU Yongcheng, Zhang Jianguo, and Wang Chunhui
Mechatronics Research Lab., Beijing Institute of Technology
Beijing, China

I. INTRODUCTION
II. MATHEMATICAL MODEL
III. CALCULATIONS AND ANALYSIS
IV. CONCLUSION AND FUTURE WORK

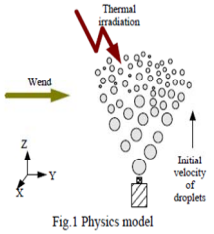


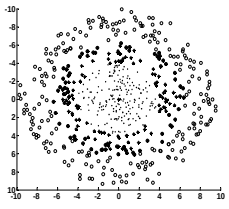
Fig.1 Physics model

WP2-4(6) 16:30-16:45

Support Vectors Pre-Extracting Method Based on Adaptive Vector Projection

Yaqin Guo, Zhengqun Wang
New Energy Engineering Department, Nantong Polytechnic College
Nantong, China

- A support vectors pre-extracting method based on adaptive vector projection is proposed.
- The algorithm for linear separable problems and non-linear separable problems are proposed.
- The proposed method can be as accurate as standard SVM, but is much faster than it .
- Experiments on two artificial data sets and UCI standard databases have verified the efficacy of the proposed.



Boundary Sample Pre-extracting

WP2-5: Vision and Image Proceeding

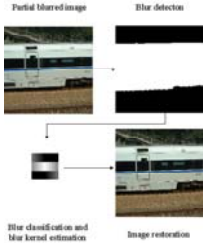
Session Chairs: Kai Chen, Southeast University
Yi Yu, Changchun University of Science and Technology
Conf. Room 5, 15:15-16:45, Wednesday, 5 August 2015

WP2-5(1) 15:15-15:30

Restoration of Degraded Image with Partial Blurred Regions Based on Blur Detection and Classification

Dong Yang, Shiyin Qin
School of Automation Science and Electrical Engineering, Beihang University
Beijing, China

- A new restoration algorithm for degraded image with partial blurred regions is proposed based on partial blurred regions detection and classification.
- A segmentation based blur detection algorithm is proposed to detect the blurred regions in partial blurred images. A blur classification algorithm is proposed to classify the blurred regions so as to restore them.



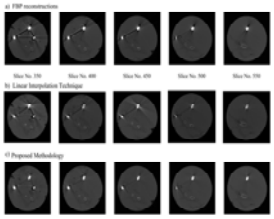
The Flow Chart

WP2-5(2) 15:30-15:45

Metal Artifact Reduction in X-ray CT imaging based on Iterative Reconstruction Approach

Shoukat Nawaz and Fu Jian
Department of Mechatronics Engineering, Beijing University of Aeronautics and Astronautics, Beijing(BUAA), China

- Propose and verify an MAR algorithm
- Algorithm removes the inaccurate metal pixels and exactly reconstructs the soft tissues
- Proposed algorithm can effectively reduce metal artifacts without producing further distortions



CT Image Reconstruction for selected slices

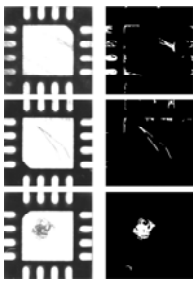
WP2-5(3) 15:45-16:00

Defects extraction for QFN based on mathematical morphology and modified region growing

Kai Chen, Zhisheng Zhang, Yuan Chao, Min Dai
Mechanical Engineering School, Southeast University
Nanjing, China

Jinfei Shi
Huaihai Institute of Technology
Lianyungang, China

- Segment QFN images with 4-thresholds.
- Eliminate the pixels around edge based on Canny edge detector.
- Use the mathematical morphology technique to remove noise pixels and locate the connected region of defects.
- Apply modified region growing method to extracting the defects from QFN surface.



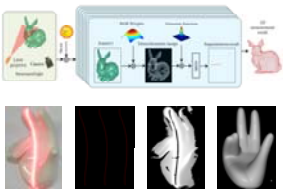
The results of the proposed method

WP2-5(4) 16:00-16:15

A Robust Stripe Segmentation Method for 3D Measurement of Structured Light

Liguo Zhang, Junyu Lin, Jianguo Sun, Guisheng Yin, Chao Ma and Liangwei Nie
College of Computer Science and Technology,Harbin Engineering University
Nantong 145, Harbin, China

- A robust algorithm of segmenting the laser stripe for 3D measurement and reconstruction.
- A monochromatic value space based on a minimum entropy model is used for preprocessing.
- A minimum entropy deconvolution model is used to segment and recover the laser stripe.



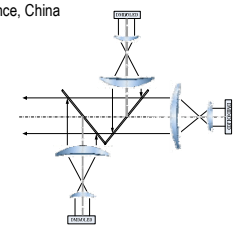
3D measurement and reconstruction

WP2-5(5) 16:15-16:30

Construction for True Three-Dimensional Imaging Display System and Analysis Based on State-space model

YU Yi , ZHU Wei
College of photo electricity engineering Changchun University of Science and Technology
Changchun, Jilin Province, China

- This paper presents a projection based on the true three-dimensional imaging display system.
- The system employs self-made high-speed rotating screen projector in the projection point as a unit consisting of voxel point light field.
- it is easy to implement and the small amount of calculation.



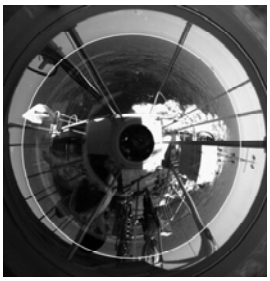
Sketch map of three axial light path

WP2-5(6) 16:30-16:45

The Sea-sky-line Edge Detection Method Based on Panoramic Images

Wenkun Bian and Qidan Zhu
College of Automation ,Harbin Engineering University
Harbin, Heilongjiang Province, China

- algorithm of panoramic image sea-sky-line extraction
- the optimal estimate sea-sky-line edge
- Adaptive threshold partition Canny edge detection
- Double amplitude threshold gradient direction filtering
- The optimal curve edge search algorithm



WP2-6: Industrial, Manufacturing Process and Automation II

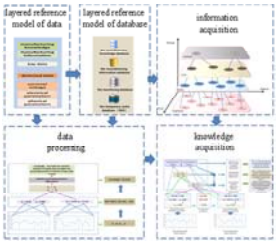
Session Chairs: Qinxue Pan, Beijing Institute of Technology
Chuang Wang, Xi'an Jiaotong University
Conf. Room 6, 15:15-16:45, Wednesday, 5 August 2015

WP2-6(1) 15:15-15:30

Cognitive Computing based Manufacturing Data Processing for Internet of Things in Job-Shop Floor

Chuang Wang and Pingyu Jiang
Xi'an Jiaotong University
Xi'an, China

- Layered reference model of data.
- Layered reference model of database.
- The manufacturing information acquisition
- The manufacturing knowledge acquisition



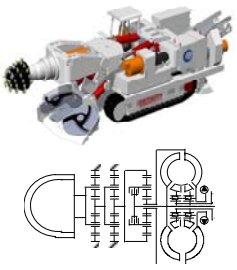
The information process implementation block diagram of job-shop

WP2-6(2) 15:30-15:45

The **Compound Electromechanical-Hydraulic Transmission System with Reflux Power of Roadheader Cutting Unit**

Kangda Chen, Dongye Sun*, Feibin Lin, Feifan Sun
*State Key Laboratory of Mechanical Transmission, Chongqing University, Chongqing 400044, China
College of Automotive Engineering, Chongqing University, Chongqing 400044, China

- Considering the higher requirements for mechanical system reliability and environmental adaptability of unmanned mining machine, a new type of compound electromechanical-hydraulic transmission system with reflux power that can continuously variable transmit according to cutting load is proposed in order to break the present transmission style.
- Explains the principle of the transmission system, deduces formulas of the speed ratio, efficiency and torque characteristic, and analyzes the performance changes of the new transmission system under different working conditions.
- The reflux power transmission system has the characteristics of adaptive continuously variable transmission, hard rock breaking and cushioning. Additionally the new system enhances the transmission efficiency significantly and meet the higher requirements for reliability and adaptability in unmanned mining.



The Roadheader

WP2-6(3) 15:45-16:00

Experimental Research on Residual Stress Measurement for Tubule Surface

Qinxue Pan, Shuai LIu, and Dingguo Xiao
Key Laboratory of Fundamental Science for National Defense for Advanced Machining Technology., Beijing Institute of Technology
Beijing, China

- The research background and the basis on Residual Stress Measurement for Tubule Surface
- Acoustoelastic theory and Basic principle of LCR.
- Research methods and techniques
- Results
- Conclusions

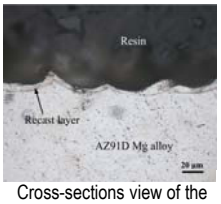
Measurement system

WP2-6(4) 16:00-16:15

Study on Hardness and Tribological Properties of High-speed Wire Electrical Discharge Machining Surface

Jinkai Xu, Kui Xia, Zhe Xu, Linshuai Zhang, Zhanjiang Yu, Huadong Yu
College of Mechanical and Electric Engineering
Changchun University of Science and Technology
Changchun, China

- A double-layer of recast and carbon layers were fabricated on AZ91D Magnesium alloy surface.
- The hardness of recast layer was improved by using the high-speed wire electrical discharge machining.
- The friction coefficient of fabrication was reduced, and it enhanced durability of AZ91D Mg alloy.



Cross-sections view of the WEDM-HS processing surface

WP2-6(5) 16:15-16:30

Personnel Identification and Intelligent Management System Based on Multi-sensor and Foxtable

Chenghui Qian, Wanyu Huang, Xiyang Liu, Yusong Xin
CIEE, University of Jilin, Changchun, Jilin Province, China

- Fingerprint sensor, charged-coupled device, infrared photoelectric sensors, ultrasonic sensors
- Fingerprint recognition, personnel access monitoring, face recognition
- Intelligent administrative system developed by Foxtable greatly improves the efficiency of laboratory management

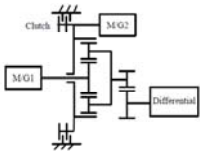
Intelligent Management System

WP2-6(6) 16:30-16:45

Efficiency Analysis of Planetary Coupling Drive System with Dual Motors on Electric

Xiaohua Wu[1], Guangwei Han[2], Shengming Han[1] and Hua[1]
1. School of Automobile and Transportation, Xihua University, Chengdu, China;
2. School of Mechanical and Power Engineering, Henan Polytechnic University, Jiaozuo, China

- Propose the structure and working principle of the planetary coupling drive system with dual motors.
- Use the motor efficiency map to determine work area of different working modes, mode switching curve, and the motor control speed in dual-motor mode.
- Examine the performance of planetary coupling drive system with dual motors through control strategy considering the efficiency.



Structure of Planetary Coupling Drive System with Dual Motors

WP2-7: Robot Vision

Session Chairs: Lei Zhang, Nantong University
Li Tian, Beijing Institute of Technology
Conf. Room 7, 15:15-16:45, Wednesday, 5 August 2015

WP2-7(1) 15:15-15:30

A Data-driven Grasp Planning Method Based on Gaussian Process Classifier

Liyun Li, Weidong Wang, Yanyu Su and Zhijiang Du
State Key Laboratory of Robotics and Harbin Institute of Technology
Harbin, Heilongjiang 150001, China

- Present a grasp planning method for grasping novel objects from point clouds provided by the Kinect camera
- By applying machine learning, the planning method can generate two points which represent the contact point and direction of grasp
- In order to tackle the problem of noise, supervised learning technique based on Gaussian Process Classifier is introduced to determine grasp quality by using the features

Grasping points detection for objects

WP2-7(2) 15:30-15:45

A Camera Calibration Method for Large Field Vision Metrology

Li Tian, Wei Zhu*, Kejie Li and Yanzhu Yang
The Key Laboratory of Biomimetic Robots and Systems, Beijing Institute of Technology
Beijing, China

- A new camera calibration method based on the common system which has existing special spatial constraints is proposed
- Only three feature points are used in entire calibration procedure
- Low cost, simple computation and high precision measurement for large field

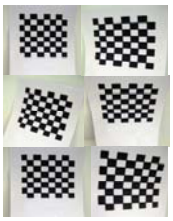
Camera calibration for large field vision metrology

WP2-7(3) 15:45-16:00

Binocular Stereovision Camera

Ling Wu , Baozhong Zhu
College of Automation, Harbin Engineering University
, Harbin Institute of Petroleum
Harbin, China

- This paper uses a compromise method between traditional calibration method and self-calibration method.
- In the calibration experiment of this paper, Calibration template is the standard checkerboard.
- The two cameras will be placed before the checkerboard. Convert the angle between the checkerboard and the degree of the image plane, and successively collect six calibration images shown in Figure.



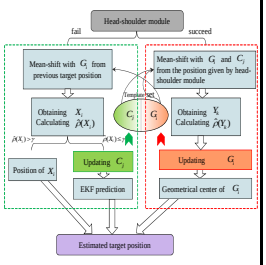
The six calibration images left cameras captured.

WP2-7(4) 16:00-16:15

Human Tracking Method Based on Multi-Template Color-Texture Mean-Shift Algorithm

Linfeng Wen, Linfeng Wen, and Lijia Wang
College of Electronic and Control Engineering, Beijing University of Technology
Beijing, China

- Determines the coarse location by using adaptive template matching algorithm based on head-shoulder.
- A multi-templates based method is presented to locate the person precisely.
- Templates are updated by considering the likelihood of the tracking results and the old templates.
- The method performs well when there are unclear disparity image and pose variations.



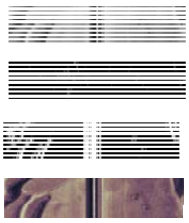
Multi-Template Mean-Shift strategy

WP2-7(5) 16:15-16:30

Specific Target Recognition and Segmentation Algorithm for Real-time Side Scan Sonar Images

[a] Lei Wang, Minhui Li, Xiufen Ye, Tian Wang
Hubei University of Technology, Hubei , China
[b] Harbin Engineering University, Beijing, China

- Introduction.
- [c]
- Special size target segmentation
- Special shape target segmentation
- Segmentation results



Sonar detection results

WP2-7(6) 16:30-16:45

A Robot Visual Servo-based Approach to the Determination of Next Best Views

Lei Zhang, Junqiu Zuo, Xingtian Yao, Xingguo Zhang, Liguo Shuai
School of the Mechanical Engineering, Nantong University
Nantong, Jiangsu, China

- In automatic 3D reconstruction, determining next best view (NBV) is the key problem for continuous automatic view planning. The mass vector chain (MVC) is one of the classical methods, but it can only determine the NBV direction.
- A visual servo-based approach is proposed in this paper for determining the orientation and direction of NBV. In the proposed approach, the 2-1/2-D visual servoing is used and modified in which MVC method is employed for orientation control and the image-based visual servoing is employed for position control. The MVC method is used in an open-loop, which decreases the dimensionality of the image Jacobian.
- The experimental results show that the proposed method can guide the robot to the desire views automatically. The final 3D reconstruction surface of an object is basically complete, only with a few tiny blind areas due to too many concave small surface patches of the object.

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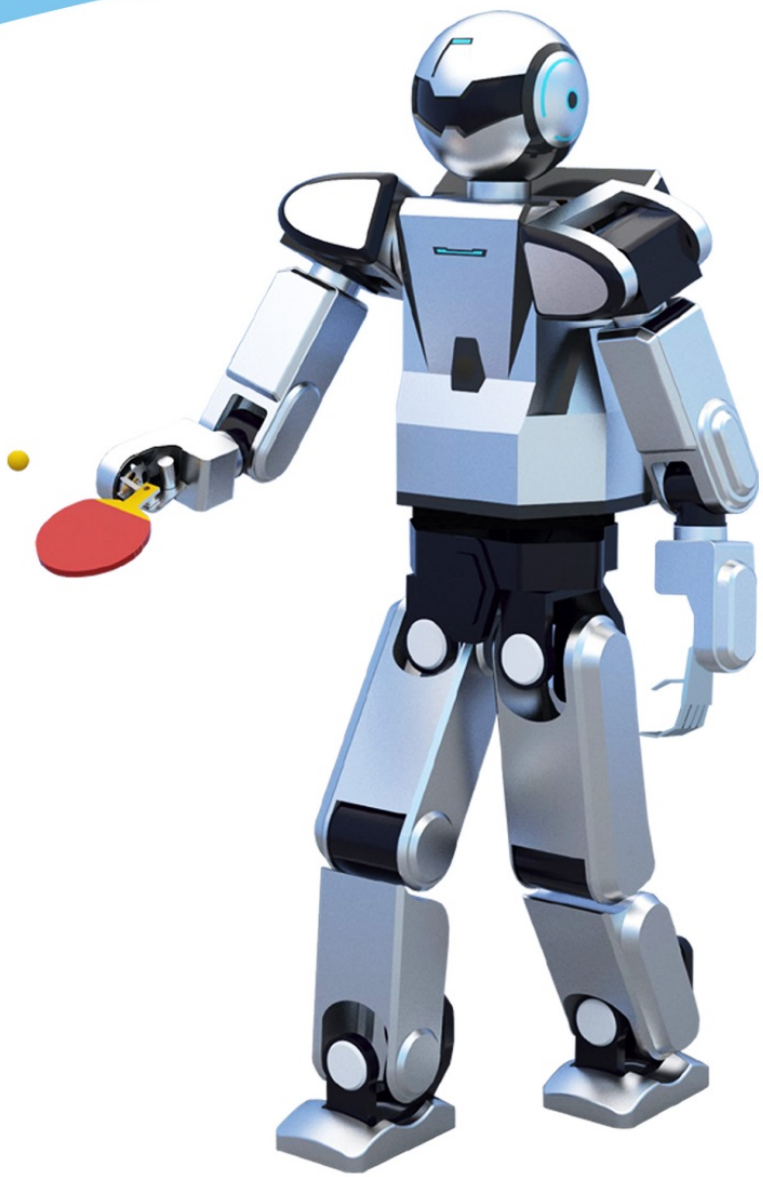

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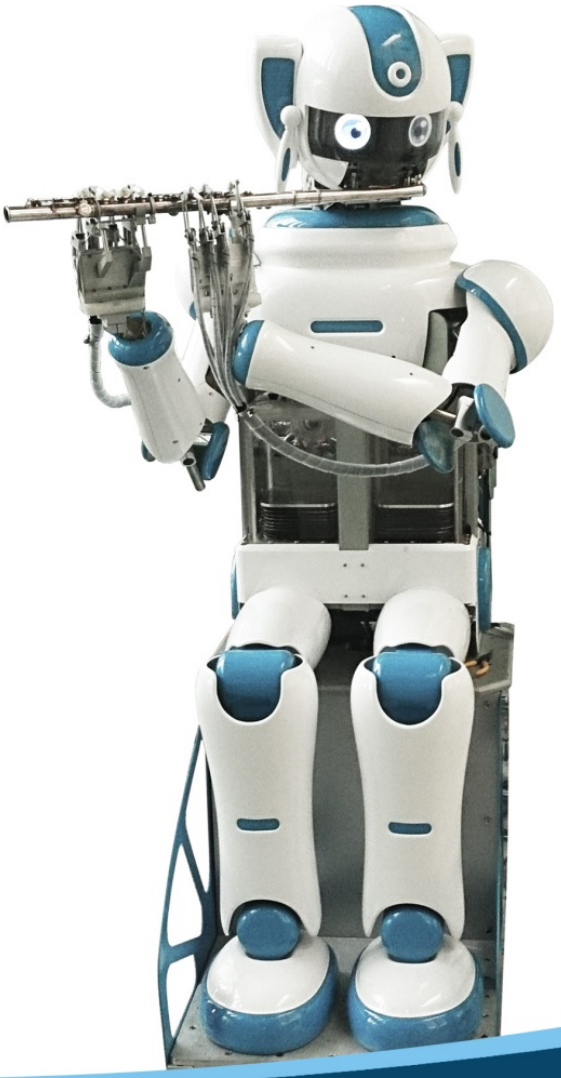

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IJMA is a fully refereed international journal that presents the state-of-the-art research in the area of mechatronics and industrial automation. The intention of ***IJMA*** is to provide an international forum to report latest developments from interdisciplinary theoretical studies, computational algorithm development and practical applications. It particularly welcomes those emerging methodologies and techniques which bridge theoretical studies and applications and have significant potential for real-world applications.

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Objectives

The main objective of ***IJMA*** is to establish an excellent channel of communication between experts in academic and research institutions, practitioners and professionals working in the industry, and policy makers.

Readership

IJMA provides a forum for information exchange between professionals, academicians and engineers who are working in the area of mechatronics, control engineering, and industrial automation, helping them to disseminate information and to learn from each other's work.

Contents

IJMA publishes original papers, technical reports, case studies, review papers and tutorials. Special Issues devoted to important topics in advanced mechatronic systems, robotics, control engineering and industrial automation will be published from time to time.

Subject Coverage

Suitable topics include, but are not limited to:

- Intelligent mechatronics, robotics and biomimetics
- Novel and unconventional mechatronic systems and robots
- Modelling and control of mechatronics systems and robots
- Elements, structures, mechanisms of micro and nano systems
- Sensors, wireless sensor networks and multi-sensor data fusion
- Biomedical and rehabilitation engineering, prosthetics and artificial organs
- AI, neural networks and fuzzy logic in mechatronics and robotics
- Industrial automation, process control and networked control systems
- Telerobotics, human computer interaction, human-robot interaction

Specific Notes for Authors

Submitted papers should not have been previously published nor be currently under consideration for publication elsewhere. (N.B. Conference papers may only be submitted if the paper was not originally copyrighted and if it has been completely re-written)

All papers are refereed through a double blind process. A guide for authors, sample copies and other relevant information for submitting papers are available on the **Submission of Papers** web-page.

You may send one copy in the form of an MS Word file attached to an e-mail to: **Professor Shuxiang Guo**, below

Editors and Members of the Editorial Board

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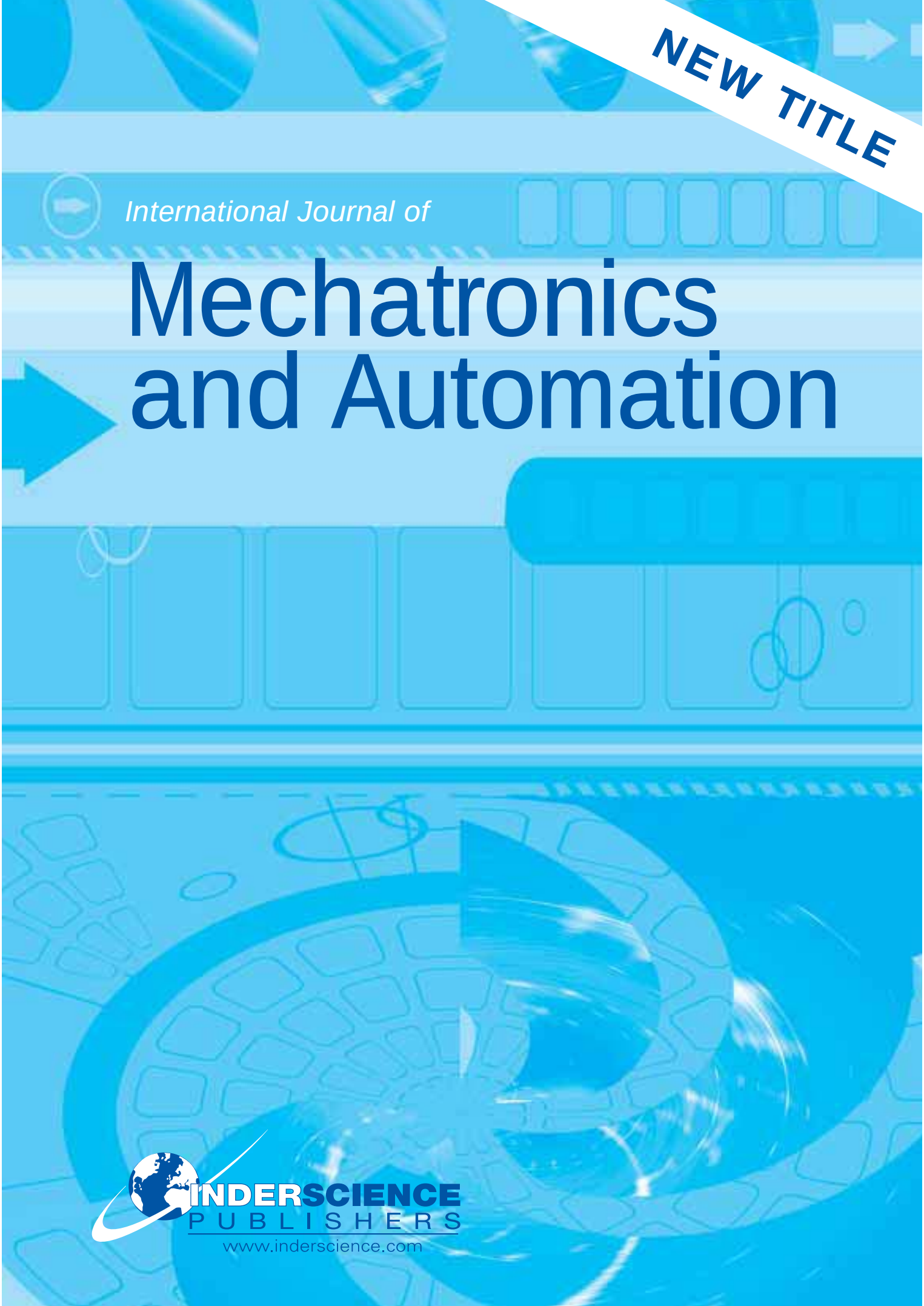

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Scope of the Journal

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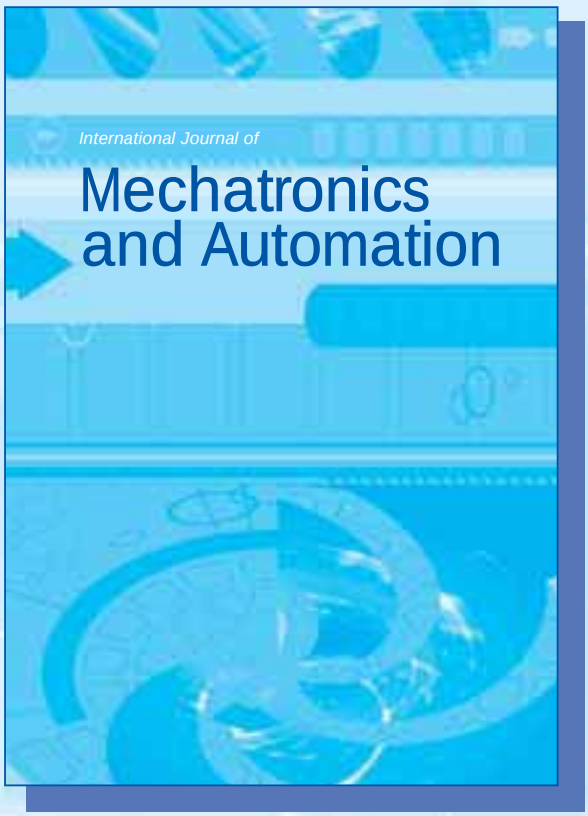

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Members of the Editorial Board

What the editors say about IJMA

The new IJMA will cover the area of mechatronics and automation that is currently very important and hot topics. I see that the technology of mechatronics and automation will play a major role in developing new technological products. Hence, I am expecting that the new journal will be a great hit with every researcher who is working on future innovations. It gives a great pleasure to be a part of the IJMA team.

Toshio Fukuda,
Nagoya University, Japan

I am honored to be a part of this exciting new journal which addresses an important and emerging area of research, and believe that it will be extraordinarily successful. I am confident that IJMA will have a significant impact in the area of mechatroronics and automation.

T.J. Tarn,
Washington University in St. Louis, USA

It is certainly an honor for me to serve as an Editorial Board member for this important new journal. Mechatronics and automation technologies are central in a wide range of expanding industries across the world. IJMA promises to provide both basic and applied researchers a high quality avenue to report their work in this exciting aspect of modern engineering.

William R. Hamel,
The University of Tennessee, USA

Mechatronics and industrial automation are at the heart of technological development and it is vital that researchers have high quality publications in which they can rapidly disseminate their results. IJMA will cover a vital and underrepresented area of research and I am confident that it will have a significant impact on the community, quickly becoming a leading journal in this field.

Darwin G Caldwell,
Italian Institute of Technology, Italy

I am honored to be invited to serve as an Editorial Board member of this new journal. Under the guidance of Editors and Editorial Board, this new journal will be an important forum for the publication of exciting new developments in emerging technological areas.

James K. Mills,
University of Toronto, Canada

The birth of the new journal is a big event in the exciting field of Mechatronics and Automation, and I am very proud to be a part of the strong editorial team that will maintain high quality and standards of all the papers published in it. The IJMA is certainly going to be a vital and unique source of information on the latest theoretical and practical achievements of the researchers in this multidisciplinary and very essential engineering area.

Nazim Mir-Nasiri,
Swinburne University of Technology, Malaysia

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IEEE ICMA 2015 Program at a Glance

August 2-5, 2015

Beijing Friendship Hotel, Beijing, China

Sunday, August 2, 2015	
15:00 - 18:30	Registration Desk Open (1F, Friendship Palace)
13:30 - 17:30	Tutorials & Workshops (Conference Room 4, 2F, Friendship Palace)
17:30 - 18:30	Reception (Conference Room 3, 2F, Friendship Palace)
Monday, August 3, 2015	
8:30 - 9:00	Opening Ceremony
9:00 - 9:50	**Plenary Talk #1** (Dr. Raja Chatila) (2F, Juying Ballroom, Friendship Palace)
9:50 - 10:40	**Plenary Talk #2 (**Dr. Atsuo Takanishi) (2F, Juying Ballroom, Friendship Palace)
10:40 - 11:00	Morning Break
11:00 - 12:00	Technical Sessions MA1 (Poster Session) (2F, Juying Ballroom, Friendship Palace)
12:00 - 13:30	Lunch Break
13:30 - 15:00	Technical Sessions MP1 (Meeting Room, 2F Building 7 and 1F Building 8)
15:00 - 15:15	Afternoon Break
15:15 - 16:45	Technical Sessions MP2 (Meeting Room, 2F Building 7 and 1F Building 8)
17:00 - 18:30	Technical Sessions MP3 (Meeting Room, 2F Building 7 and 1F Building 8)
Tuesday, August 4, 2015	
9:00 - 10:00	**Plenary Talk #3 (**Dr. Metin Sitti) (Meeting Room 5, 1F, Building 8)
10:00 - 10:30	Morning Break
10:30 - 12:00	Technical Sessions TA1 (Meeting Room, 2F Building 7 and 1F Building 8)
12:00 - 13:30	Lunch Break
13:30 - 15:00	Technical Sessions TP1 (Meeting Room, 2F Building 7 and 1F Building 8)
15:00 - 15:15	Afternoon Break
15:15 - 16:45	Technical Sessions TP2 (Meeting Room, 2F Building 7 and 1F Building 8)
18:30 - 21:00	Award Banquet (2F, Juying Ballroom, Friendship Palace)
Wednesday, August 5, 2015	
9:00 - 10:00	**Plenary Talk #4** (Dr. Koichi Hashimoto) (Meeting Room 5, 1F, Building 8)
10:00 - 10:30	Morning Break
10:30 - 12:00	Technical Sessions WA1 (Meeting Room, 2F Building 7 and 1F Building 8)
12:00 - 13:30	Lunch Break
13:30 - 15:00	Technical Sessions WP1 (Meeting Room, 2F Building 7 and 1F Building 8)
15:00 - 15:15	Afternoon Break
15:15 - 16:45	Technical Sessions WP2 (Meeting Room, 2F Building 7 and 1F Building 8)
17:00 - 18:00	Farewell Party (Meeting Room 5, 1F Building 8)

* 15 minutes (Speech: 12 minutes, Q&A:3 minutes) are scheduled for oral presentation including discussions for each paper.

* 30 minutes (core time) are scheduled for poster presentation