IEEI ICMA 2015 2015 IEEE International Conference on Mechatronics and Automation

AUGUST 2-5, 2015 BEIJING, CHINA

Conference Digest



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2015 IEEE International Conference on Mechatronics and Automation

IEEE ICMA 2015

Beijing, China

August 2 - 5, 2015

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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

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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



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.

1F, Friendship Palace, Beijing Friendship Hotel
1F, Friendship Palace, Beijing Friendship Hotel
1F, Building 8, Beijing Friendship Hotel
1F, Building 8, Beijing Friendship Hotel
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

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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

Department of Modern Mechanical Engineering,

Waseda University, Japan

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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 <u>sitti@is.mpg.de</u>


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 in health-care, bioengineering, mobile sensor impact applications 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.

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

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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 1990. and 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

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.

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.

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.

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.

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.

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 WD2 at the ALER STREET
15.15 10.45	Technical Sessions WF2 (Meeting Room, 2F Building / and 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

		TEFE IC.	MA 2015 Technic	Droam Sunds	A line to 2015		
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Room	1	2	3	4	5	6	7
Time	Conf. Room 1	Conf. Room 2	Conf. Room 3	Conf. Room 4	Conf. Room 5	Conf. Room 6	Conf.Room 7
15:00 - 18:30			Registrat	tion Desk Open		Loc	ation: 1F, Friendship Palace
13:30 - 17:30			Tutoria	ıls & Workshops		Location: 2F, Conf.	Room 4, Friendship Palace
17:30 - 18:30				Reception		Location: 2F, Conf.	Room 3, Friendship Palace
		IEEE ICI	MA 2015 Technica	al Program, Mond	ay, August 3, 2015	6	
7.30 17.00					Locati	on: August 3, 2015: 08:00 ~	12:00 1F, Friendship Palace
00:/T - 0C:/		1	kegistration Desk Ope	п	Locati	on: August 3, 2015: 12:00 ~	17:00 1F, Building 8
8:30 - 9:00			Openir	ng Ceremony		Location: 2F, Juying F	3allroom, Friendship Palace
9:00 - 9:50	Plenary	y Talk #1	On Some Capacities to Ena Professor and Director Re	ble Human Robot Interaction aja Chatila, University Pierr	re and Marie Curie and CN	RS, Paris, France Location: 2F, Juying F	3allroom, Friendship Palace
9:50 - 10:40	Plenary	y Talk #2	Humanoid Robotics Resear Professor and Director At	ch and Its Applications tsuo Takanishi, Waseda Uni	versity, Tokyo, Japan	Location: 2F, Juying F	allroom, Friendship Palace
			W	10rning Break			
00 11 00				MA1-P			
00:71 - 00:11			Poster Session (Intel	lligent Mechatronics and Auto	onation)	Location: 2F,Juying F	3allroom, Friendship Palace
				Lunch Break			
	MP1-1	MP1-2	MP1-3	MP1-4	MP1-5	MP1-6	MP1-7
13:30 - 15:00	UAV	Modeling and Simulation I	Organized Session: Medical Robots for Minimal Invasive Surgery I	Advanced Control Systems	Organized Session: Cooperative Control and Multi-Agent Systems I	Design and Analysis of NANO Systems I	Organized Session: Biomimetic Underwater Robot
			Ý	ternoon Break			
	MP2-1	MP2-2	MP2-3	MP2-4	MP2-5	MP2-6	MP2-7
15:15 - 16:45	interrigent systems 1	Modeling and Simulation II	Medical Robots for Minimal Invasive Surgery	Control System Design	Organized Session: Cooperative Control and Multi-Agent Systems II	Design and Anarysis of NANO Systems II	Organized Session: Humanoid Robot I
17:00 - 18:30	MP3-1 Intelligent Systems II	MP3-2 Modeling and Analysis	MP3-3 Organized Session: Madical Debets for	MP3-4 Biomedical Robotic	MP3-5 Biomimetic Systems	MP3-6 Nano Sensor Design	MP3-7 Humanoid Robot II
			Minimal Invasive Surgery	System			

		IEEE ICN	MA 2015 Technica	d Program, Tused	ay, August 4, 201	5	
Room	1	2	3	4	5	6	7
Time	Conf. Room 1	Conf. Room 2	Conf. Room 3	Conf. Room 4	Conf. Room 5	Conf. Room 6	Conf.Room 7
7:30 - 17:00			Registratic	on Desk Open			Location: 1F, Building 8
9:00 - 10:00	Plenary	- Talk #3	Small-Scale Mobile Robotic Professor and Director Me	cs stin Sitti, Carnegie Mellon	University, Pittsburgh, US.	A Location: 1F,	Meeting Room 5, Building 8
			W	orning 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
			T	Junch 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
			Affi	ernoon Break,			
15:15 - 16:45	TP2-1 Intelligent Mechatronics and Application II	TP2-2 Modeling, Simulation Techniques and Methodology II	TP2-3 Rehabili tation 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 1	Ballroom, Friendship Palace

		IEEE ICM.	A 2015 Technical	Program, Wednes	day, August 5, 20)15	
Room	1	2	3	4	5	9	7
Time	Conf. Room 1	Conf. Room 2	Conf. Room 3	Conf. Room 4	Conf. Room 5	Conf. Room 6	Conf.Room 7
7:30 - 17:00			Registrati	ion Desk Open			Location: 1F, Building 8
9:00 - 10:00	Plenary	· Talk #4	Visual Servo Microscope fe Professor Koichi Hashimo	or Optogenetic Manipulation to, Tohoku University, Sen	and Neural Network Identii dai, Japan	fication Location: IF, I	Meeting Room 5, Building 8
			W	torning 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
			1	Lunch Break			
13:30 - 15:00	WP1-1 Intelli gent 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
			ΨΨ	ternoon 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			I	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
MD2 7	

MP3-7 Humanoid Robot II

IEEE ICMA 2015 Conference Digest

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



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



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



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



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



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



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(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(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(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.

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

The Experiment and Analysis of Torsion Axle Stiffness



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



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



The Voltage Locus

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



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



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 Optimization process of beam example to illustrate the topology optimization process

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



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



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



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(19) 11:00-12:00



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

Analysis of Turbine Fluid Dynamics Based on FSI

Yiming Li¹, Guiqiu Song¹, Xiaoyu Feng¹, Dengchen Li² and Gong Zhang¹ 1:School of Mechanical Engineering & Automation, Northeastern University, 110819, China 2:China Aerospace Science and Technology Corporation, Beijing, 100048, China

dynamic

fluid-structure

- Based on the fluid-structure coupling theory, the wheel of the bulk 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.

got the

characteristics of bulb tubular turbine

considering



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

article

The

under

coupling.



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



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



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



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



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



Maglev Control

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.



Key Research Laboratory for Control Theory & Applications in Complicated Systems, Tianjin University of Technology Power electronic device in inverter use IGBT, IGCT or 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(26) 11:00-12:00 Spatial Linear Path-Following Control for an



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

Development of Marine Diesel Engine Working Condition Acquisition and Analysis System

Defu Zhang¹, Shimin Han², Huichao Xiao², Xiangyi Wei¹ (1.Maritime College, Tianjin University of Technology, Tianjin ,China; 2. School of Electrical Engnieering, Tianjin University of Technology, Tianjin , China)

A Review of STATCOM On The Electric Power

System

Youjie Ma, Ahui Huang and Xuesong Zhou

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.



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

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



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(35) 11:00-12:00



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



 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(34) 11:00-12:00



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



reduce operating costs of Tunnel kiln.

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



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(41) 11:00-12:00



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



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
- 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(42) 11:00-12:00



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



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

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

A New Bond Graph Model for Op amp

Mehrnaz Aghanouri Kupaei¹, Ali Esmaeili¹, and Saeed Behbahani² 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(44) 11:00-12:00





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



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



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. Scene PTZ gaussian mixture Target

The diagram of auto-tracking system designed

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(50) 11:00-12:00



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



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



Parallel Gap Test

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

Xiang Wan, Daoguo Yang, Miao Cai, Shunteng Hai 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).

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



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 Beiling, 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 antenna systems

The Time-Frequency Diagram

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



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



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



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



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

Impedance Matching Circuit for Synchronous Switch Harvesting on Inductor Interface

Zhuo Xu¹, Zhengbao Yang², and Jean Zu² ¹Department of Precision Instrument, Tsinghua University, Beijing, China ²Vibration, Design, and Mechatronics Lab., University of Toronto, Toronto, Canada

This paper presents a power conditioning 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(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(62) 11:00-12:00



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



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



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



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



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



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



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



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



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



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, Oiong Wang and Zhaodi Jia Safety Engineering Institute, China Petroleum & Chemical Corporation Oingdao, 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.

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



- 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.



Experimental System

The testing platform of the cycle life testing

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



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



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



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



Ephepsy EEG signal of channel with right si

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



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



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.



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



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 The closed-loop insulin pump infusion

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



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



Telerehabilitation training

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



IEEE ICMA 2015 Conference Digest
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 closedloop flight tests.

The Pelican quadrotor in hover

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 algorithm 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(5) 14:30-14:45



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



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



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



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



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

Dynamics Forces Modelling and Simulation for 3-RUU Parallel Main Hand Lingtao Yu¹, Wenjie Wang¹ӂ, Huajian Song², Jing Yang¹, Lan Wang¹, ¹College of Mechanical and Electrical Engineering, Harbin Engineering University ²State 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 The model of 3-RUU Parallel applicative in an environment which need more force sensing accuracy



Main Hand

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



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



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



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



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



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 20 model of the normalial

- 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.



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



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



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



 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

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



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 BLDCM capacitor voltage is considered and Equivalent Circuit used as an input to the controller. The duty ratio can be calculated accurately.

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



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



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



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



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 and eachieved with the proposed quantized control law.



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

Design of Formation Control Architecture Based on Leader-following Approach Tianyong Zhang Guoping Liu Center For Control Theory and Guidance Faculty of Advanced Technology University of

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

- 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



South Wales

Pontypridd, U.K

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



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(4) 14:15-14:30



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 Clancy¹, Xuezhong Wu², Yu Sun³, and and Xinyu Liu^{1*} ¹Department of Mechanical Engineering, McGill University, Canada ²Department of Mechatronics Engineering, National University of Defense Technology, China ³Department 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.



 Closed-loop nanopositioning is performed.



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

A Novel Detection Algorithm of Microspheres Based on Hough Transform and Ellipse Fitting Changsheng Dai¹, Weibin Rong², Zenghua Fan¹, Yu Zou¹, Lining Sun¹

¹State 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.



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(2) 13:45-14:00



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



NOA81 chip for SH-SY5Y cell culture

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



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



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



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



- · 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



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



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



Detection System

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 nedical 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



The prototype of a novel

It will have good application prospects in the field of sea island development in the amphibious spherical robot future

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



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



hool 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 micromilling machine tool.
- The hydrophobicity and superhydrophobicity on aluminum alloy surface is a coupling function result by both submillimetre regular grating array and many irregular nanoscale Water droplet on aluminum alloy surface pits and projections distributing on submillimetre grooves surface.

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



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



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



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



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



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



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



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
- 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.



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



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



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



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



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



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(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.



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



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



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



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



Xuanchun Yin*1, Shuxiang Guo*2,*3 and Yu Wang *1 *IGraduate 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





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 time 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.



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

A Cost-Effective Microindentation System for Soft Material Characterization

Weize Zhang¹, Xianke Dong¹, Simon Silva-Da Cruz¹, Hossein Khadivi Heris^{1,2}, Luc G. Mongeau, Allen J. Ehrlicher², and Xinyu Liu^{1*} ¹Department of Mechanical Engineering, McGill University, Canada ²Department 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 pro-

vides accurate and fast force control.

Reliable results are obtained which



match well with those from expensive Microindentation system setup

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

commercial systems.

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(2) 15:30-15:45



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



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



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



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

A General Vector-based Algorithm to Generate Weighted Voronoi Diagrams Based on ArcGIS Engine Song Tiant, 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.

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



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



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



Weighted Voronoi diagram

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



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(5) 16:15-16:30



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



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





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.



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

Biomimetic inspiration for PKM torso design in humanoid robots

Hulin Huang, Ceccarelli Marco, Weimin Zhang, Oiang 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.



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



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



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 Guangyu Luan State Key Laboratory of Robotics and System, College of Information Technology, Heilongjiang Bayi Agricultural University Daging, China Harbin Institute of Technology Harbin, 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(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.





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



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



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

temperature is 20 °C



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



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



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



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 · Illustration of quadric common faults of the circulating profile error and radius cooling water system. Contact point compensation. · In this paper ,water quality prediction model has been proposed. The model of the radius compensation. The platform has realized the data Angle Subdivision collection, reading and analysis of Approach Algorithm. water quality. IPSO algorithm. Expert system interface The IAA platform can ensure smooth and reliable operation of the

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

industrial cooling water system



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



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



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



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



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



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

MP3-3(2) 17:15-17:30



MP3-3(4) 17:45-18:00



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} IThe Institute of Advanced Biomedical Engineering System, School of Life Science, Beijing Institute of Technology, No.5, Zhongguancum 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 pressure contours have proved the and hydrodynamic features and provided important evidence to conform the assumptions made during the hydrodynamic parameter estimation.



ater vertical mo velocity vectors vertical motion and

MP3-4(3) 17:30-17:45

Design of Dual-frequency Bioreactor Control System Xiang Hongbiao1*, Wang Shoujun1, Zhang Chungiu1, Li Xingfei2 and Liu Jun1 Tianjin Key Laboratory of the Design and Intelligent Control of the Advanced Mechatronical System, Tianjin University of Technolog¹, Tianjin 300384, China State Key Laboratory of Precision Measuring Technology and Instruments², 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

MP3-4(5) 18:00-18:15



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.

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



MP3-4(6) 18:15-18:30



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.

MP3-5(3)	17:30-17:45
	11100 11110

Insect-inspired Biomimetic Underwater Microrobots for a Father-son Robot System Maoxun Li¹, Shuxiang Guo^{2,3}, Kazuhiro Yamashita¹ 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 insectinspired microrobots for mounting on the father robot were developed.



Microrobots

Plane view of the distribution of the flow velocity

- 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.

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(2) 17:15-17:30



MP3-5(4) 17:45-18:00



MP3-5(6) 18:15-18:30

Introducing Authority and Hubness into **Graph Matching** Yu-Ren Zhang, Xu Yang and Hong Qiao Li-Jin Xu and Wei You Institute of Automation, Chinese Academy of Sciences 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

Anhui Efort Equipment Co., Ltd





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



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

The Annulus Elastic Body

- 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.

MP3-6(5) 18:00-18:15



MP3-6(2) 17:15-17:30



MP3-6(4) 17:45-18:00



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



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



MP3-7(3) 17:30-17:45



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.

when the robot is out of balance.

- The control strategy adjusts the ZMP back to the stability domain
- Simulation results are presented to show the effectiveness

The IPR Robot

MP3-7(2) 17:15-17:30



MP3-7(4) 17:45-18:00



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



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.



the proposed knee joint mechanism

- A prototype of the bipedal robot with this new mechanism has been developed.
- The effectiveness of the mechanism is confirmed by experimental results.

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 Dreast

- · 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%.

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.



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 inpipe 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(4) 11:15-11:30



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 Tpipes.
- · 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







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



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 MARÉ², FU Yongling¹ and HAN Xu¹

 School of Mechanical Engineering and Automation, Beihang University, Beijing, China 2. Institut Clement 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

Interest of multilevel models with

different physical effects to be

simulated vs. engineering needs

risks, development costs



TA1-2(5) 11:30-11:45



TA1-2(2) 10:45-11:00



TA1-2(4) 11:15-11:30



TA1-2(6) 11:45-12:00



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 Li², Felyun Cong^{1, 2}, Zheming Tong² Atsushi Yamashita³ and Hajime Asama³

 School of Mechanical Engineering, Zhejiang University, Hangzhou, China
 R&D Center of Mechatronics and Intelligent Control, Zigong Innovation Center of Zhejiang University, Zigong, China
 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(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.





Geometrical sketch

TA1-3(5) 11:30-11:45

A Reconfiguration Approach for Selfreconfigurable 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.



TA1-3(2) 10:45-11:00



TA1-3(4) 11:15-11:30



TA1-3(6) 11:45-12:00



Bo Uin, 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(2) 10:45-11:00

TA1-4(1) 10:30-10:45



TA1-4(5) 11:30-11:45



TA1-4(6) 11:45-12:00



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 SiO₂ layer was deposited on the shape memory alloy element to eliminate the load effect.



Bistable Micro-actuator

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(5) 11:30-11:45

Research on Energy Harvesting Circuit Based on Self-filling DEG Shiju E, Alfei 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 mechanicalelectrical 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.



TA1-5(2) 10:45-11:00

Realization of Fractional Order Integrator by Rational Function in the Form of Continued Product

Liii 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(6) 11:45-12:00



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



 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(3) 11:00-11:15



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

TA1-6(2) 10:45-11:00



TA1-6(4) 11:15-11:30



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(3) 11:00-11:15



6-strut tensegrity model

TA1-7(5) 11:30-11:45



²Beijing 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(2) 10:45-11:00



TA1-7(4) 11:15-11:30



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 Space manipulator system in clearance joint.

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.



TP1-1(3) 14:00-14:15



TP1-1(5) 14:30-14:45



SB-VAWT with CPC

TP1-1(2) 13:45-14:00



TP1-1(4) 14:15-14:30



TP1-1(6) 14:45-15:00



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



· Factor of Safety = 3.37.



pronged forklift mechanism.

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.



The path is planned from assembled state to disassembled state, using the potential variation method.



Automatic path generation using mobility potential

TP1-2(5) 14:30-14:45



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 A typical distillation process inside the column can be properly estimated.

TP1-2(4) 14:15-14:30



TP1-2(6) 14:45-15:00



TP1-3: Medical and Rehabilitation

Session Chairs: Zhidong Wang, Chiba Technology University Jun Liu, Tianjin University of Technology Conf. Room 3, 13:30-15:00, Tuesday, 4 August 2015

TP1-3(1) 13:30-13:45



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. Q1 Q2 Q3

 DA content reduction was detected in striatum, and the more reduction in rAAV-αsynuclein A53T group owning to the more toxicity of mutation protein.

TP1-3(5) 14:30-14:45



TP1-3(2) 13:45-14:00



TP1-3(4) 14:15-14:30



TP1-3(6) 14:45-15:00



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



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(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.



TP1-4(2) 13:45-14:00



TP1-4(4) 14:15-14:30



TP1-4(6) 14:45-15:00



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(3) 14:00-14:15



TP1-5(5) 14:30-14:45



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(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(4) 14:15-14:30



TP1-5(6) 14:45-15:00

Least Squares Based on Rodrigues Matrix and Its Application in Similar Material Model of Mining

Fuqin Yang¹, Huayang Dai¹and Huimin Xing²

.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



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



Unmanned Aerial Vehicle

TP1-6(5) 14:30-14:45

greedy policy.



TP1-6(2) 13:45-14:00



TP1-6(4) 14:15-14:30



TP1-6(6) 14:45-15:00


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



TP1-7(3) 14:00-14:15



TP1-7(5) 14:30-14:45



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(2) 13:45-14:00



TP1-7(4) 14:15-14:30



TP1-7(6) 14:45-15:00



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



TP2-3(3) 15:45-16:00



TP2-3(5) 16:15-16:30



- · 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.



TP2-3(2) 15:30-15:45



TP2-3(4) 16:00-16:15



TP2-3(6) 16:30-16:45



hydraulic press is enough but the lack of rigidity of the upper beam and the movable beam, need to improve the design.





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



TP2-2(3) 15:45-16:00

Hardware-in-the-loop Simulation System of VIS Based on MATLAB and ADAMS

Xian Li¹, Mingli Ding¹, Muding Wang², Chao Yang², Yanbo Sun², and Haitao Jing² 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



The VIS of McPherson

- 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.

TP2-2(5) 16:15-16:30



TP2-2(2) 15:30-15:45



TP2-2(4) 16:00-16:15



TP2-2(6) 16:30-16:45



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(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(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 Zhao¹, Wei Wei², Jian Guo¹, Fang Zhao¹, Yuye Hu¹ ¹Tianjin Key Laboratory for Control Theory and Applications in Complicated Systems, Tianjin University of Technology, Tianjin, China

²College of Physics, Optoelectronics and Energy, Soochow University, Jiangsu, China ³Intelligent 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.



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
- A visual marker system base on stereo vision was used to track the
 - stereo vision was used to track the gait movement of healthy individuals, which acted as bases of gait planning.
- n the viduals, anning.
- Gait planning and customization were implemented using patient parameters Lower Limbs rehabilitation robot on a lower limb rehabilitation robot.

TP2-3(4) 16:00-16:15



TP2-3(6) 16:30-16:45

Study on a Medical Robot for Mandible Reconstruction Surgery

Honghua Zhao¹, Jianying Tian²

¹School of Mechanical Engineering, University of Jinan
²Department 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.
 - ind outlook.





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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(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

- the paper is uncerly based on the estimation and prediction of pseudo partial derivative (PID).
 It analyzed and compared the
- 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(5) 16:15-16:30

An H_m Filter Based Approach for Battery SOC **Estimation with Performance Analysis** Yuehang Chen¹, Dagui Huang¹, Daiwei Feng¹ and and Kaiming Wei² ¹School of Mechatronics Engineering, ²School of Automation Engineering University of Electronic Science and Technology of China Chengdu, Sichuan, China · Battery SOC estimation is key to ---battery management system design. #3 · Present a new battery SOC - o estimation algorithm using H_{∞} filter. 1-0 Performance under different noises and different parameters are analyzed using computer simulation. A comparison with traditional MAILAB Model for Algorithm method shows its robustness. (Partial)

TP2-4(2) 15:30-15:45



TP2-4(4) 16:00-16:15



TP2-4(6) 16:30-16:45



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



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 classic gray level threshold segmentation algorithm is used segmentation image.



Defogging imge

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.

	6	T (Simulati	on Results
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e		F	Frequency (%	IHz)	
9	Compar	ison of	maxin	num bia	as betv

- Theoretical Results

- The demodulation loss and squaring loss are presented.
 The interference not only changes the
- The interference not only changes the discriminator slope but also induces a code tracking bias.
 The interference not only changes the Comparison of maximum b theoretical results and simulat

TP2-5(2)	15:30-15:45
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TP2-5(4) 16:00-16:15



TP2-5(6) 16:30-16:45



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



TP2-6(3) 15:45-16:00



TP2-6(5) 16:15-16:30



TP2-6(2) 15:30-15:45



TP2-6(4) 16:00-16:15



TP2-6(6) 16:30-16:45



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



• Model validation using a laser tracker.

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 antr non-Gaussian changes caused by weak gear fault. The acquired fault trend is accurate and 150 effective.

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.



Time / hour The trend lines of bispectral entropy

TP2-7(2) 15:30-15:45



TP2-7(4) 16:00-16:15



TP2-7(6) 16:30-16:45



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(3) 11:00-11:15



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.

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-angleadjustable 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 The In-pipe Robot with Two Steerable Driving Wheels performing experiments in various types of pipelines.

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(4) 11:15-11:30



WA1-1(6) 11:45-12:00

Model and Dynamic Analysis in the Process of Walking

- Jigang Tong¹, Shili Sheng², Wennan Chang² and Enzeng Dong¹
- ¹ Tianjin University of Technology ²Nan 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

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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

WA1-2(2) 10:45-11:00



WA1-2(3) 11:00-11:15



Finally, simulation results are discussed

WA1-2(5) 11:30-11:45





- 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(6) 11:45-12:00



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 Tsai¹, Kouji Mizoue¹, Makoto Kaneko¹, Shinya Sakuma² and Fumihito Arai²

² Dept. of McChanical Engineering, Osaka University, Suita, Japan
² Dept. of McChanical 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%

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.



20µm

Cell Deformability Evaluation

sed Method

 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.

WA1-3(5) 11:30-11:45



WA1-3(2) 10:45-11:00



WA1-3(4) 11:15-11:30



WA1-3(6) 11:45-12:00



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



WA1-4(3) 11:00-11:15



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.



Designed and actual trajectories

The R2D4 UUV

WA1-4(2) 10:45-11:00



WA1-4(4) 11:15-11:30



WA1-4(6) 11:45-12:00



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



WA1-5(3) 11:00-11:15



WA1-5(5) 11:30-11:45



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(2) 10:45-11:00





WA1-5(6) 11:45-12:00



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



· Feasibility and applicability are Verified by experiments.

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.

WA1-6(5) 11:30-11:45

Research on the Relationship between Characteristic Parameters and Transformer Life

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



RCMS data flow architecture

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
- 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(4) 11:15-11:30



WA1-6(6) 11:45-12:00



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 walking direction 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



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



The climbing robot

which can move up and down. It can be use in some aspects such as

reconnaissance, rescue, etc.

WA1-7(5) 11:30-11:45



WA1-7(2) 10:45-11:00



WA1-7(4) 11:15-11:30



WA1-7(6) 11:45-12:00



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



WP1-1(3) 14:00-14:15



WP1-1(5) 14:30-14:45



WP1-1(2) 13:45-14:00



WP1-1(4) 14:15-14:30



WP1-1(6) 14:45-15:00



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 fluidstructure interaction problems in this -1411111 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

 The modeling and simulation of fishlike swimming are conducted to reveal the mechanisms that lead to the thrust force.





- 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.



Vortex pattern in the wake

robot in ADAMS platform

WP1-2(5) 14:30-14:45



WP1-2(2) 13:45-14:00



WP1-2(4) 14:15-14:30



WP1-2(6) 14:45-15:00



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-aoing developed quadruped robot QR-I at our lab

WP1-3(3) 14:00-14:15



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 Tianiin, China
- To explain the reasons why in-pipe robots play a very important role in the rapid development of
- To generalize the type and feature of the traditional in-pipe robots .
- To clarify and analyse the latest conception and design of in-pipe
- To draw a conclusion about advantage and disadvantage of in-



In-pipe inspection robot

WP1-3(4) 14:15-14:30



WP1-3(6) 14:45-15:00



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 method for detecting proposed SNPs with the popular methods The implement of the proposed

method on the cloud platform



Figures of the experiment and The figure of the experiment conclusion

WP1-3(5) 14:30-14:45

Soft Actuator for Hand Rehabilitation

Shuxiang Guo²⁷, Yang Zhao¹⁷, Wei Wei¹, Jian Guo², Xin Zhao², and Weijie Zhang¹⁷² ¹¹ Tianjin Key Laboratory of the Design and Intelligent Control of the Advanced Mechatronical System Tianjin University of Technology Binshui Xidao 391, Tianjin, China ¹² Tianjin Key Laboratory for Control Theory & Application in Complicated Systems and Biomedical Robot Laboratory Tianjin University of Technology Binshui Xidao 391, Tianjin, China ¹³ Intelligent Mechanical Systems Engineering Deartment Faculty of Engineering Kagawa University Takamatsu, Kagawa, Japan ¹⁴ Colleage of Bursits, Ortheletropics and Engrey Spotchwu University

*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.



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 midcourse guidance law
- · Simulation results



Target Acquisition of Interceptor

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.



WP1-4(5) 14:30-14:45



WP1-4(2) 13:45-14:00



WP1-4(4) 14:15-14:30



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





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(2) 13:45-14:00

WP1-5(1) 13:30-13:45



- Compared original algorithm, the improved algorithm can overcome the defect that the model is sensitive to initial position.
 - The Improved Algorithm
- The improved algorithm improved the robustness and the speed of location.

WP1-5(5) 14:30-14:45

Research on Image Matching Technology for the Spherical Stereo Vision

Baofeng Zhang¹, Na Liu², Yingkui Jiao¹, Yongchen Li¹, Junchao Zhu¹ 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.







WP1-5(6) 14:45-15:00



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(2) 13:45-14:00

WP1-6(1) 13:30-13:45



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(5) 14:30-14:45



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. High-Speed Permanent Magnet Proposed algorithm possesses great Synchronous Motor prospect in high-speed occasion.

Permanent Magnet Synchronous Motor

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.



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12.1

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



WP1-7(3) 14:00-14:15



WP1-7(5) 14:30-14:45



WP1-7(2) 13:45-14:00



WP1-7(4) 14:15-14:30





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 $(2 \times 2 \text{ matrix})$. · 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(3) 15:45-16:00



WP2-1(5) 16:15-16:30

effectively.

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-\$50mm 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(2) 15:30-15:45



- 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(4) 16:00-16:15



Ning Cao¹, Guofu Gao², Chongyang Zhao^{1,2}, Jiqing Chen¹, Hengyu Li¹ and Yi Yang¹ ¹School of Mechatronics Engineering and Automation, Shanghai University, Shanghai, China ²School 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

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

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.

WP2-2(3) 15:45-16:00

· Using Gabor Wavelet Transform to

get expression feature information.

Binary Coding will be choose to get

we use local Histogram of Oriented

Gradients to get expression feature

Finally Support vector machine

classifier is used for expression

vectors.

classification

WP2-2(5) 16:15-16:30

5 different Gabor feature graph. Then

WP2-2(2) 15:30-15:45



WP2-2(4) 16:00-16:15



WP2-2(6) 16:30-16:45



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.



Experimental flow chart

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



WP2-3(3) 15:45-16:00



- Odometry model building for four wheels differential drive robot
- SLAM and path planning in autonomous navigation based on robot operating system



WP2-3(5) 16:15-16:30

· Experimental results



WP2-3(2) 15:30-15:45



WP2-3(4) 16:00-16:15



Jian Kong¹, Mingli Ding², Xian Li², Changsen Li³, and Shuo Li³ 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



WP2-4(3) 15:45-16:00



WP2-4(5) 16:15-16:30



WP2-4(2) 15:30-15:45



Energy harvesting from mechanical vibration

· Energy harvesting in shoes

WP2-4(4) 16:00-16:15



WP2-4(6) 16:30-16:45



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



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 Jinfei Shi Mechanical Engineering School, Southeast University Nanjing, China nstitute of Te • 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

· Apply modified region growing

method to extracting the defects



WP2-5(5) 16:15-16:30

from QFN surface.

defects.



WP2-5(2) 15:30-15:45



WP2-5(4) 16:00-16:15



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



The information process implementation block diagram of job-shop

WP2-6(3) 15:45-16:00

Experimental Research on Residual Stress Measurement for Tubule Surface Qinxue Pan, Shuai Llu, 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 Residual Stress on Measurement for Tubule Surface
 - Acoustoelastic theory and Basic principle of LCR.
- Research methods and techniques
- Results
- Conclusions



Measurement system

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(2) 15:30-15:45



WP2-6(4) 16:00-16:15



WP2-6(6) 16:30-16:45



Examine the performance of planetary coupling drive system with dual motors through control strategy considering the efficiency.





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



for objects

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

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 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 left cameras captured. shown in Figure.

The six calibration images

WP2-7(5) 16:15-16:30



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(4) 16:00-16:15



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 to many concave small surface patches of the object.



Experimental set up

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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