THE 2012 HEE INTERNATIONAL CONFERENCE ON ROBOTICS AND AUTOMATION





Foreword

It is a great honor to welcome you to the 2012 IEEE International Conference on Robotics and Automation (ICRA 2012), which is being held in the great city of Saint Paul, Minnesota. This year, ICRA 2012 continues to be the flagship conference in robotics and automation by focusing on technical excellence and innovation on many different fronts. The ICRA theme is "Robots and Automation: Innovation for Tomorrow's Needs." Robotics and automation are at the crossroads of new developments in algorithms, hardware, and software that pave new routes in technological innovation. Saint Paul is the vibrant capital of Minnesota, known as the "Land of 10,000 Lakes." St. Paul and Minneapolis constitute a large metropolitan area known as the "Twin Cities." Many companies like 3M, Cargill, Target, Best Buy are headquartered in the Twin Cities.

This year, we have received an unusually large number of submissions – 2032 papers from over 50 countries. Due to the record number of submissions, the Conference Editorial Board (CEB) and the Senior Program Committee were forced to make difficult decisions in selecting papers to maintain the quality and balance of the technical program. We regret that many excellent papers could not be accommodated. iThenticate was introduced with the goal of reducing overlap with previous paper submissions. A very aggressive approach was followed in order for each paper to receive at least two meaningful and constructive reviews. A total of 818 papers were selected, which resulted in one of the lowest acceptance rates in the history of ICRA. Some of these papers are presented in interactive sessions, a first for an ICRA. All the presentations, with the author's approval, will be videotaped and archived, another first for our conferences. The objective is to create new methods for promoting our community and serving our members. Having the proceedings in a USB thumbdrive is another innovative step. The technical sessions are accompanied by special tutorials where we invited some world experts to share their knowledge. The tutorials are free to all the participants and cover various robotics/automation topics of current research interest. It should be noted that 18 workshops will be organized, all of them supported/proposed by the corresponding RAS Technical Committees (another first for our conferences). ICRA 2012 will have one of the largest exhibitions in our recent history with systems from industry, research institutions, and national laboratories. The video proceedings include 18 video submissions that cover topics ranging from ground robots to computer vision. Supplementing the technical presentations, the program is highlighted by plenary talks delivered by distinguished scholars - Professor Bradley Nelson on "Robotics in the Small," Professor Harry Asada on Bio-Bots, and Professor Jun-Ho Oh on the humanoid robot HUBO II.

We would like to express our sincere appreciation and thanks to the entire Organizing Committee, the CEB, the reviewers, and the local arrangements staff for their contributions and tireless efforts towards the success of ICRA 2012. In particular, we like to express our sincere thanks and appreciation to Lynne Parker for being the organizer of this long and intensive review process as the Editor-in-Chief of the CEB, Volkan Isler and his local staff for the smooth operation of the conference, and Max Meng for the digest creation. We also like to extend our sincere thanks to Raj Mahdavan for a superb exhibitions organization, Venkat Krovi who worked tirelessly to make sure that we are financially sound, and Bert Tanner who handled our registration. Numerous individuals, in particular Dan Lofaro, Alison Amundson, Kathy Colabaugh, Becky Helgeson and Keisha Carr

enabled us to execute such a complex process. Finally, our special thanks go to all the authors for contributing their research work, the participants and the exhibitors for making the 2012 IEEE International Conference on Robotics and Automation a memorable event. Enjoy Minnesota and its more than 10,000 lakes!!!



Nikos Papanikolopoulos

General Chair

Paul Oh

Program Chair

Table of Contents

ICRA ORGANIZATION	
ICRA 2012 ORGANIZING COMMITTEE	
ICRA 2012 SENIOR PROGRAM COMMITTEE	
ICRA 2012 CONFERENCE EDITORIAL BOARD	
ICRA2012 REVIEWERS	VIII
ICRA 2012 CORPORATE SPONSORS	xxv
PLENARY SESSIONS	XXVII
WORKSHOPS AND TUTORIALS	xxxv
ICRA ROBOT CHALLENGE 2012	XXXIX
EXHIBITIONS	XLVII
ICRA 2012 AWARDS	LIII
INDUSTRY FORUM	LV
NSF PRESENTATION	LVII
SOCIAL EVENTS	
CONFERENCE LOCATIONS	LX
PROGRAM AT A GLANCE	LXXXV

ICRA Organization

Honorary Chairs	
George Bekey, University of South	nern California
Kazuhiro Kosuge, Tohoku U	niversity
C.S. George Lee, Purdue Un	iversity
Bruno Siciliano, University	of Naples
T.J. Tarn, Washington Universi	ty, St. Louis
Sponsoring Society	
IEEE Robotics and Automation S	Society (RAS)
www.ieee-ras.org	



ICRA 2012 Organizing Committee

General Chair

Nikos Papanikolopoulos, University of Minnesota

Co-General Chairs

Henrik Christensen, Georgia Institute of Technology

Shigeki Sugano, Waseda University

Rüdiger Dillmann, The Karlsruhe Institute of Technology

Program Chair

Paul Oh, Drexel University

Co-Program Chairs

Stergios Roumeliotis, University of Minnesota

Satoshi Tadokoro, Tohoku University

Kostas Kyriakopoulos, National Technical University of Athens

Finance Chair

Venkat Krovi, University at Buffalo

Local Arrangements Chair

Volkan Isler, University of Minnesota

Registration Chair

Herbert Tanner, University of Delaware

Publications Chair

Max Meng, The Chinese University of Hong Kong

Publicity Chair

Maria Gini, University of Minnesota

Travel Awards Chair

Nilanjan Sarkar, Vanderbilt University

Workshops Chair

John M. Hollerbach, University of Utah

Tutorials Chair

John Spletzer, Lehigh University

Video Sessions Chair

Stefano Stramigioli, University of Twente

Robot Challenge Chair

Steve Cousins, Willow Garage

Exhibitions Chair

Raj Madhavan, UMD-CP/NIST

Awards Chairs

Kevin Lynch, Northwestern University

Frank Park, Seoul National University

Danica Kragic, Royal Institute of Tech (KTH)

ICRA 2012 Senior Program Committee



Paul Oh, Drexel University
John Spletzer, Lehigh University
Shigeki Sugano, Waseda University
Stergios Roumeliotis, University of Minnesota
C. S. George Lee, Purdue University
Frank Park, Seoul National University
Yuan Zheng, The Ohio State University
Vijay Kumar, University of Pennsylvania
Jaydev Desai, University of Maryland
Christian Laugier, INRIA Rhône-Alpes
Peter Allen, Columbia University
Herbert Tanner, University of Delaware
Jae-Bok Song, Korea University
Ani Hsieh, Drexel University

John Hollerbach, The University of Utah
Kevin Lynch, Northwestern University
Stefano Stramigioli, University of Twente
Venkat Krovi, University at Buffalo
T.J. Tarn, Washington University, St. Louis
Lynne Parker, The University of Tennessee
Marcus Vincze, Vienna University of Technology
Volkan Isler, University of Minnesota
Ron Alterovitz, University of North Carolina
Jana Kosecka, George Mason University
Kostas Daniilidis, University of Pennsylvania
Christopher Rasmussen, University of Delaware
Nak Young Chong, Japan Advanced Institute of Science
and Technology
MinJun Kim, Drexel University

ICRA 2012 Conference Editorial Board

Editor-in-Chief

Lynne Parker, The University of Tennessee

Editors

Hyouk Ryeol Choi, Sungkyunkwan University

Danica Kragic, Royal Institute of Technology (KTH)

Steven LaValle, University of Illinois

Spiridon Reveliotis, Georgia Institute of Technology

Gaurav Sukhatme, University of Southern California

Han Ding, Shanghai Jiao Tong University

Christian Laugier, INRIA Rhône-Alpes

Allison Okamura, The Johns Hopkins University

Nicholas Roy, Massachusetts Institute of Technology

Associate Editors

Abbeel, Pieter Abbott, Jake Adams, Martin Akesson, Knut Allen, Peter Alterovitz, Ron Althoefer, Kaspar Andersson, Sean Andrade-Cetto, Juan Antonelli, Gianluca Arras, Kai Oliver Artemiadis, Panagiotis Asada, Minoru Asano, Fumihiko Asfour, Tamim Balakrishnan, Hamsa Balkcom, Devin Bamberg, Stacy Barfoot, Timothy

Barth, Eric J.

Beetz, Michael

Bekris, Kostas E. Bennewitz, Maren Berenson, Dmitry Bergeles, Christos Berkelman, Peter Bernardino, Alexandre Birchfield, Stan Bonnifait, Philippe Bowling, Alan Bretl, Timothy Brunskill, Emma Burschka, Darius Byl, Katie Caiti, Andrea Caldwell, Darwin G. Carpin, Stefano Castellanos, Jose A. Cavusoglu, M. Cenk Chatila, Raja Chaumette, Francois

Cheah, C. C.

Chen, Weidong Chen, XiaoQi Chen, Zhiyong Cheong, Joono Chernova, Sonia Chinzei, Kiyoyuki Cho, Kyu-Jin Cho, Young-Jo Choi, Hyouk Ryeol Choi, Youngjin Chopra, Nikhil Chung, Timothy H. Chung, Woojin Correll, Nikolaus Cortes, Jorge Cortes, Juan Dai, Jian Darabi, Houshang Degani, Amir Detweiler, Carrick Devy, Michel

Dias, Jorge Dillmann, Rüdiger Dimarogonas, Dimos V.

Ding, Han Dollar, Aaron Dong, Lixin Dubey, Rajiv Edsinger, Aaron Eustice, Ryan Fabian, Martin Ferre, Manuel Fiorini, Paolo Fraichard, Thierry Frew, Eric W. Frisoli, Antonio Gans, Nicholas Garcia, Elena Gerkey, Brian Gini, Maria

Gordillo, José-Luis Gosselin, Clement Gravdahl, Jan Tommy Grisetti, Giorgio Grollman, Daniel Gross, Roderich Guglielmelli, Eugenio Hannaford, Blake Harders, Matthias Hasegawa, Yasuhisa Hashimoto, Koichi

Hauser, Kris Hirche, Sandra Hollinger, Geoffrey Hover, Franz Howard, Ayanna Hrabar, Stefan Hu, Guoqiang Hu, Zhencheng Huang, Loulin

Ibanez-Guzman, Javier

Ijspeert, Auke Isler, Volkan

Huang, Tian

Jaramillo-Botero, Andres

Jensfelt, Patric Jo, Sungho

Julier, Simon Justin Kanda, Takayuki

Kang, Sungchul Kao, Imin

Kazanzides, Peter Kheddar, Abderrahmane

Kikuuwe, Ryo Kim, Jinhyun Kim, Jongwon Kim, Sangbae Knepper, Ross A Konno, Atsushi Konyo, Masashi Koo, Ja Choon Kosecka, Jana Kragic, Danica Kress-Gazit, Hadas Krovi, Venkat

Kuchenbecker, Katherine J.

Kuffner, James Kulic, Dana

Krüger, Norbert

Kubota, Takashi

Kyriakopoulos, Kostas

Kyrki, Ville Lacroix, Simon Lamiraux, Florent Laugier, Christian LaValle, Steven M Li, Qinchuan Lien, Jyh-Ming Likhachev, Maxim Lilienthal, Achim, J. Liu, Honghai Liu, Xin-Jun Loizou, Savvas

Lopes, Manuel

Lopez-Nicolas, Gonzalo Ma, Shugen

Marchand, Eric Martinelli, Agostino Martinet, Philippe Masson, Favio Menciassi, Arianna Meng, Max Q.-H. Michael, Nathan

Milford, Michael J Minguez, Javier Misra, Sarthak Mizuuchi, Ikuo

Moll. Mark Moon, Hyungpil Morales, Antonio Morales, Marco Morimoto, Jun Morrison, James Murrieta-Cid, Rafael Nagatani, Keiji

Nashashibi, Fawzi Neira, José Nieto, Juan Nunes, Urbano Oh, Sang-Rok Okamura, Allison M.

O'Kane, Jason Oztop, Erhan Pantofaru, Caroline

Papadopoulos, Evangelos

Park, Hoon Cheol Park, Jong Hyeon Parker, Lynne Patoglu, Volkan Patton, James Pearce, Janice Peer, Angelika Peters, Jan Petersson, Lars Petrovskaya, Anna

Piater, Justus Pons, Jose Luis Poulakakis, Ioannis Pradalier, Cedric Prattichizzo, Domenico

Raczkowsky, Joerg

Ramamoorthy, Subramanian

Ramos, Fabio Reid, Ian

Rekleitis, Ioannis Reveliotis, Spiridon Rives, Patrick Riviere, Cameron Roberts, Jonathan Robuffo Giordano, Paolo

Rocco, Paolo

Roszkowska, Elzbieta

Roy, Nicholas Rusu, Radu Bogdan Rybski, Paul E.

Ryu, Jee-Hwan Sacone, Simona Sagues, Carlos Saitou, Kazuhiro Saranli, Uluc Saripalli, Srikanth Saxena, Ashutosh Seatzu, Carla Shah, Julie A. Shell, Dylan Sibley, Gabe Siegwart, Roland Simaan, Nabil Sitti, Metin Smith, Ryan Solis, Jorge Soueres, Philippe Sridharan, Mohan Srinivasa, Siddhartha

Stachniss, Cyrill

Stilman, Mike

Su, Chun-Yi Sugahara, Yusuke Suh, Il Hong Sukhatme, Gaurav Tedrake, Russ

Tews, Ashley Desmond

Tokhi, Osman Toussaint, Marc Trinkle, Jeff Ude, Ales Upcroft, Ben Van den Berg, Jur Vaughan, Richard Vendittelli, Marilena Vincze, Markus Vona, Marsette Voyles, Richard Wang, Danwei Wang, Hesheng Wolf, Denis Fernando

Xiao, Jing

Xie, Xiaolan Xiong, Zhenhua Yagi, Yasushi Yamakita, Masaki Yang, Ming Yi, Jingang Yin, Zhouping Yoder, John David Yoshida, Eiichi Yoshida, Kazuya Zavlanos, Michael M.

Zhang, Fumin Zhang, Hong Zhang, Mingjun Zhao, Huijing Zhu, LiMin Zhu, Xiangyang Zillich, Michael

ICRA2012 Reviewers

Abadie, Joel Abaid, Nicole Abayazid, Momen Abbasnia, Pegah Abbink, David A. Abbott, Jake Abdallah, Fahed Abdallah, Muhammad Abdellatif, Mohamed Abdessemed Foudil, fod Abdi, Hamid Abdul Hafez, A. H. Abdulla, Waleed Habib Abellard, Alexandre Abelmann, Leon Abichandani, Pramod Abiko, Satoko Acevedo, José Joaquín Achanccaray, D.Ronald Achar, Supreeth Achour, Nouara Achtelik, Markus W. Achtelik, Michael C. Ackermann, Marko Acosta, Juan Camilo Adams, Martin Adli, Mehmet Arif Adluru, Nagesh Adorno, Bruno Vilhena AdouaneE, Lounis Agamennoni, Gabriel Agamennoni, Osvaldo E. Agarwal, Priyanshu Agha, Gul Aghaebrahimi Samani, Hooman Aghili, Farhad Agius, Harry Agmon, Noa Agostinho Rocha, Lucio Agrawal, Sunil Ahmad, Mohd Ridzuan Ahmadi, Mojtaba Ahn, Hyo-Sung Ahn, Jooeun Ahn, Sang Chul Ahn, SungHwan Ahrary, Alireza Aiyama, Yasumichi Ajoudani, Arash

Akanyeti, Otar Akbarimajd, Adel Akce, Abdullah Akella, Srinivas Akesson, Knut Akgun, Baris Akin, H. Levent Akiyama, Yoshitake Al Janaideh, Mohammad Al Marzouqi, Mohamed Al-Ani, Tarik Alami, Rachid Alazrai, Rami Albores, Carlos Alboul, Lyuba Albrecht, Sven Albu-Schäffer, Alin Alcazar, Javier Adolfo Aldana, Carlos Iván Alderink, Gordon Aldoma, Aitor Alempijevic, Alen Aleotti, Jacopo Alexandre dit Sandretto, Julien Alexis, Kostas Alfayad, Samer Alici, Gursel Alipour, Khalil Allen, Peter Allen, Thomas Allibert, Guillaume Alliez, Pierre Almeida, Jose Aloimonos, Yiannis Algasemi, Redwan Alterovitz, Ron Althoefer, Kaspar Althoff, Daniel Alvarez, Alberto Alvarez, José M. Alvarez-Aguirre, Alejandro Alves Neto, Armando Amato, Nancy Amigoni, Francesco Amin-Shahidi, Darya Amine, Semaan Aminzadeh, Vahid Ammi, Mehdi An, Byoungkwon

An, Su-Yong Anand, Abhishek Ananthanarayanan, Arvind Anderson, Monica Ando, Takeshi Andrade-Cetto, Juan Andreasson, Henrik Andreff, Nicolas Andreopoulos, Alexander Andrés, Kecskeméthy Ang Jr, Marcelo H Angeles, Jorge Angermann, Michael Anguelov, Dragomir Anis, Yasser H Ankarali, Mustafa Mert Annas, Jonathan Annunziata, Salvatore Antelis, Javier Antone, Matthew Antonelli, Gianluca Antoniadis, Ioannis Antoun, Sherine Aoi, Shinya Aoustin, Yannick Aoyama, Tadayoshi Arabagi, Veaceslav Aragues, Rosario Arai, Hirohiko Arai, shogo Arai, Tamio Arai, Tatsuo Arain, Bilal Ahmed Aranda, Joan Aranda, Miguel Arata, Jumpei Araujo, Helder Araujo, Jose Araújo, Rui Arbeiter, Georg Arbel, Tal Arbulu, Mario Arechavaleta, Gustavo Arena, Paolo Argall, Brenna Argyle, Matthew Arikawa, Keisuke Arimoto, Suguru Arisumi, Hitoshi Ariyur, Kartik B.

Armada, Manuel Armingol, Jose Arras, Kai Oliver Arrichiello, Filippo Arsenault, Marc Arsicault, Marc Arslan, Omur Artemiadis, Panagiotis Artigas, Jordi Arumbakkam, Arjun Årzén, Karl-Erik Asadpour, Masoud Asano, Fumihiko Asbeck, Alan Asfour, Tamim Asmar, Daniel Aswani, Anil Ataka, Manabu Atherton, J. Alan Atkeson, Christopher Attamimi, Muhammad Au, Samuel Aufrere, Romuald Aukes, Daniel Avizzano, Carlo Alberto Axelsson, Patrik Ayad, Mustafa Ayala-Ramirez, Victor Ayanian, Nora Ayaz, Yasar Aycard, Olivier Aydemir, Alper Azimi, Ali Azizi vahid, azizi vahid Azizian, Mahdi Babes-Vroman, Monica Baca, Jose Bachmann, Eric Bachrach, Abraham Bachrach, Jonathan Bachta, Wael Badino, Hernan Bae, Joonbum Bagnell, James Bahr, Alexander Bai, Congmin Bai, He Bai, Shaoping Bailey, Tim Baisch, Andrew

Boom, Bas

Bajo, Andrea Bajracharya, Max Balaguer, Benjamin Balaguer, Carlos Balakirsky, Stephen Balasubramanian, Ravi Balasuriya, Arjuna Balicki, Marcin Balkcom. Devin Ball, David Bandera, Antonio Bandyopadhyay, Tirthankar Banerjee, Amarnath Banerjee, Ashis Bang, Seokwon Baradat, Cédric Barajas, Leandro Baran, Eray A. Barber, Adam Barbera, Giovanni Barbic, Jernej Baril, Mathieu Barissi, Sasan Barnes, Michael Barrera, Alejandra Barreto, João P. Barrett, Samuel Barrientos, Antonio Barrio, Jorge Barry, Andrew J. Barry, Jennifer Barton, Kira Bartsch, Sebastian Bascetta, Luca Basile, Francesco Basilico, Nicola Basso, Brandon Baumgartner, Eric Bayro-Corrochano, Eduardo-Jose Baysal, Cabbar V. Bazin, Jean-Charles Beardsley, Paul Bebek, Ozkan Beccai, Lucia Becerra, Hector Becerra, Israel Becker, Brian C. Becker, Jan Becker, Marcelo Becker-Asano, Christian Beeson, Patrick Beevers, Kristopher Behal, Aman

Behar, Evan Behkam, Bahareh Behnke, Sven Behzadipour, Saeed Bekele, Esubalew T. Bekiroglu, Yasemin Belini. Valdinei Belkhouche, Fethi Bell, Brett Bellotto, Nicola Belta, Calin Ben Amar, Faiz Ben Amor, Heni Ben Ouezdou, Fathi Ben Sghaier, Amani Ben-Tzvi, Pinhas BenAbdelkader, Chiraz Benenson, Rodrigo Benfold, Ben Benjamin, Michael Bennis, Fouad Benvenuto, Antonella Berengueres, Jose Berenson, Dmitry Bergamasco, Massimo Bergbreiter, Sarah Bergeles, Christos Berger, Cyrille Berger, Marie-Odile Bergström, Niklas Berkelman, Peter Berlin, Matt Berman, Spring Bernabeu, Enrique J Bernardes, Mariana Costa Bernardino, Alexandre Bernhardsson, Bo Berns, Karsten Berntorp, Karl Berselli. Giovanni Bertram, Torsten Bertrand, Sylvain Bertuccelli, Luca Besada-Portas, Eva Bethel, Cindy Bevly, David Beynier, Aurelie Bezzo, Nicola Bhaskar, Harish Bhatia, Amit Bhattacharjee, Tapomayukh Bhattacharya, Sourabh Bhattacharya, Subhrajit Bi, Shusheng

Biagiotti, Luigi Bialkowski, Joshua J Bianchini, Gianni Bianco, Giovanni Bibby, Charles Biber, Peter Bibuli, Marco Bicchi, Antonio Bidaud, Philippe Bigdeli, Abbas Bigelow, Daniel Biggs, Geoffrey Bilen, Hakan Billard, Aude Binney, Jonathan Birbach, Oliver Birchfield, Stan Bird. Nathaniel Birglen, Lionel Birk, Andreas Bischof, Horst Bishop, Bradley Bistry, Hannes Biswas, Joydeep Bizdoaca, Nicu George Bjerkeng, Magnus Björkman, Mårten Blackmore, Lars Blanco, Jose-Luis Blanco, M. Dolores Blaschko, Matthew Bleuler, Hannes Blodow, Nico Bó, Antônio Padilha Lanari Bobadilla, Leonardo Bobick, Aaron Bodenmueller, Tim Boedecker, Joschka Boehler, Alexander Boel. Rene Boesecke, Robert Boettcher, Uwe Boge, Toralf Bohg, Jeannette Boley, Daniel Bonaccorso, Filippo Bonani, Michael Bone, Gary Bonev, Boyan Bonfe, Marcello Bonnabel, Silvere Bonnifait, Philippe Bonnin, Patrick Booij, Olaf

Boonvisut, Pasu Boots, Byron Bordignon, Mirko Borghesan, Gianni Borgstrom, Per Henrik Borovac, Branislav Borràs Sol, Júlia Borrmann, Dorit Borst, Christoph Bosse, Michael Bosworth, William Botelho. Silvia Botelho, Wagner Tanaka Botturi, Debora Boucher, Patrice Bouchigny, Sylvain Boularias. Abdeslam Bouri, Mohamed Bourne, David Bouthemy, Patrick Bouzgarrou, Belhassen Chedli Bowling, Alan Boxerbaum, Alexander Boyd, Jeffrey Boyer, Frédéric Boyer, Frédéric Bozma, Isil Bradley, David Bradley, David Bradski, Gary Branicky, Michael Branson, David Braun, David J. Brechtel, Sebastian Breitenmoser, Andreas Breitholtz, Claes Brener, Nicolas Brennan, Sean Breñosa, Jose Bretl, Timothy Brewer, Bambi Brewer, Reuben Brick, Timothy Briot, Sébastien Brock, Oliver Brockers, Roland Brooks, Christopher Brooks, Douglas Brostow, Gabe Brown, H. Ben Browning, Brett Brox, Thomas

Broz, Frank Bruce, James Robert Brugali, Davide Bruneau, Olivier Brunete, Alberto Brusey, James Bruyninckx, Herman Bruzzone, Luca Bry, Adam Bryson, Mitch Bu, Nan Buch, Anders Glent Buchli, Jonas Buelow, Heiko Buelthoff, Heinrich H. Buffet, Olivier Bugajska, Magdalena Bukkapatnam, Satish Bullo, Francesco Burch, Derek Burden, Samuel Burdick, Joel Burgard, Wolfram Burgner, Jessica Burguera, Antoni Burkhard, Corves Burrus, Nicolas Burschka, Darius Buschmann, Thomas Busoniu, Lucian Butail, Sachit Butler, Zack Butterfass, Jörg Butz, Martin Volker Butzke, Jonathan Buys, Koen Byl, Katie Büschges, Ansgar Byun, Doyoung Bäuml, Berthold Caballero, Fernando Cabecinhas, David Caccavale, Fabrizio Cadena Lerma, Cesar Dario Cadenat, Viviane Cai, Binghuang Cai, Yueri Caiti, Andrea Cajigas, Iahn Cakmak, Maya Calabro', Vincenzo Calado, Pedro Calafiore, Giuseppe Caldwell, Darwin G.

Caldwell, Timothy Calinon, Sylvain Callegari, Massimo Calway, Andrew Camarillo, David B. Cameron, Stephen Campbell, Jason Campbell, Mark Campion, Gianni Campolo, Domenico Campos, Mario Montenegro Chakraborty, Nilanjan Campos Delgado, Daniel Ulises Campoy, Pascual Candido, Salvatore Cangelosi, Angelo Cannata, Giorgio Cannella, Ferdinando Cao, Yi Cao, Yongcan Cao, Zhengcai Capantini, Lorenza Cappelle, Cindy Cappelleri, David Caprari, Gilles Caputo, Barbara Carballo, Alexander Carbone, Giuseppe Carfang, Anthony Carignan, Craig Carloni, Raffaella Carlson, Tom Carnegie, Dale Anthony Carneiro, Gustavo Caro, Stéphane Caron, Guillaume Carpaneto, Jacopo Carpin, Stefano Carreras, Marc Carrozza, Maria Chiara Casadio, Maura Casalino, Giuseppe Casals, Alicia Caselli, Stefano Cassinis, Riccardo Castillo, Pedro Castrillón, Modesto Catalano, Manuel Caurin, Glauco Augusto de Paula Cavallo, Giuseppe Cavanough, Gary Cazorla, Miguel Cederborg, Thomas

Celebi, M. Emre Celik, Ozkan Celikkanat, Hande Censi, Andrea Cervera, Enric Cha, Kyoungrae Chablat, Damien Chaib-draa, Brahim Chaillet, Nicolas Chaimowicz, Luiz Chakravorty, Suman Chaminade, Thierry Chan, Ambrose Chang, Dongsik Chang, H. Jacky Chang, Lillian Chang, Pyung Hun Chang, Yung-Jung Chao, Crystal Chapuis, Roland Chardonnet, Jean-Remy Charpillet, Francois Charpillet, François Chateau, Thierry Chatzigeorgiou, Dimitris Chaumette, Francois Checchin, Paul Checchin. Paul Chellali, ryad Chemori, Ahmed Chen, Bor-rong Chen, Diansheng Chen, Fang Chen, Fei Chen, Haoyao Chen, Heping Chen, I-Ming Chen, Jian Chen, Jun Chen, Liguo Chen, Pei Chen, Qijun Chen, Shih-Feng Chen, Weidong Chen, Weihai Chen, Wenhua Chen, Wenjie Chen, Xiang Chen, XiaoQi Chen, Yongquan Chen, Zhaopeng Chen, Zheng Chen, Zhiyong

Cheng, Chi-Cheng Cheng, Harry Cheong, Joono Cherfaoui, Véronique Cherubini, Andrea Chesi, Graziano Cheung, Allen Chevallereau, Christine Chew, Chee Meng Chiang, Luciano Chiaverini, Stefano Chinello, Francesco Chirikjian, Gregory Chitsaz, Hamidreza Chitta, Sachin Chiu, George Chiu, Han-Pang Chli, Margarita Cho, Baek-Kyu Cho, Changhyun Cho, Hye-Kyung Cho, Jang Ho Cho, Young-Jo Choi, Changhyun Choi, Changrak Choi, Dongil Choi, Han-Lim Choi, Hee-Byoung Choi. Jaesoon Choi, Jinwoo Choi, Jongeun Choi, Jongsuk Choi, Junho Choi, Seungmoon Choi, Youngjin Chopra, Nikhil Choset, Howie Choti, Michael Choukroun, Daniel Christensen, Anders Lyhne Christensen, Henrik Iskov Chugo, Daisuke Chung, Jaeheon Chung, Mike Chung, Soon-Jo Chung, Timothy H. Chung, Wan Kyun Chung, Wing Kwong Chung, Woojin Churchill, Winston Cianchetti. Matteo Ciaravella, Gaetano Ciocarlie, Matei Cipriani, Christian

Civera, Javier Claes, Daniel Clark, Christopher M. Clark, Jonathan Clavel, Reymond Clayton, Garrett Cleghorn, William L. Clerentin, Arnaud Clévy, Cédric Coates, Adam Cobzas, Dana Codol, Jean-Marie Cohen, Benjamin Coimbra, A. Paulo Colas, Francis Coleman, Sonya Colla, Valentina Colledani, Frédéric Collet, Alvaro Collewet, Christophe Collier, Jack Colorado, Julian Colton, Mark Company, Olivier Comparetti, Mirko Daniele Comport, Andrew Ian Conceição, André G. S. Conconi, Michele Cong, Yang Conner, David Connette, Christian Pascal Contreras-Vidal, Jose Luis Controzzi, Marco Cooke, Nancy Cooney, Martin D. Coradeschi, Silvia Cordella, Francesca Corke, Peter Corominas Murtra, Andreu Coros, Stelian Corso, Jason Cortesao, Rui Costa, Anna H. R. Cotton, Sebastien Couceiro, Micael Courreges, Fabien Coursey, Kino Courteille, Eric Courtial, Estelle Cowan, Noah J. Cowley, Anthony

Crandall, Jacob

Crespi, Alessandro

Crick, Christopher

Crisostomi, Emanuele Croft, Elizabeth Crosnier, André Cui, Jinshi Cui, Lei Cui, Rongxin Cui. Yanzhe Cummins, Mark Joseph Cunningham, Alexander Curtis, Sean Cutkosky, Mark Cutti, Andrea Giovanni Dahiya, Ravinder S. Dahl, Torbjorn Dai, Jian Dalamagkidis, Konstantinos Dalibard, Sebastien Dalley, Skyler Daly, John Michael Dame, Amaury Dang, Hao Dani, Ashwin Daniali, Hamid Daniel. Christian Daniilidis, Kostas Dantam, Neil Dantu, Karthik Darbha, Swaroop Dariush, Behzad Darzi, Ara Das, Aditya Das, Aveek Das, Jnaneshwar Dautenhahn, Kerstin David, Pynadath Davis, Steven Davison, Andrew J Davoine, Franck De Almeida, Anibal De la Torre. Fernando De Luca, Alessandro De Mathelin, Michel De Menezes Pereira, Arvind A. De Momi, Elena

De Nijs, Roderick

De Schutter, Joris

De Silva, Lavindra

Degroote, Arnaud

Deguchi, Koichiro

Dehghan, Ehsan

Debenest, Paulo

Maria

De Rossi, Stefano Marco

Deisenroth, Marc Peter Del Vecchio. Domitilla Delahoche, Laurent Dellaert, Frank Dellen, Babette Demeester, Eric Demetz. Oliver Demircan, Emel Demiris, Yiannis Demiroglu, Cenk Denny, Jory Denzler, Joachim Derbakova, Anna Derenick, Jason Dertien, Edwin Desai, Jaydev P. Deschaud, Jean-Emmanuel Deshpande, Ashish DeSouza, Guilherme Detry, Renaud Devasia, Santosh Devy, Michel Dewanto, Vektor Deyle, Travis Di Palma, Federico Di Paola, Donato Diamanti, Olga Diao, Xiumin Dias. Jorge Dias, M. Bernardine Diaz. James Diftler, Myron Dille, Michael Diller, Eric D. Dillmann, Rüdiger DiMaio, Simon P. Dimarogonas, Dimos V. Dimitoglou, George Dimitrov, Dimitar Nikolaev Ding, HuaFeng Ding, Jerry Ding, Liang Ding, Ming Ding, Xilun Ding, Xu Chu Dinh, Thang Diosi, Albert Dissanayake, Gamini Distante, Arcangelo Dixon, Michael Dixon. Warren Djapic, Vladimir Djoudi, Dalila

Djugash, Joseph

Do, Martin Dobrokhodov, Vladimir Dobson, Andrew Dogar, Mehmet Remzi Doh, Nakju Doi, Miwako Doitsidis. Lefteris Dolan, John M. Dolgov, Dmitri Dombre, Etienne Dominey, Peter Ford Dong, Hao Dong, Shuonan Dong, Wei Dong, Wenjie Dong, Yongkun Dong, Zhuxin Doniec, Marek Donlin, Regina Kathleen Donzé, Alexandre Dopfer, Andreas Dornaika, Fadi Doshi, Prashant Dotoli, Mariagrazia Douillard, Bertrand Doulgeri, Zoe Dragan, Anca Drenner, Andrew Drew, Benjamin Drews Jr, Paulo Droeschel, David Drumwright, Evan Druon, Sebastien Dryanovski, Ivan Du, Jingli Du, Zhijiang Du Toit, Noel E. Duan, Feng Dubey, Venketesh Duchaine, Vincent Duckett, Tom Dudek, Gregory Duff, Elliot Dunbabin, Matthew David Dune, Claire Durfee. Ed Durham, Joseph W. Durrie, Jason Duschau-Wicke, Alexander Duvallet, Felix Dzul, Alejandro Earon, Ernest J. P.

Echigo, Tomio

Edan, Yael

Edlund, Jeffrey Effinger, Robert Egerstedt, Magnus Eichhorn, Volkmar Eielsen, Arnfinn Aas Ek, Carl Henrik Ekeberg, Örjan El Hamzaoui, Oussama El Homsi, Salim El Khoury, Antonio Elara, Mohan Rajesh Elbassioni, Khaled Elfes, Alberto Elhawary, Haytham Elinas, Pantelis Ellekilde, Lars-Peter Elnagar, Ashraf Elseberg, Jan Elwin, Matthew Emami, M. Reza Emaru, Takanori Endo, Gen Englot, Brendan Enquobahrie, andinet Egtami, Alina M. Erbatur, Kemalettin Erdogan, Ahmetcan Erdogan, Gurkan Eren, Tolga Erez, Tom Erickson, Lawrence H Erinc, Gorkem Erkmen, Aydan Erkmen, Ismet Erol Barkana, Duygun Escande, Adrien Esden-Tempski, Piotr Espiau, Bernard Esteves, Claudia Estrada. Carlos Evans, Mathew Even, Jani Evrard, Paul Fabri, Simon G. Fagiolini, Adriano Fahimi, Farbod Faigl, Jan Fainekos, Georgios Fairfield, Nathaniel Fakhari, Amin Falconi, Riccardo Fallon, Maurice Falotico, Egidio Falquez, Juan

Fan, Zheng Fan, Zhun Fanti, Maria Pia Fantoni, Isabelle Farinelli, Alessandro Farkhatdinov, Ildar Farritor, Shane Fatikow, Sergej Fazli, Pooyan Fearing, Ronald Featherstone, Roy Fedder, Gary K. Federspil, Philipp A Fei, Yan-Qiong Felekis, Dimitrios Felfoul, Ouajdi Fenelon, Michael Angelo Amith Feng, Lin Ferguson, Dave Fernandes, Leandro Carlos Fernandes Martins, Murilo Fernandez-Lopez, Gerardo Fernandez-Madrigal, Juan-Antonio Ferrari, Vincenzo Ferré, Etienne Ferreira, Antoine Ferreira, Fausto Ferreira, João Ferreira, João Filipe Ferreira, Ricardo Ferrer, Gonzalo Ferretti, Gianni Ferrier, Nicola Ferrigno, Giancarlo Ferrin, Jeffrey Ferris, Daniel Fiala, Mark Fiazza, Maria-Camilla Fichtinger, Gabor Ficuciello, Fanny Fierro, Rafael Filippidis, Ioannis Fillatreau, Philippe Filliat, David Fink, Jonathan Finucane, Cameron Fischer, Gregory Scott Fischer, Markus Fischer, Nic Fischer, Peer

Fisher, John W.

Fitch, Robert

Fjerdingen, Sigurd Aksnes Flacco, Fabrizio Flagg, Anna Flash, Tamar Flavigné, David Fleming, Andrew J. Fletcher, Luke Flint, Alex Florescu, Mihaela Cecilia Fofi, David Fogel, Efi Foix, Sergi Foka, Amalia Folkesson, John Follador, Maurizio Fontana, Marco Forbes, James Richard Formica. Domenico Forner-Cordero, Arturo Forssen, Per-Erik Foskey, Mark Fossati, Andrea Foster, Mary Ellen Fotouhi, Reza Fourquet, Jean-Yves Fox, Charles Frahm, Jan-Michael Fraisse, Philippe Franceschelli, Mauro Franch, Jaume Franchi, Antonio Frank, Barbara Frank, Heinz Frank, Jordan Frank Bolton, Pablo Fraundorfer, Friedrich Frazzoli, Emilio Freidovich, Leonid Freitas, Gustavo Freitas Jr., Robert A. Fremont, Vincent Frew, Eric W. Fried, Georges Frisoli, Antonio Frisoli, Antonio Fritz, Mario From, Pål Johan Frommberger, Lutz Frontoni, Emanuele Fruchard, Matthieu Fränti. Pasi Fröhlich, Florian Alexander Fu, Chenglong Fu, Li-Chen

Fu, Michael J. Fu. Xiao-Yu Fua, Pascal Fuchiwaki, Ohmi Fuchs, Thomas Fujie, Masakatsu G. Fuilmoto, Hideo Fujimoto, Yasutaka Fujiwara, Kiyoshi Fukai, Hironobu Fukao, Takanori Fukuda, Toshio Fukui. Rui Fukuma, Takeshi Fukuoka, Yasuhiro Fumagalli, Matteo Funakoshi, Kotaro Funase. Rvu Furgale, Paul Timothy Gabel, Thomas Gabiccini, Marco Gaiser, Immanuel Galambos, Péter Galiana, Ignacio Gallagher, Garratt Gallego, Juan Alvaro Galvan, Stefano Galvez Lopez, Dorian Gams, Andrej Gan, Dongming Gan, Seng Keat Gangloff, Jacques Gans, Nicholas Gao, Bingtuan Gao, Haibo Gao, Peng Gao, Zhan Garcia, Elena Garcia, Germain Garcia, Nicolas Garcia, Rafael Garcia Hernandez, Nadia Vanessa Garcia-Morales, Isabel Garcia-Vega, Virginia Angelica Garulli, Andrea Gas, Bruno Gaspar, Jose Gasparini, Simone Gasparri, Andrea Gauthier, Michael Gautier, Maxime

Gavrilova, Marina

Hashimoto, Kenji

Gayle, Russell Gazi, Veysel Ge, Shuzhi Sam Ge, Yunjian Gedikli, Suat Gee, Andrew Gehrig, Dirk Geib, Christopher Geiger, Andreas Geraerts, Roland Geyer, Christopher Geyer, Hartmut Ghaffari Toiserkan, Kamran Gharpure, Chaitanya Gherardi, Luca Ghidoni, Stefano Ghorbani, Reza Ghose. Debasish Ghrist, Robert Giampaolo, Conte Gielniak, Michael Joseph Gienger, Michael Giglio, Davide Giguere, Philippe Gil, Jorge Juan Gil, Stephanie Gillespie, Brent Gillet, Denis Gillula, Jeremy Gimenez, Antonio Gini, Giuseppina Gini, Maria Giralt, Xavier Girdhar, Yogesh Girgin, Sertan Gitlin, Richard Glas, Dylan F. Glover, Arren Gnemmi, Alberto Gning, El Hadji Amadou Gobbalipur Ranganath, Javanth Goedeme, Toon Gofuku, Akio Goldberg, Ken Goldenberg, Andrew Goldman, Roger E. Gonçalves, Eder M. Goncalves, Nelson

Gonzalez, David

Gonzalez, Felipe

Gonzalez, Javier

Gonzalez, Juan Pablo

Gonzalez de Santos, Pablo

Gonzalez Villagomez, Jesus Gonzalez-Galvan, Emilio J. Goo, Nam Seo Goodin, Chris Goodwine, Bill Gorb, Stanislav N Gorman, Jason Gosline, Andrew Gosselin, Clement Gosselin, Frederick P. Goswami, Ambarish Gouaillier, David Gould, Stephen Goulette, François Gouttefarde, Marc Gowal, Sven Grabe, Volker Grady. Devin Graham, Rishi Grainger, Steven Grand, Christophe Granström, Karl Grant, Edward Grassi Junior, Valdir Gray, Steven Gregg, Robert D. Greggio, Nicola Greytak, Matthew Gribovskaya, Elena Gribovskiy, Alexey Griffin, Brent Austin Griffiths, Paul Griffiths, Sascha Grimes, Matthew Koichi Grindle, Garrett Grizzle, J.W Groeger, Martin Groff, Richard Grollman, Daniel Grosch, Patrick Gross, Horst-Michael Grossmann, Etienne Groten, Raphaela Grothues, Thomas Grupen, Rod Gruyer, Dominique Grzes, Marek Grzonka, Slawomir Gräser, Axel Gu, Hong Gu, Jason Guan, Yisheng Guarnieri, Michele

Guerreiro, Bruno J. N.

Guerrero, J.J. Guiochet, Jeremie Guivant, Jose Guizilini, Vitor Gunes, Hatice Guo, Chunzhao Guo. Feng Guo, Meng Guo, Shuxiang Guo, Yi Gupta, Kamal Gupta, Megha Gupta, Nikhil Gupta, Satyandra K. Guralnik, Dan Gustafson, Joakim Gustafsson, Fredrik Gutmann, Jens-Steffen Guy, Stephen J. Gyan, Philippe Haar, Stefan Hachiya, Hirotaka Haddadin, Sami Hadsell, Raia Haffele, Celina Hafner, Verena Vanessa Hager, Gregory Hagita, Norihiro Hamel. Tarek Hammer, Patrick Hammer, Peter Hammond III, Frank L. Han, Chang-Soo Han, Jeakweon Han, Jianda Han, Jonghui Han, Kyung Min Han, Li Han, Long Hanazawa, Yuta Handroos, Heikki Hanheide, Marc Hansen, Peter Hao, Lina Harada, Kensuke Harada, Tatsuya Harata, Yuji Harkins, Richard Harrison, Alastair Hart, Stephen Hartley, Richard Haschke, Robert Hasegawa, Osamu

Hasegawa, Yasuhisa

Haslinger, Robert Hatakeyama, Shoshiro Hatton, Ross Hauert, Sabine Hauser, Kris Havlena, Michal Havoutis, Ioannis Hawasly, Majd Hayet, Jean-Bernard Haynes, Galen Clark Hayward, Vincent He. Hu Hebert, martial Hebert, Paul Heger, Frederik W. Hehn, Markus Heidarsson, Hordur K Heidrich-Meisner, Verena Heinen, Milton Hemachandra, Sachithra Madhawa Hemakumara, Madu Prasad Hendrich, Norman Hennes, Daniel Henrich, Dominik Henry, Peter Herbst, Evan Herder, Just Herdt, Andrei Herisse, Bruno Hermans, Tucker Herranz, Luis Hershberger, Dave Hertkorn, Katharina Hertzberg, Christoph Hesch, Joel Hesselbach, Juergen Hester, Todd Heuer, Herbert Heyneman, Barrett Higashi, Toshimitsu Higashimori, Mitsuru Hill, Andrew John Hillier, Nick Hilsenstein, Volker Hines, Lindsey Hirai, Shinichi Hirata, Yasuhisa Hirose, Toshinori Hirschmüller, Heiko Hirzinger, Gerd Ho, Van Hoburg, Warren

Hodoshima, Ryuichi Hoeppner, Hannes Hoffman, Judy Hoffmann, Frank Hoffmann, Gabriel Hofmann, Andreas Hogan, Neville Hogue, Andrew Hoinville, Thierry Holgate, Matthew Holl, Mark R. Hollerbach, John Hollinger, Geoffrey Hollis, Ralph Holm, Jonathan K. Holz, Dirk Holzer, Stefan Hong, SeongHun Hong, Tsai Hoover, Aaron Horan, Ben Horiguchi, Yukio Hornung, Armin Hosoda, Koh Hover, Franz Hovland, Geir How, Jonathan Howard, Tom Howe, Robert D. Howell, Larry L. Hsiao, Kaijen Hsieh, M. Ani Hsu, David Hsu, Jjohn Hu, Bin Hu, Chao Hu, Hesuan Hu, Huosheng Hu, Jwu-Sheng Hu, Wengi Hu, Xiaoming Huaman, Ana Huang, Albert S. Huang, Chih-Fang Huang, Chintien Huang, Han-Pang Huang, Haomiao Huang, Jian Huang, Ke Huang, Qiang Huang, Shoudong Huang, Tian Huang, Weiwei Huang, Wes

Huang, Yanan Huang, Yazhou Huang, Yihua Huber, Daniel Huebner, Kai Huerta, Ivan Hugel, Vincent Hulin, Thomas Humbert, James Sean Hung, Calvin Hunt, Andres Huntsberger, Terry Hurst, Jonathan Hussain, Moazzam Hutchinson, Seth Hutter, Marco Huynh, Van Huynh, Vu Anh Hwang, Gilgueng Hwang, Inseok Hwang, Jung-Hoon Hyodo, Kazuyuki Hyon, Sang-Ho Hypki, Alfred Hyun, Baro Hyun, MyungOok Hyyti, Heikki Sakari Hörnstein, Jonas lagnemma, Karl Ibanez-Guzman, Javier Ichim, Alexandru-Eugen Iida, Fumiya lizuka, Kojiro lispeert, Auke Ikemata, Yoshito Ila, Viorela Ilhan, Berkay Deniz Ilies, Horea Ilonen, Jarmo Inamura. Tetsunari Ince, Gokhan Infantes, Guillaume Ingrand, Francois Felix Inoue, Kenji Inoue, Roberto S. Inoue, Takahiro locchi, Luca Iordachita, Iulian Isern-González, Josep Ishibashi, Ryota Ishida, Hiroshi Ishigami, Genya Ishiguro, Akio

Ishihara, Abraham

Ishii, Hiroyuki Ishikawa, Masato Islam, Md Nurul Isler, Volkan Itkowitz, Brandon Ito, kazuyuki Ito, Satoshi Iturrate, Iñaki Ivanescu, Mircea Iwahashi, Naoto Iwai, Yoshio Iwase, Masami Iwashita, Yumi Iwatani, Yasushi Iyengar, Sitharama S Jafari, Amir Jafari, Rouhollah Jagersand, Martin Jaillet, Leonard Jain, Abhinandan Jain, Advait Jain, Dominik Jakubiak, Janusz Janabi-Sharifi, Farrokh Janiak, Mariusz Janot, Alexandre Jardon Huete, Alberto Jarvis, Raymond Austin Jasiobedzki, Piotr Jaulin, Luc Jeanpierre, Laurent Jenkin, Michael Jensen, Elizabeth Jensfelt, Patric Jentoft, Leif P. Jeon, Jeong hwan Jeong, Hyunhwan Jeong, Jay Jeong, Mun-Ho Jesus, Tales Jetchev, Nikolay Ji, Sang Hoon Jia, Yan-Bin Jian, Ping Jiang, Guangying Jiang, Yong Jiang, Yun Jiang, Zhaoliang Jiang, Zhe Jiménez, Pablo Jin, Jiyong Jin, Tao Jin, Yaochu Johannsson, Hordur

Johansson, Rolf Johnson, Aaron Johnson, David Johnson, David Johnson, Miles Joho, Dominik Jones, Bryan Jones, Edward Gil Jonker, Pieter Joseph, Joshua Joseph, Samleo L. Jouffrais, Christophe Joung, Sanghyun Ju, Zhaojie Julià, Carme Julian, Brian Jun, Jae Yun Jung, Boyoon Jung, Changbae Jung, Eui-jung Jung, Hee-Tae Jung, Min Yang Jung, Seul Jäntsch, Michael K, Sridharan Kaelbling, Leslie Kaess, Michael Kaestner, Ralf Kagami, Shingo Kajikawa, Shinya Kajita, Shuuji Kak, Avinash Kalakrishnan, Mrinal Kalkan, Sinan Kallio, Pasi Johannes Kallmann, Marcelo Kalmar-Nagy, Tamas Kamamichi, Norihiro Kamarainen, Joni-Kristian Kamegawa, Tetsushi Kamgarpour, Maryam Kaminaga, Hiroshi Kammel, Sören Kamnik, Roman Kamper, Derek Kanakia, Anshul Kanehiro, Fumio Kaneko, Makoto Kang, Hongwen Kang, Sang Hoon Kang, Taesam Kano, Takeshi Kanoun, Oussama Kantor, George

Kapadia, Apoorva Karaman, Sertac Karayiannidis, Yiannis Karimadini, Mohammad Karnad, Nikhil Karras, George Karumanchi, Sisir Katayama, Yasuhiro Katic, Dusko Katsiaris, Pantelis Katz, Dov Katz, Roman Kavraki, Lydia Kawahara, Tomohiro Kawamoto, Junji Kawamura, Atsuo Kawamura, Sadao Kawasaki. Haruhisa Kawasaki, Hiroshi Kawashima, Kenji Kawewong, Aram Kazakidi, Asimina Kazemi. Moslem Kearney, Michael Keith, François Keller, Thierry Kelly, Jonathan Kelouwani, Sousso Kemper, Kevin Kendoul, Farid Kenyon, Robert Kernbach, Serge Kesner, Samuel B. Khansari-Zadeh, Seyed Mohammad Khorasani, Khashayar Khwaja, Asim Kiguchi, Kazuo Kikuchi, Koki Kikuchi, Takehito Killpack, Marc Kim, Bong Keun Kim, Byeong-Sang Kim, Chang Young Kim, ChangHwan Kim, Doik Kim, Donghyeon Kim, Gon-Woo Kim, H. Jin Kim, Hong Seok Kim. Hwa Soo Kim, Hyoung-Rock Kim, Hyun-Jung Kim, Jinhyun

Kim, Jiwoong Kim, Jong-Hoon Kim, Jong-Hwan Kim, Jong-Wook Kim, Jonghoek Kim, Jonghyuk Kim. Jung Kim, Kangjin Kim, Keehoon Kim, Kwang Kim, MinJun Kim, Soohwan Kim. Whee Kuk Kim, Yeon-Ho Kim, Young J. Kim, Young-Suk Kimball, Peter Kimmel, Andrew Kimura, Hiroshi Kimura, Shinichi King, H. Hawkeye Kingston, Peter Kino, Hitoshi Kinsey, James Kinugasa, Tetsuya Kirby, Brian Kirchner, Frank Kirsch, Alexandra Kita. Kahori Kjellstrom, Hedvig Klank, Ulrich Klaptocz, Adam Kleeman, Lindsay Klein, Georg Klein, Julius Kleiner, Alexander Klesh, Andrew Klimentjew, Denis Klingbeil, Ellen Klodmann, Julian Kloetzer, Marius Klotzbuecher, Markus Kneip, Laurent Knepper, Ross A Knoll, Alois Knox, W. Bradley Kobayashi, Etsuko Kobayashi, Hiroaki Kobayashi, Jun Kobayashi, Ryo Kobayashi, Yo Kober, Jens Kobilarov, Marin Kobilarov, Marin

Kodagoda, Sarath Koenig, Nathan Koganezawa, Koichi Koizumi, Norihiro Kojima, Fumio Kojima, Masaru Koku, Bugra Kollar, Thomas Kolling, Andreas Kolsch, Mathias Kolter, J. Zico Komma, Philippe Komoriya, Kiyoshi Komura, Taku Kondo, Hideki Kondo, Kazuaki Konidaris, George Dimitri Konietschke, Rainer Konolige, Kurt Kontolatis, Ioannis Koo, Ja Choon Kootstra, Gert Koppula, Hema Swetha Kormushev, Petar Korrapati, Hemanth Kortsmit, Jeroen Kosa, Gabor Kosecka, Jana Koseki. Yoshihiko Kosuge, Kazuhiro Kotosaka, Shinya Kottege, Navinda Kouskoulas, Yanni Kovac, Mirko Kovacs, Gabor Kovecses, Jozsef Koziol, Scott Kozlowski, Krzysztof R. Kraft, Dirk Kragic, Danica Krainin, Michael Kratochvil, Bradley Krichmar, Jeffrey Krishna, Madhava Kristan, Matej Kroeger, Torsten Kroemer, Oliver Krohs, Florian Kronander, Klas Krontiris, Athanasios Krovi. Venkat Krueger, Volker Krug, Robert Krupa, Alexandre

Krut, Sebastien Kruusmaa, Maarja Krüger, Norbert Kubus, Daniel Kucukyilmaz, Ayse Kudoh, Shunsuke Kuehnlenz, Kolia Kuemmerle, Rainer Kuffner, James Kuhn, Juliane Kuindersma, Scott Kuipers, Benjamin Kulchenko, Paul Kulic, Dana Kumagai, Masaaki Kumar, Rajesh Kumar, Vijay Kummert. Franz Kunii, Yasuharu Kunz, Clayton Kunz, Tobias Kunze, Lars Kurabayashi, Daisuke Kuratate, Takaaki Kurazume, Ryo Kurita, Yuichi Kurniawati, Hanna Kurokawa, Haruhisa Kushlevev. Aleksandr Kuwata, Yoshiaki Kwartowitz, David Kweon, In So Kwon, Dong-Soo Kwon, Hyunki Kwon, SangJoo Kwon, Tae-Bum Kühnlenz, Kolja Kyriacou, Theocharis Kyriakopoulos, Kostas Kyrki, Ville La, Hung Labonte, Daniel Lacevic, Bakir Lacroix, Simon Ladický, Lubor Laffranchi, Matteo Lahijanian, Morteza Lahr, Derek Lai, Chun C. Lai, Kevin Lakaemper, Rolf Lakemeyer, Gerhard Lakemond, Ruan

Laksanacharoen, Pudit (Sathaporn) Lalonde, Jean-Francois Lam, Siew Kei Lam, Tin Lun Lambert, Alain Lambert, Pierre Lamon, Pierre Lampariello, Roberto Lan, Chao-Chieh Lanz, Oswald Larlus, Diane Larson, Amy Larsson, Thomas Laschi, Cecilia Lau, Boris Lau, Manfred Lau. Nuno Lau, Tak Kit Lauer, Martin Lauffenburger, Jean-Philippe Leite, Antonio C. Laugier, Christian Laumond, Jean-Paul Laurel, Benjamin Lauzier, Nicolas Lawitzky, Andreas Lawitzky, Martin Lawrence, Dale Lazaro, Maria Teresa Lazewatsky, Daniel Le, Quoc Le Marchand, Olivier Le Ny, Jerome Lebesnerais, Guy Leblebicioglu, Kemal LeCun, Yann Lee, Beom-Hee Lee, Bryce Lee, C. S. George Lee, Chil-Woo Lee, Choon-Young Lee, Daniel D. Lee, Dongheui Lee, Dongjun Lee, Doo Yong

Lee, Hyoung-Ki

Lee, Hyunsuk

Lee, Jae Hoon

Lee, Jeihun

Lee, Jihong

Lee, Jongwon Lee, Joon-Yong

Lee, Ju-Jang

Lee, Jangmyung

Lee, Kiju Lee, Kwang Wee Lee, Kyoungmin Lee, Minhyung Lee, Sangyoon Lee, Se-Jin Lee, seung-ik Lee, Sooyong Lee, Sukhan Lee, Sung-Hee Lee, Suwoong Lee, Tae-Eog Lee, Woosub Lefaudeux, Benjamin Lefeber, Dirk Legnani, Giovanni Lehman, Amy C. Lehnert, Christopher Leibe, Bastian Leishman, Alexander Lemaignan, Séverin Lenaghan, Scott Lengagne, Sebastien Lennartson, Bengt Lenz, lan Lenzo, Basilio Leonard, John Leonard, Simon Leonetti, Matteo Lerasle, Frederic Lermusiaux, Pierre F.J. Lesire, Charles Levihn, Martin Levine, Daniel S Lewis, Jeremy Lewis, Michael Lhuillier, Maxime Li, Baopu Li, Bin Li, Hao Li, Hongyi Li, Howard Li, Jianmin Li, Lin Li, Ming Li, Ming Li, Peng Li, Qinchuan Li, Shigang Li, Tiemin

Li, Tsai-Yen

Li, Wai Ho

Li, Wei

Li, Weifeng Li, Wen Li, Xiang Li, Xiang Li, Xiaobo Li, Y.F. Li, Yanbo Li, Yangmin Li, Yaoyu Li, Yonggang Li, Yuanping Li, Yuwen Li, Zhenning Liarokapis, Minas Liaw, Hwee Choo Liemhetcharat, Somchaya Lien, Jyh-Ming Lightcap, Chris Lilienthal, Achim, J. Liljebäck, Pål Lim, Bokman Lim, Gi Hyun Lim, Hun-ok Lima, Pedro Lin, Hai Lin, Pei-Chun Lin, Wei Lin, Yun Lin, Zhiyun Linderoth, Magnus Lindhé, Magnus Lindsey, Quentin Lindzey, Laura Lippi, Vittorio Lippiello, Vincenzo Lister, Kevin Listmann, Kim Daniel Little, James J. Littlefield, Zakary Litus, Yaroslav Liu, Bingbing Liu, Caishan Liu, Changchun Liu, Chao Liu, Chengju Liu, Guangjun Liu, Hong Liu, Hong Liu, Hongbin Liu, Honghai Liu, Hugh H.T. Liu, Jindong Liu, Jing-Sin Liu, Jingen

Liu, Jingtai Liu, Jinguo Liu, Lantao Liu, Ming Liu, Ming-Yu Liu, Ronggiang Liu, Shih-Yuan Liu, Xin-Jun Liu, Xinyu Liu, Yang Liu, Yen-Chen Liu, Yong Liu, Yonghuai Liu, Yunhui Livingston, Scott Lizarralde, Fernando Llarena, Adalberto Lobo, Jorge Loc, Vo-Gia Lodi Rizzini, Dario Loeb, Gerald Loizou, Savvas Long, Xiaolin Lopes, Gabriel Lopes, Manuel López-Franco, Carlos Alberto Lopez-Nicolas, Gonzalo Lopez-Padilla, Rigoberto Lou, Yunjiang Low, K. H. Low, Tobias Daniel Lowe, David Lozano-Perez, Tomas Lu, David V. Lu, Yanyan Lu, Yi Luber, Matthias Lubrano, Emanuele Lucas. Charles Lueth, Tim C. Luo, Dingsheng Luo, Fayi Lupashin, Sergei Lutz, Philippe Lutz, Philippe Lynch, Kevin Lyon, Caroline Lyons, Daniel Lyu, Siwei Lösch, Martin Ma, Jeremy Ma, Lili Ma, Ou

Migliore, Davide

Ma, Shugen Ma, Xianghong MacDonald, Bruce Machado, Luis Macharet, Douglas Guimarães Maciejewski, Anthony A. Maddern, William Maeda, Guilherme Jorge Maeda, Yusuke Magnenat, Stéphane Magnusson, Martin Mahdizadeh, Amin Mahmud, Hassan Mahony, Robert Mahvash, Mohsen Maier, Daniel Mair. Elmar Maire, Frederic Maitin-Shepard, Jeremy Majdik, Andras Majoe, Dennis Majumdar, Anirudha Majumder, S Majure, Lydia Maki, Kevin Maldonado, Alexis Malek, Lukasz Malhotra, Mark Malmirchegini, Mehrzad Malvezzi, Monica Malysz, Pawel Manchester, Ian Mandel, Christian Mann, George K. I. Manocha, Dinesh Manolakis, Dimitris Manoonpong, Poramate Mansley, Chris Mao, Zhi-Hong Marani, Giacomo Marantos, Panos Marble, James Marchand, Eric Marconi, Lorenzo Marder-Eppstein, Eitan Marfil, Rebeca Marhamati, Nina Marin, Raul Marin-Hernandez, Antonio Marin-Jimenez, Manuel J. Marinakis, Dimitri Marino, Alessandro Mariottini, Gian Luca

Markdahl, Johan Markelic, Irene Marques, Jorge S. Marques, Lino Marra, Steven Marshall, Joshua A. Martel, Sylvain Marthi, Bhaskara Martin, Patrick Martin, Philippe Martin, Steven Colin Martinelli, Francesco Martinez, Jorge L. Martinez, Sonia Martinez Mozos, Oscar Martinez Salazar, Harold Roberto Martinez-Cantin, Ruben Martinez-Carranza, Jose Martinez-Gomez, Jesus Martínez-Otzeta, José María Martínez-Rosas, Juan C. Martins, Ricardo Marton, Zoltan-Csaba Maruyama, Hisataka Masamune, Ken Mashimo, Tomoaki Masia, Lorenzo Mason, Julian Masone, Carlo Masory, Oren Masoud, Ahmad A. Mastrogiovanni, Fulvio Masuda, Taisuke Matabosch, Carles Mather, T, William Mathis, Frank Matos, Vítor Matsubara, Takamitsu Matsuhira, Nobuto Matsuno, Takayuki Matsuura, Daisuke Matteo Zoppi, zoppi Matthews, lain Matuszek, Cynthia Maufroy, Christophe Maus, Horst Moritz Mavroidis, Constantinos Maxon, Sean May, Stefan Maycock, Jonathan Maye, Jerome Mayer, Christoph Mayol, Walterio

Maza, Ivan Mazurek, Gustaw Mazza, Edoardo Mazzolai, Barbara McCarthy, Chris McDermott, Erik McGinnity, Martin McInroy, John McIsaac, Ken McKee, Gerard McKinnon, David McLurkin, James McManus, Colin Medeiros, Adelardo Medina Ayala, Ana Ivonne Medrano-Cerda, Gustavo Meeussen, Wim Meger, David Paul Meghjani, Malika Mei, Christopher Mei, Deqing Mei, Jiangping Mei, Tao Meier, Franziska Meier, Lorenz Mejias, Luis Mekonnen, Alhayat Ali Melchiorri, Claudio Mellinger, Daniel Menciassi, Arianna Mendoza Garcia, Ricardo Franco Menegatti, Emanuele Menezes, Paulo Meng, Qing-Hao Menon, Carlo Mericli, Cetin Mericli, Tekin Merino, Luis Merlet, Jean-Pierre Mermoud, Gregory Merryweather, Andrew Mertz, Christoph Merz, Torsten Mettin, Uwe Meyer, Wolfgang Meyer-Delius, Daniel Mezouar, Youcef Micaelli, Alain Micera, Silvestro Michalek, Maciej, Marcin Michael, Nathan Michaud, Francois Michel, Olivier

Mihaylova, Lyudmila Miklic, Damjan Miksik, Ondrej Miller, Stephen Mills, James K. Milner, Theodore Edgar Milstein, Adam Milutinovic, Dejan Minato, Takashi Minor, Mark Miossec, Sylvain Miranda Neto, Arthur, Arthur Mirats Tur, Josep M. Mirisola, Luiz Gustavo Missura, Marcell Mistry, Michael Mita, Seiichi Mitchell, Julie C. Mitobe, Kazuhisa Mitsou, Nikos Mitsugami, Ikuhisa Mitsukura, Yasue Mitsunaga, Noriaki Mittendorfer, Philipp Miura, Jun Miura, Kanako Miwa, Hirovasu Miyake, Yoshihiro Miyakoshi, Seiichi Miyashita, Takahiro Miyoshi, Takanori Mizukawa, Makoto Moberg, Stig Modayil, Joseph Mohan, San Mohta, Kartik Molfino, Rezia Moll. Mark Mombaur, Katja Monin, Andre Monroy, Raúl Montambault, Serge Montano, Luis Montes, Hector Montesano, Luis Montijano, Eduardo Moon, Chang-bae Moon, Jae-Sung Moore, Joseph Moore, Richard James Donald Mora, Andres

Moradi, Hadi Moradi Dalvand, Mohsen Morales, Antonio Morales, Marco Morales Saiki, Luis Yoichi Morbidi, Fabio Mordohai, Philippos Moreira, Pedro Morén, Jan Moreno, Juan Camilo Moreno, Plinio Moreno-Valenzuela, Javier Morgansen, Kristi Morgul, Omer Mori, Greg Morikawa, Yasushi Morin, Pascal Morisawa. Mitsuharu Moro, Federico Lorenzo Morton, Peter Moshkina, Lilia Moshtagh, Nima Mosteo, Alejandro R. Mouaddib, Abdel-Illah Mountney, Peter Mouri, Tetsuya Mourikis, Anastasios Mousset, Stéphane Mueller, Andreas Muelling, Katharina Mugler, Emily Muja, Marius Constantin Mukai, Toshiharu Mukhopadhyay, Shayok Mullane, John Munih, Marko Munoz, Daniel Munoz, Luis Alberto Munoz-Gomez, Lourdes Muradore, Riccardo Murakami, Kenichi Murakami, Kouji Murakami, Toshiyuki Murillo, Ana Cristina Murphey, Todd Murphy, Chris Murphy, Elizabeth Murray, David Murrieta-Cid, Rafael Muscato, Giovanni Muszynski, Robert Mut, Vicente Myung, Hyun Mörtl, Alexander

Nabeshima, Cota Naffin. David Nagahara, Hajime Nagai, Yukie Nagakubo, Akihiko Nagamune, Ryozo Nagano, Akinori Nagaoka, Kenji Nagarajan, Umashankar Nagasaka, Kenichiro Nagatani, Keiji Nageotte, Florent Nagy, Zoltan Nahon, Meyer Naish, Michael D. Nakadate, Ryu Nakajima, Masahiro Nakamura, Keisuke Nakamura, Ryoichi Nakamura, Taro Nakamura, Tomoaki Nakamura, Yoshihiko Nakamura, Yutaka Nakanishi, Hiroki Nakanishi, Jun Nakanishi, Yuto Nakazawa, Atsushi Naldi, Roberto Namvar, Mehrzad Nanayakkara, Thrishantha Napier, Ashley Napp, Nils Narayanan, Krishna Kumar Nardi, Daniele Narioka, Kenichi Naroditsky, Oleg Narukawa, Terumasa Nascimento, Erickson Nashashibi, Fawzi Natale, Ciro Natale, Lorenzo Navarro-Serment, Luis E. Nawaz, Sarfaz Nayar, Hari Nebot, Eduardo Necsulescu, Dan Nedevschi, Sergiu Negre, Amaury Nelson, Bradley J. Nelson, Carl Nenchev, Dragomir Neo, Ee Sian Nestinger, Stephen

Neubert, Jonas

Neuhaus, Peter Neuman, Bradford Neumann, Gerhard Newcombe, Richard Newman, Paul Newman, Wyatt Ng, Teck Chew Nguyen, Minh Hoai Ni. Kai Nia Kosari, Sina Niccolini, Marta Nieto-Granda, Carlos Niiyama, Ryuma Nijboer, Femke Nikolakopoulos, George Nili Ahmadabadi, Majid Nilsson, Klas Nilsson, Martin Nishide, Shun Nishioka, Yasutaka Nishiwaki, Koichi Nisky, Ilana Nitsch, Verena Noda, Tomoyuki Nohmi, Masahiro Nokleby, Scott Nonaka, Kenichiro Noonan, David Noori, Narges Nori, Francesco Norrlöf, Mikael Nourani Vatani, Navid Novales, Cyril Nuechter, Andreas Nuevo. Jesus Nuno, Emmanuel Nuske, Stephen O'Brien, John O'Callaghan, Simon Timothy Ouyang, Gaoxiang O'Kane, Jason O'Malley, Marcia Ocaña, Manuel Odakura, Valguima Odashima, Shigeyuki Odhner, Lael Ogasawara, Tsukasa Ogata, Tetsuya Ogino, Masaki Ognibene, Dimitri Ogura, Yu Oh, Sang June Oh, Sang Min Oh, Se-Young Oh, Sehoon

Oh, Yonghwan Ohbuchi, Ryutarou Ohmura, Yoshiyuki Ohno, Kazunori Ohta, Aaron Oishi, Meeko Okada, Masafumi Okada, Nobuhiro Okamoto, Jun Okamoto Junior, Jun Okuda, Kenji Olague, Gustavo Oliveira, Paulo Oliver, Gabriel A. Ollero, Anibal Olson, Edwin Onal, Cagdas Denizel Onda, Kazuhisa Onishi, Masaki Ono, Masahiro Opdenbosch, Patrick Orin, David Oriolo, Giuseppe Orkin, Jeff Orteu, Jean-José Ortmaier, Tobias Osentoski, Sarah Osório, Fernando Ota. Yusuke Otaduy, Miguel A. Otake, Mihoko Otsuki, Masatsugu Ott, Christian Ott, Lionel Ottaviano, Erika Otte, Michael W. Ottensmeyer, Mark Oudever, Pierre-Yves Overett, Gary Mark Owaki, Dai Owen-Hill, Alexander Oyama, Eimei Ozawa, Ryuta Ozay, Necmiye Ozsoyeller, Deniz Oztop, Erhan Pac, Muhammed Rasid Padir, Taskin Padois, Vincent Pagala, Prithvi sekhar Paik, Jamie

Palli, Gianluca

Pallottino, Lucia

Palmer III, Luther R. Palunko, Ivana Pan, Jia Pangercic, Dejan Panin, Giorgio Panousopoulou, Athanasia Paoli. Andrea Paolini, Robert Papadopoulos, Evangelos Papadopoulos, Georgios Papageorgiou, Xanthi Papaleo, Eugenia Papanikolopoulos, Nikos Paparoditis, Nicolas Papazov, Chavdar Paprotny, Igor Park, Chung Hyuk Park, Frank Park, Hae Won Park, Hae Won Park, Hyungju Andy Park, In-Won Park, Jae Byung Park, Jaeheung Park, Jong Hyeon Park, Jong Jin Park, Wooram Park, Yong-Jai Park, Yong-Lae Parker, Chris Parker, Lonnie Parra, Carlos Parra Vega, Vicente Parsley, Martin Peter Pascoal, Antonio Pashkevich, Anatol Pasqualetti, Fabio Passenberg, Carolina Patel, Rajnikant V. Pathak. Kaustubh Patil, Sachin Patoglu, Volkan Patron-Perez, Alonso Patronik, Nicholas Paul, Rohan Pavone, Marco Paxman, Jonathan Payandeh, Shahram Payton, David Paz, Lina María PB, Sujit Pchelkin, Stepan Peijie, Zhang

Pellegrini, Stefano

Pelrine, Ron Peltason, Julia Pepy, Romain Peralta Cabezas, José Luis Perdereau, Véronique Pereira, Fernando Pereira, Guilherme Perez, Patrick Perez-del-Pulgar, Carlos Perrin, Nicolas Yves Perrollaz, Mathias Peschel, Joshua Pessin, Gustavo Peters, Steven Petillot, Yvan R. Petit, Antoine Petrick, Ron Petrovskaya, Anna Pettre, Julien Pezzementi, Zachary Pfaff, Patrick Pham, Minh Tu Pham, Quang-Cuong Phee, Louis Philippsen, Roland Phillips, Mike Phung, Tri Cong Piater, Justus Piccigallo, Marco Pickup, Lyndsey Pimenta, Luciano Pinies, Pedro Piovesan, Davide Pipe, Tony Pippin, Charles Pitzer, Benjamin Pivtoraiko, Mihail Pizarro, Oscar Plaku, Erion Plank. Markus Plante, Jean-Sebastien Platt, Robert Plonski, Patrick Plöger, Paul G. Pochyly, Ales Poduri, Sameera Poignet, Philippe Polat, Ilhan Pollard, Nancy S Polushin, Ilia G. Pomerleau, Francois Pon, Aura Ponda, Sameera

Popa, Dan

Popovic, Marko Porez, Mathieu Porfiri, Maurizio Porta, Josep M Posner, Ingmar Possani Espinosa, Andre Pott. Andreas Poulakis, Pantelis Pounds, Paul Prabhakaran, B Pradalier, Cedric Prado, José Augusto Prankl, Johann Prasser, David Prats, Mario Pratt, Jerry Prattichizzo, Domenico Prestes, Edson Pretto, Alberto Prieto, José Carlos Prime, Zebb Prisacariu, Victor Pronobis, Andrzej Prorok, Amanda Provancher, William Provatidis, Christoforos Provost, Julien Pryor, Mitch Przybylski. Markus Puangmali, Pinyo Pugeault, Nicolas Puig, Luis Putze, Felix Qian, Huihuan Qiu, Quan Quadros, Alastair James Quaglia, Davide Quek, Boon Kiat Quigley, Morgan Quigley, Steven Quinn, Roger, D. Rabaud, Vincent Raczkowsky, Joerg Radkhah, Katayon Raducanu, Bogdan Rahn, Christopher Rahwan, Talal Rai, Piyush Rakotondrabe, Micky Ramachandran, Deepak Raman. Vasumathi Ramirez-Amaro, Karinne Ramisa, Arnau Ramos, Ander

Ramos, Fabio Rand. Omri Randelli, Gabriele Ranganathan, Ananth Rasmussen, Christopher Rasolzadeh, Babak Rastgaar, Mohammad Ratliff, Nathan Ravindran, Balaraman Redon, Stephane Reed, Brooks Reed, Kyle Brandon Reggiani, Monica Régnier, Stéphane Reina, Giulio Reishus, Dustin Reiter, Austin Reitmayr, Gerhard Rekleitis, Georgios Rekleitis, Ioannis Remy, C. David Remy, Sekou Ren, Hongliang Ren, Lei Ren, Ping Ren, Wei Ren, Xiaofeng Rentschler, Mark Revnolds. Matthew Ribnick, Evan Richa, Rogerio Richtsfeld, Andreas Richtsfeld, Mario Ridao, Pere Rieffel, John Riek, Laurel D. Riener, Robert Rigatos, Gerasimos Righetti, Ludovic Rimon, Elon Ringwood, John Riskowski, Jody L. Ristic-Durrant, Danijela Ritter, Helge Joachim Riviere, Cameron Rizzi. Alfred Roa, Maximo A. Roberti, Flavio Roberts, Jonathan Robertsson, Anders Robuffo Giordano, Paolo Rocchi, Fabrizio Rocha, Rui Paulo Rocon, Eduardo

Rodemann, Tobias Rodrigues de Campos, Gabriel Rodriguez, Alberto Rodriguez, Samuel Rodríguez Tsouroukdissian, Adolfo Rodriguez y Baena, Ferdinando Rodriguez-Angeles, Alejandro Rodriguez-Losada, Diego Rodriguez-Seda, Erick J. Roehrig, Christof Roennau, Arne Rogers, Alex Rogers III, John G. Rogge, Jonathan Roh, Se-gon Rolland, Luc Rollinson, David Roman, Chris Romano, Joseph M. Rombokas, Eric Romero, Javier Ros, Lluis Rosa, Lorenzo Rosecrance, John Rosell, Jan Rosen, Jacob Rosenthal, Stephanie Roser, Martin Rosman, Benjamin Ross, Stephane Rossini, Luca Rottmann, Axel Rouanet, Pierre Roudet, Céline Roulet-Dubonnet, Olivier Roumeliotis, Stergios Roy, Debanik Roy, Pritam Roy, Rajarshi Royer, Eric Rubenstein, Michael Rublee, Ethan Ruepp, Oliver Ruesch, Jonas Ruffaldi, Emanuele Rufli, Martin Ruggiero, Fabio Ruhnke, Michael Ruiz, Ubaldo Ruiz-Ugalde, Federico

Ruml, Wheeler Rummel, Juergen Rus, Daniela Rusu, Radu Bogdan Ryde, Julian Rydén, Fredrik RvII. Markus Ryu, Dongseok Ryu, Jeha Sa, Inkyu Saad, Maarouf Saal, Hannes Philipp Sabattini, Lorenzo Sabourin, Christophe Sadegh, Nader Sadowska, Anna Saeedi Gharahbolagh, Sajad Saegusa, Ryo Saerbeck, Martin Saffiotti, Alessandro Saga, Satoshi Sagawa, Ryusuke Saglia, Jody Alessandro Sahbani, Anis Sahin, Erol Sakagami, Norimitsu Sakai, Satoru Sakar, Mahmut Selman Sakka, Sophie Salaris, Paolo Salas, Joaquin Salsedo, Fabio Salvi, Giampiero Salvi, Joaquim Salvietti, Gionata Samadani, Ali-Akbar Samur, Evren Sanan, Siddharth Sánchez, Emilio Sanchez Plazas, Oscar Sanchez-Ante, Gildardo Sankaranarayanan, Ganesh Santana, Pedro Santana, Pedro Henrique de Schöner, Gregor Rodrigues Quemel e Assis Scilingo, Enzo Pasquale Santos, Cristina Santos, Veronica J. Santos, Vitor Sanz, Pedro J Sanz-Merodio, Daniel Sarakoglou, Ioannis Saranli, Afsar

Sardellitti, Irene

Sargeant, Ramon

Sariola, Veikko Saripalli, Srikanth Sartori, Massimo Sasaki, Daisuke Sathia Narayanan, Madusudanan Sato. Jun Sato, Katsunari Sato, Takahide Satoh, Satoshi Sattar, Junaed Sattar, Tariq Sauser, Eric Savage, Jesus Savla, Ketan Scandaroli, Glauco Garcia Scaramuzza, Davide Scerri, Paul Schaal, Stefan Scharstein, Daniel Schauß, Thomas Scheggi, Stefano Scheidig, Andrea Scheidt, Robert Scherer, Sebastian Scheuer, Alexis Scheutz, Matthias Schiavone, Giuseppina Schiebener, David Schill, Felix Schlegel, Christian Schoellig, Angela Schroeter, Derik Schuerle, Simone Schuller, Björn Schulman, John Schulz, Dirk Schuresko, Michael Schwab, Arend L. Schwager, Mac Schwertfeger, Sören Schäfer, Bernd-Helge Schöler, Florian Se, Stephen Sebastian, Jose Maria Sebe, Nicu Secchi, Cristian Seegmiller, Neal Andrew Seet, Gim Lee, Gerald Seibold, Ulrich Seipel, Justin Sekimoto, Masahiro

Sekiyama, Kosuke Semini. Claudio Senoo, Taku Sensinger, Jonathon Sentis, Luis Seo, Keehong Seo, TaeWon Seo, Young-Woo Seok, SangOk Sequeira, Joao Service, Travis Seyfarth, Andre Sfakiotakis, Michael Sgorbissa, Antonio Shacklock, Andrew Shademan, Azad Shah, Rajat Shah. Shridhar Shahbazi, Hossein Shakhimardanov, Azamat Shames, Iman Shammas, Elie Shang, Weiwei Shao, Xiaowei Shao, Zhufeng Shapiro, Amir Shapiro, Justin Adam Scott Sharf, Inna Sharma, Rajnikant Sharma, Sanjay Shayganfar, Mohammad Shell, Dylan Shen, Jinglin Shen, Shaojie Shen, Wei-Min Shen, Xiangrong Shen, yajing Shen, Yantao Shende, Apoorva Sheng, Weihua Sheridan, Patricia Kristine Shi, Fei Shi, Lei Shi, Zhenwu Shibata, Mizuho Shibata, Tomohiro Shih, Ching Long Shiller, Zvi Shilpiekandula, Vijay Shim, David Hyunchul Shimizu, Masahiro Shimoda, Shingo Shimojo, Makoto Shin, Dongjun

Shin, Jiwon Shirinzadeh, Bijan Shkolnik, Alexander Shkurti, Florian

Shoaei, Mohammad Reza

Short, Elaine Shvalb, Nir Si, Yulin Sibley, Gabe Sidobre, Daniel Silva, Filipe Simaan, Nabil Simeon, Thierry Simeon, Thierry

Simetti, Enrico

Simões, Eduardo do Valle

Simon, Dan Simonetto. Andrea Simonin, Olivier Simpkins, Alex Sinapov, Jivko Singh, Amarjeet Singh, Arjun Singh, Gautam Singh, Sanjiv Singh, Surya

Sinibaldi, Edoardo Sintov, Avishai Siqueira, Adriano Sira-Ramírez, Hebertt

Siri, Silvia Sitte, Joaquin Sitti, Metin Sivic, Josef Skocaj, Danijel Skonieczny, Krzysztof Skotheim, Øystein Skrzypczynski, Piotr Slocum, Alexander Smith, Christopher

Smith, Stephen L. Smith, Stuart Snape, Jamie Soccol, Dean Solà, Joan Solea, Razvan Solis, Jorge

Sommerlade, Eric

Smith, James

Smith, Joshua R.

Son, Hyoung II Song, Dan Song, Jae-Bok Song, Kai-Tai

Song, Xuan Song, Yang Song, Yimin

Song, Yun Seong Sorbello, Rosario Sorrenti, Domenico G.

Sotzing, Christopher Spenko, Matthew Spinello, Luciano Spletzer, John Spong, Mark

Sproewitz, Alexander Sprunk, Christoph Sreenath, Koushil Sridhar, Muralikrishna

Sridharan, Mohan Srinivasa, Siddhartha Srinivasan, Manoi Stachniss, Cyrill Stachura, Maciej Stampfer, Dennis Stan, Sergiu-Dan

Stankovic, Milos Stasse, Olivier Steder, Bastian Steedman, Mark Steinbach, Eckehard Steinbauer, Gerald

Steinfeld, Aaron Stenger, Björn Stepp, Cara

Stergiopoulos, Yiannis Stetten, George Stewart, Robert Stiefelhagen, Rainer

Stienen, Arno H.A. Stiffler, Nicholas Stilwell, Daniel Stinckwich, Serge Stingu, Emanuel Stocco, Leo

Stoianovici, Dan

Stojmenovic, Ivan Stolkin, Rustam Stoy, Kasper Stoyanov, Danail Stoyanov, Todor

Stramigioli, Stefano Strasdat, Hauke Strobl, Klaus H. Stroupe, Ashley W.

Stulp, Freek Stump, Ethan Sturm, Jürgen Stückler, Jörg Su. Hao Su, Jianbo Su, Yuxin

Suarez, Raul Suárez-Ruiz, Francisco Subramanian, Arunkumar Sucan, Ioan Alexandru Sucar, Luis Enrique Suchý, Jozef Sudsang, Attawith Suetani, Hiromichi Sugawara, Ken

Sugihara, Tomomichi Sugimoto, Norikazu Sugimoto, Shigeki Suh, Chris SeungBeum

Sugihara, Ryo

Suh, Il Hong Sujit, P.B. Suleiman, Wael Sullivan, Josephine Sulzer, James

Sumioka, Hidenobu Summers, Ian R. Sun, Dong

Sun, Yu Sun de la Cruz, Joseph Sundström, Nina Sung, YoonChang

Surdilovic, Dragoljub Suri, Subhash Surmann, Hartmut Sutton, Robert

Suzuki, Kenji Suzuki, Takashi Suzuki, Tsuyoshi Svinin, Mikhail Swaney, Philip Swieringa, Kurt Sycara, Katia Sünderhauf, Niko Szewczyk, Jérôme

Sznitman, Raphael Szwaykowska, Klementyna T. Miura, Kenjiro Tada, Yasunori Tadakuma, Kenjiro Tadakuma, Riichiro Tadano, Kotaro Tadokoro, Satoshi Taffoni, Fabrizio Taghirad, Hamid D.

Tahara, Kenji

Tahri, Omar Taïx, Michel Takadama, Keiki Takahashi, Junji Takahashi, Masaki Takahashi, Yasutake Takaiwa. Masahiro Takaki, Takeshi Takamatsu, Jun Takamuku, Shinya Takanishi, Atsuo Takano, Wataru Takanobu, Hideaki Takayama, Leila Takayama, Toshio Takeda, Hiroyuki Takeda, Yukio Takemura, Hiroshi Takemura, Noriko Takeuchi, Eijiro Takita, Yoshihiro

Tallapragada, Pavankumar

Takubo, Tomohito

Takuma, Takashi

Tan, Hong Tan, Jindong Tan, Min Tan, U-Xuan Tan. Xiaobo Tanaka, Kanji Tang, Chinpei Tang, Jiong Tangorra, James

Tani, Jun

Tanikawa, Tamio Tanner, Herbert G. Tao, JianGuo Tao, Pey Yuen Tapia, Lydia Tapus, Adriana Tardos, Juan D. Tarn, T. J. Taro, Maeda Tassa, Yuval Tavakoli, Mahdi Tavares, Dalton Taylor, Camillo Jose Taylor, Matthew Tazaki, Yuichi Tchon, Krzysztof

Te Boekhorst, Rene Techy, Laszlo Tee, Keng Peng Teichman, Alex

Teixeira, Bruno Otávio Soares Teller, Seth Tellex, Stefanie Tendick, Frank Teniente Avilés, Ernesto Homar Tenreiro Machado, J. A. Teo, Tat Joo Ter Mors, Adriaan W. Terabayashi, Kenji Terada, koji Terashima, Kazuhiko Tesch, Matthew Teuliere, Celine Theodorou, Evangelos Thill, Serge Thomas, Shawna Thomaz, Andrea Lockerd Thompson, David Thompson, Simon Thuilot, Benoit Thunberg, Johan Thurrowgood, Saul Tian, Jiang Tian, Yanqing Tikhanoff, Vadim Tipaldi, Gian Diego Tobergte, Andreas Todorov, Emanuel Toglia, Chiara Toibero, Juan Marcos Tokekar, Pratap Tokuda, Junichi Tolic, Domagoj Tolley, Michael Thomas Tombari, Federico Toming, Gert Tomita, Kohji Tomono, Masahiro Topcu, Ufuk Torii, Akihiko Torras, Carme Torricelli, Diego Tousignant, Steve Tovar, Benjamin Tovey, Craig Townsend, Julie Trahanias, Panos Trassoudaine, Laurent Traver, V. Javier Trawny, Nikolas Trejos, Ana Luisa Trianni, Vito

Triboulet, Jean Triebel, Rudolph Trinkle, Jeff Trivedi, Deepak Tsagarakis, Nikolaos Tsai, Chia-Hung Dylan Tsetserukou, Dzmitry Tsiotras, Panagiotis Tsourdos, Antonios Tsubouchi, Takashi Tsui, Katherine Tsuji, Toshiaki Tsuji, Toshio Tsujita, Teppei Tsukagoshi, Hideyuki Tsukahara, Atsushi Tsumaki, Yuichi Tufekci, Zekeriya Tully, Stephen Tumova, Jana Tun Latt, Win Tunay, Ilker Turetta, Alessio Turpin, Matthew Uchibe, Eiji Uchiyama, Masaru Ude, Ales Ueda, Jun Ueda, Ryohei Uemura, Mitsunori Ueno, Hiroshi Ueshiba, Toshio Ugur, Emre Uhl, Klaus Ulbrich, Heinz Umeda, Kazunori Underwood, James Patrick Unel, Mustafa Unver, Ozgur Urakubo, Takateru Urbann, Oliver Ushida, Shun Vahrenkamp, Nikolaus Vaidyanathan, Ravi Valdastri, Pietro Valdes, Victor Vale, Alberto Valencia, Philip Valentin-Coronado, Luis Manuel Valério, Duarte Valero-Cuevas, Francisco

Valle, Maurizio

Vallery, Heike

Valls Miro, Jaime Van Brussel, Hendrik Van de Wouw, Nathan Van den Berg, Jur Van der Smagt, Patrick Van der Stappen, Frank Van Dijk, Wietse Van Ham, Ronald Van Hoof, Herke Van Rossum, Anne Vande Weghe, Mike Vandeborre, Jean-Philippe Vander Hook, Joshua Vander Poorten, Emmanuel В. Vanderborght, Bram Vanness, Justin Varadarajan, Karthik Mahesh Varnell, Paul Varol, Huseyin Atakan Vartholomeos, Panagiotis Vasilescu, Iuliu Vaskevicius, Narunas Vásquez-Gómez, J. Irving Vasudevan, Shrihari Vaughan, Richard Vazquez-Diosdado, Jose Velagapudi, Prasanna Velasco-Villa, Martin Veltink, Peter Ventura, Rodrigo Venture, Gentiane Verl, Alexander Vernaza, Paul Vernon, David Verschure, Paul Vertechy, Rocco Vicentini, Federico Victorino, Alessandro Correa Vieira, Marcos Vijayakumar, Sethu Villagra, Jorge Villamizar Vergel, Michael Villani, Luigi Villgrattner, Thomas Vincze, Markus Viollet, Stephane Virk, Gurvinder Singh Visala, Arto Visentin, Francesco Visioli, Antonio

Visser, Arnoud

Viswanathan, Pooja Vitiello, Valentina Vitrani, Marie-Aude Vitus, Michael Vlachos, Kostas Vo, Christopher Von Hundelshausen, Felix Vona, Marsette Voros, Sandrine Vorst, Philipp Voyles, Richard Vu Quy, Hung Wada, Masayoshi Wagner, Bernardo Wahl, Friedrich M. Wait, Keith Wakamatsu, Hidefumi Walker, Daniel S. Walker, Ian Wallhoff, Frank Walsh, Conor James Walsh, Thomas Walter, Jennifer Walter, Matthew Wang, Chieh-Chih Wang, Congqing Wang, Han Wang, Hao Wang, Heng Wang, Hesheng Wang, Hui Wang, Jingchuan Wang, Jiuguang Wang, Kai Wang, Kundong Wang, Liyu Wang, Michael Yu Wang, Minghui Wang, Shuo Wang, Wei Wang, Weidong Wang, Weifu Wang, Wenhui Wang, Xiaona Wang, Xudong Wang, Xuyong Wang, Yang Wang, Yong Wang, Yue Wardi, Yorai Warren, Michael Waslander, Steven Lake Watanabe, Tetsuyou Watman, Daniel

Watts, Kevin Wawerla, Jens Webb, Barbara Webb, Dustin Webster III, Robert James Weikersdorfer, David Weiss, Stephan Weisshardt, Florian Weisz. Jonathan Weitzenfeld, Alfredo Welke, Kai Wen, Shuang-Quan Werfel, Justin Westphal, Ralf Wettels, Nicholas Wettergreen, David Wheeler, Jason White. Paul Whitman, Eric Whitty, Mark Albert

Wildes, Rick Wilkie, David Williams, Brian Patrick Williams, David Williams, Iain Alexander

Wieber, Pierre-Brice

Wiedemann, Christian

Wiertlewski, Michael

Williams, Stefan Bernard Williamson, Sinead Willimon, Bryan Wimboeck, Thomas Winck, Ryder Winfield, Alan Wing, Rowan Winter, Amos Greene

Wirz Gonzalez, Raul

Wisse, Martijn Withrow, Thomas Witte. Hartmut Wittmeier, Steffen Woergoetter, Florentin Woern, Heinz

Wohlkinger, Walter Wollherr, Dirk

Wongpiromsarn, Tichakorn

Wood, Nathan Wood, Robert Woolsey, Craig Worcester, James Wrede. Sebastian Wright, III, Cornell Wu, Guanglei Wu, Haiyuan

Wu, Jianhua Wu, Jianxin Wu, Ming Wu, Wei Wu, Xiaojun Wu, Xinyu Wu. Yan

Wuensche, Hans J Wurm. Kai M. Wyatt, Jeremy Wörgötter, Florentin Xi, FengFeng

Xia, Tian Xiao, Jing Xiao, Jizhong Xie, Hui Xie, Ming Xie, Shaorong Xie, Xiang Xiong, Zhenhua Xu, Angi

Xu, Bin Xu, De Xu, Jing Xu, Kai Xu, Kun Xu, Ling Xu, Lisheng Xu, Qingsong Xu, Zhe Xu, Zhe Xu, Zhonghua

Yadmellat, Peyman Yaghobi, Mostafa Yagi, Yasushi Yaguchi, Hiroaki Yairi, Takehisa Yamada, Hiroya Yamakawa, Yuji

Yamakita Masaki, yamakita

Yamamoto, Akio Yamamoto, Ko Yamamoto, Tomonori Yamane, Katsu Yamanishi, Yoko Yamano, Mitsuhiro Yamashita, Atsushi Yamashita, Juli Yamauchi, Brian Yamauchi, Yasushi Yamawaki. Tasuku Yamazaki, Kimitoshi Yan, Huaicheng

Yan, Yuling

Yang, Bo Yang, Gi-Hun Yang, Guang-Zhong Yang, Guilin Yang, Huizhen Yang, Jie Yang, Jie Yang, Jingzhou Yang, Jung-Min Yang, Ming Yang, Shao-Wen Yang, Sungwook Yang, Woosung Yang, Yawei Yang, Yousheng Yano, Ken'ichi

Yao, Jun Yao, Ligang Yao, Yan-an Yashima, Masahito Yazicioglu, Yigit Ye, Changlong

Yebes, Torres, José Javier Yeon, Je Sung

Yershov, Dmitry Yershova, Anna Yesilyurt, Serhat Yi, Byung-Ju Yi, Jiangiang Yi, Jingang Yim, Mark Yim, Sehyuk Yim, Woosoon Ying, Xianghua Yip, Wai-Kuan Yoder, John David

Yokoi, Hiroshi

Yokoi, Kazuhito Yokokohji, Yasuyoshi Yoneda, Kan Yoshida, Eiichi Yoshida, Haruyuki Yoshida, Kazuya Yoshikai, Tomoaki Yoshikawa, Masahiro Yoshikawa, Taizo Yoshikawa, Yuichiro Yoshimitsu, Kitaro You, Bum Jae Youngsun, Ryuh Yu. Hongnian

Yu, Jiancheng

Yu, Seungnam

Yu, Jingjun

Yu, Wei Yu. Wenwei Yu, Wonpil Yu, Yong Yu, Yue-Qing Yuan, Jianjun Yuan, Kui Yue, Shigang Yun, Dongwon Yun, Seung-kook Zaccaria, Renato

Zanchettin, Andrea Maria

Zanella. Andrea Zapata, René Zatsiorsky, Vladimir Zauner, Klaus-Peter Zavlanos, Michael M. Zeeshan, Arif Muhammad

Zefran, Milos Zelenika, Saša Zell, Andreas

Zendjebil, Iman Mayssa Zenou, Emmanuel Zerbato, Davide Zhang, Chi Zhang, Dingguo Zhang, George Zhang, Hai-Tao Zhang, Hao Zhang, Hong Zhang, Houxiang Zhang, Jian Zhang, Jianwei Zhang, Li Zhang, Li Zhang, Liangjun Zhang, Mingjun

Zhang, Shiqi Zhang, shiwu Zhang, Wei Zhang, Wende Zhang, Wengi Zhang, Wenzeng Zhang, Xuebo Zhang, Yanliang Zhang, Yinghua Zhang, Yizhai Zhang, Yongde Zhang, Yunong Zhao, Huijing Zhao, Jianguo Zhao, Liang Zhao, Mingguo Zhao, Qian

Zhao, Xiaoguang Zheng, Yaqing Zheng, Yili Zheng, Yu Zhong, Ziguo Zhou, Chao Zhou, Chunlin Zhou, Longjiang Zhou, MengChu Zhou, Xun Zhou, Yu Zhu, Chi Zhu, Junda Zhu, Lijun Zhu, Wen-Hong Zhu, Yanhe

Ziebart, Brian
Zielinska, Teresa
Zimmer, Uwe
Zinn, Michael
Zivkovic, Zoran
Zlatanov, Dimiter
Zlot, Robert
Zollo, Loredana

Zucker, Matthew Zullo, Letizia Zwicker, Ekkehard Zykov, Victor Zöllner, Johann Marius

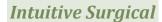
ICRA 2012 Corporate Sponsors

We acknowledge the support of the following Corporate Sponsors to the 2012 IEEE International Conference on Robotics and Automation.

GOLD SPONSORS

















www.abb.com

www.intechopen.com

www.intuitivesurgical.com

www.willowgarage.com

SILVER SPONSORS









www.maplesoft.com

www.mathworks.com

Plenary Sessions

Robotics in the Small

Tuesday May 15, 2012, 13:15-14:15, Ballrooms A, B, C, E, F, and G Chair: Shigeki Sugano, Waseda University



Professor Brad Nelson Department of Robotics and Intelligent Systems, ETH-Zürich, Zürich, Swiss

Abstract

While the futuristic vision of micro and nanorobotics is of intelligent machines that navigate throughout our bodies searching for and destroying disease, we have a long way to go to get there. Progress is being made, though, and the past decade has seen impressive advances in the fabrication, powering, and control of tiny motile devices. Much of our work focuses on creating systems for controlling micro and nanorobots in liquid as well as pursuing applications of these devices. Larger scale microrobots for delivering drugs to the retina to treat eye diseases such as age related macular degeneration and retinal vein and artery occlusion are moving towards clinical trials. As size decreases to the nanoscale, we have been inspired by motile bacteria, such as E. coli, and have developed nanorobots that swim with a similar technique. Applications we pursue at these scales are for the treatment of breast cancer and cerebral infarctions.

The potential impact of this technology on society is high, particularly for biomedical applications, though many challenges remain in developing micro and nano robots that will be useful to society. An overarching requirement for achieving breakthroughs in this area is the need to bring together expertise from a wide variety of science and engineering disciplines. Robotics brings expertise in the planning and control of mechanisms with many degrees of freedom in uncertain environments. Nanotechnology teaches innovative approaches to fabricating nanoscale machines. In addition, biomedical imaging advances are needed, as is fundamental insight into the nature of fluid dynamics at very small scales. Medical professionals must be tightly integrated into the development cycle, and experts in developing business models and intellectual property must be closely consulted.

As systems such as these enter clinical trials, and as commercial applications of this new technology are realized, radically new therapies and uses will result that have yet to be envisioned.

Biography

Brad Nelson is the Professor of Robotics and Intelligent Systems at ETH Zürich. His primary research focus is on microrobotics and nanorobotics with an emphasis on applications in biology and medicine. He received a B.S.M.E. from the University of Illinois at Urbana-Champaign and an M.S.M.E. from the University of Minnesota. He has worked as an engineer at Honeywell and Motorola and served as a United States Peace Corps Volunteer in Botswana, Africa, before obtaining a Ph.D. in Robotics from Carnegie Mellon University in 1995. He was an Assistant Professor at the University of Illinois at Chicago (1995-1998) and an Associate Professor at the University of Minnesota (1998-2002). He became a Full Professor at ETH Zürich in 2002.

Prof. Nelson has received a number of awards including more than a dozen Best Paper Awards and Award Finalists at major robotics conferences and journals. He was named to the 2005 "Scientific American 50," Scientific American magazine's annual list recognizing fifty outstanding acts of leadership in science and technology from the past year for his efforts in nanotube manufacturing. His laboratory won the 2007 and 2009 RoboCup Nanogram Competition, both times the event has been held. His lab appears in the 2012 Guinness Book of World Records for the "Most Advanced Mini Robot for Medical Use." He serves on the editorial boards of several journals, has chaired several international workshops and conferences, has served as the head of the ETH Department of Mechanical and Process Engineering, the Chairman of the ETH Electron Microscopy Center (EMEZ), and is a member of the Research Council of the Swiss National Science Foundation.

Bio-Bots: Bio-Integrated Robotics Using Live Cells As Components

Wednesday May 16, 2012, 13:15-14:15, Ballrooms A, B, C, E, F, and G Chair: Rüdiger Dillmann, The Karlsruhe Institute of Technology



Professor H. Harry Asada

Department of Mechanical Engineering,

Massachusetts Institute of Technology (MIT), Cambridge, MA, USA

Abstract

Live cells and tissues cultured in microfluidic in vitro environment can be used as components of a robot. Skeletal muscles, for example, have the potential to be effective actuators for powering a micro-robot or an artificial "animal". Muscle strips can be formed from their precursory cells, myoblasts, by guiding them through multi-stage myogenic process. Muscle strips self-assembled together with a robotic structure can activate a high DOF micro mechanism, for which there is no actuator technology currently available. Such live biological materials will be a game-changing technology in designing robotic systems and extending their applications to broader fields. This talk will introduce the state-of-the-art of bio-artificial muscles and other key biological components, and address potentials and challenges of bio-integrated robots. Three thrusts of bioengineering and control technologies will be highlighted. First, skeletal muscle cells are genetically altered so that each muscle strip can be controlled individually with high spatiotemporal resolution: Optogenetics. When exposed to a light beam, a group of light-sensitive muscle strips contract locally and dynamically, creating multi DOF motion in a compact body. Second, a new culturing technique is developed for creating 3-D fascicle-like muscle constructs, which is a key step for scaling up the bio-artificial muscles to a large-scale functional muscle. Finally, a new stochastic control method for controlling a population of cells and micro-tissues will be discussed. While individual cells and tissues are inevitably heterogeneous and stochastic, their population behaviors are stable and functional in a wide range. A new approach is needed for in vitro control of cells and tissues to assure robust, reliable behaviors. The talk will conclude with future research agenda on Bio-Bots at the NSF Science and Technology Center, Emergent Behaviors of Integrative Cellular Systems, where the speaker's group has been participating.

Biography

H. Harry Asada is Ford Professor of Engineering and Director of the Brit and Alex d'Arbeloff Laboratory for Information Systems and Technology in the Department of Mechanical Engineering, Massachusetts Institute of Technology (MIT), Cambridge, MA. He received the B.S., M.S., and Ph.D. degrees in precision engineering in 1973, 1975, and 1979, respectively, all from Kyoto University, Japan. He specializes in robotics, biological engineering, and system dynamics and control. His current research in the biological engineering area includes bio-artificial muscles, angiogenesis, modeling and control of cell migration, and cell tracking image processing. His current robotics research includes wireless micro underwater robots for direct inspection of nuclear reactors, aircraft manufacturing robotics, wearable supernumerary robotic limbs for assisting factory workers and astronauts, and cellular PZT actuators. He won the Best Conference Paper Award at the IEEE International Conference on Robotics and Automation in 1993 and 1999, its Best Automation Paper Award in 1997, and 2010, the O. Hugo Schuck Best Paper Award from the American Control Council in 1985, and Best Journal Paper Awards from the Society of Instrument and Control Engineers in 1979, 1984, and 1990. He received the Rufus Oldenburger Medal from ASME in 2011, and the Henry Paynter Outstanding Researcher Award from ASME Dynamic Systems and Control in 1998. He also received the Ruth and Joel Spira Award for Distinguished Teaching from the School of Engineering, MIT, for his contribution to robotics education. Dr. Asada is a Fellow of ASME.

Development Outline of the Humanoid Robot: HUBO II

Thursday May 17, 2012, 13:15-14:15, Ballrooms A, B, C, E, F, and G Chair: Henrik Iskov Christensen, Georgia Institute of Technology



Professor Jun Ho Oh

Department of Mechanical Engineering,

Korea Advanced Institute of Science and Technology (KAIST), Korea

Abstract

Hubo II is a 40-DOF full size Humanoid Robot with 1.3m of height and 45Kg of weight. Hubo II which was originally developed at KAIST is now in commercial production stage by Rainbow Co., an enterprise licensed by KAIST. Nine Hubo II have successfully been delivered to universities and research institutes in Singapore and the US.

The full size humanoid robot differs from the toy size small ones in many aspects. It should have a very stable and well-designed structure with little uncertainties. It must be strong enough to move its body weight, but not so heavy to minimize the torques to drive the body parts. All the electrical parts and sensors including force/torque sensors, inertia sensors, the driver circuits, and decentralized control must be designed and fabricated compact enough to be fit in the enclosure of the body.

Another important task is to design a walking algorithm. The walking algorithm is composed with two parts: off-line gait pattern design and real time stabilization control. Gait pattern design is to find a periodic function for each joint of leg such that humanoid robot is to walk with desired velocity keeping a certain level of stability. We suggested a simple function connected with cubic spline and sine functions with minimal number of parameters. This approach simplifies the parameter adjustment procedure. Play back of gait pattern found from the former process, however, does not guarantee the robot walks in real practice since there are number of uncertainties involved in real situations. The uncertainties include ground inclination, friction, and un-modeled vibration of the body. The stabilization algorithm should deal with these kinds of problems. Hubo's walk algorithm has eight levels of hierarchical control architecture to cope with the general circumstances in the walking environment.

The general issues mentioned above will be presented.

Biography

Professor Jun Ho Oh (57) received his B.S. and M.S. degree from Yonsei University, Seoul, Korea in 1977 and 1979, respectively. After working at Korea Atomic Energy Research Institute as a researcher from 1979 to 1981, he received Ph.D. degree in mechanical engineering in the field of automatic control at U.C., Berkeley in 1985. He is now a distinguished professor of mechanical engineering and the director of Humanoid robot research center (Hubo Lab) at Korea Advanced Institute of Science and Technology (KAIST).

He has performed many industry and government research projects in motion control, sensors, microprocessor applications, robotics, etc. He is especially interested in mechatronics and system integration. In the past ten years, he completed unique humanoid robot series KHR-1, KHR-2, Hubo and Hubo 2 and he also developed Albert Hubo and Hubo FX-1. He is currently studying to improve the performance of humanoid robot for faster and more stable walking, robust robot system integration and light weight design. He is a member of ASME and IEEE. He is also a member of the National Academy of Engineering of Korea.

Workshops and Tutorials

The workshops and tutorials are scheduled on Monday and Friday of the conference week. They are listed here for your consideration. More detailed information and all workshops and tutorials proceedings can be found on the conference website http://www.icra2012.org/program/workshop.php and http://www.icra2012.org/program/tutorials.php. All events take place in the RiverCentre meeting rooms 1-12.

Monday May 14, 2012 Workshops/Tutorials (08:30-17:30)

Room	ı ID	Title	Organizers
1	Workshop 1	Variable Impedance Actuators Moving the Robots of Tomorrow	Raffaella Carloni, Bram Vanderborght, Alin Albu-Schäffer, Antonio Bicchi
2	Workshop 2	Bio-Bots	H. Harry Asada
3	Workshop 3	Many-Robot Systems: Crossing the Reality Gap	Donald Sofge, Volkan Isler, Ani Hsieh, Frank Ehlers
4	Workshop 4	New Design Principles and Frontiers for Wearable Robotics	Maria Chiara Carrozza Dino Accoto
5	Workshop 5	Seventh Full-day Workshop on Software Development and Integration in Robotics (SDIR-VII)	Davide Brugali Bruce A. Mac Donald Issa A.D. Nesnas
6	Workshop 6	Haptic Teleoperation of Mobile Robots: Theory, Applications and Perspectives	Cristian Secchi, Domenico Prattichizzo, Antonio Franchi, Paolo Robuffo Giordano
7	Workshop 7	Robotics and Performing Arts: Reciprocal influences	Pericle Salvini Daniela Rus
8	Workshop 8	Robotic Satellite Servicing	Craig Carignan Giacomo Marani Wendell Chun
9	Workshop 9	2nd Workshop on Semantic Perception, Mapping and Exploration (SPME)	Dirk Holz, Zoltan-Csaba Marton, Andreas Nuechter, Andrzej Pronobis, Radu Bogdan Rusu
10-11	Tutorial 1	Motion Planning for Dynamic Environments	Steve LaValle
12	Tutorial 2	Industry Track	Bonnie Yue Carlos Osorio

Friday May 18, 2012 Workshops/Tutorials (08:30-17:30)

Room	ID	Title	Organizers
1	Workshop 10	The Future of HRI - Paving the Way to Next Generation of HRI	Pericle Salvini Monica Nicolescu Iroshi Hishiguro
2	Workshop 11	Bio Assembler for 3D Cellular System Innovation	Tatsuo Arai
3	Workshop 12	Conditions for Replicable Experiments and Performance Comparison in Robotics Research	Fabio P. Bonsignorio, Angel P. Del Pobil, John Hallam, Raj Madhavan,
4	Workshop 13	Workshop on Long-term Autonomy II	Paul Furgale Gabe Sibley Tim Barfoot
5	Workshop 14	Pathways to Clinical Needle Steering: Recent Advances and Future Applications	Cameron Riviere Robert Webster
6	Workshop 15	Stochastic Geometry in SLAM	Martin Adams Ba-Ngu Vo
7	Workshop 16	Modular Surgical Robotics: How Can We Make It Possible?	Paolo Fiorini Giancarlo Ferrigno Elena De Momi
8	Workshop 17	Industry-Academia Collaboration in the ECHORD Project: a Bridge for European Robotic Innovation	Alois Knoll Bruno Siciliano Norberto Pires
9	Workshop 18	Semantic Perception and Mapping for Knowledge-enabled Service Robotics	Michael Beetz, Patric Jensfelt, Alper Aydemi, Dejan Pangercic, Ben Pitzer, Bhaskara Marthi
10	Tutorial 3	Advanced 3D Point Cloud Processing with Point Cloud Library (PCL)	Radu Rusu
11	Tutorial 4	Reinforcement Learning for Robotics and Control	Pieter Abbeel Jan Peters
12	Tutorial 5	Robot Operating System (ROS): Core and Advanced Topics	Christopher Crick

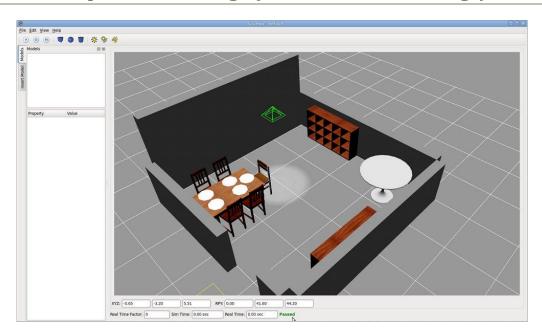
ICRA Robot Challenge 2012

This year's ICRA Robot Challenge will be held at ICRA 2012. Our goal is to make the Challenge accessible to all members of the ICRA community, to integrate it tightly with the technical aspects of the conference, and to encourage as many participants as possible to bring their teams and participate. This year's challenge will consist of six events:

- The Mobile Manipulation Challenge
- The Modular Robotic Challenge
- The Mobile Microrobotics Challenge
- The DARwin-OP Humanoid Application Challenge
- The Manufacturing Challenge

Each challenge is organized individually, but all will be co-located at the conference. The Robotic Challenges are being held in the Roy Wilkins Auditorium of RiverCentre in Saint Paul. To participate in any of the challenges, use the contact information below.

The Mobile Manipulation Challenge (AKA Sushi Boat Challenge)



This year a new Mobile Manipulation Challenge will show off the state of the art in integrated perception and manipulation. The challenge models a set of "sushi boat" restaurant tasks: clearing a table, setting a table, and serving from a rotating table.

We will run this challenge at two scales: human and mini. The human scale will use real tables and chairs and dishes. The mini scale will be suited for smaller robots.

Participants are welcome to bring their own robots and software, or to make use of Willow Garage's PR2 robots (human scale) or Kuka's YouBot robots (mini scale) for the challenge. Simulations of the space at both scales will be available in advance.

More information will be available at MobileManipulationChallenge.org.

Indoor Robotic Contingency (formerly Planetary Robotic Contingency, AKA the modular robot competition)

This challenge simulates an unexpected problem where a robotic solution must be quickly developed and deployed, using only existing resources. The intent of this event is to develop versatile robotic systems and software that can be adapted quickly to address unexpected events. Since humans are present, a natural solution to realistic unexpected events would exploit human creativity and human-robot interaction.

The competition drives not only the development of versatile robotic hardware and on-board software, but also the design and development of programming and assembly tools capable of rapidly implementing a wide variety of capabilities. Since tele-operation is not precluded for this event, the development of effective user interfaces is another expected outcome.

The Environment and Event Parameters

The environment for this event will consist of two areas: a green zone and a red zone. The green zone will represent the human-occupied area from which the robots will be "launched" onto the red zone (where humans may not enter). Robots must be placed in an airlock chamber and drive (or be driven) out onto the red zone. If a robot needs to return to the green zone, it must do so through the airlock chamber. The airlock will be 1.5m long, 1m wide, and 1m tall, with 1m by 1m doors at each end of the long dimension.

Teams will be allowed to use only what they can carry within one airline suitcase. This may be any container that weighs less than 50lbs (23kg) and with outside dimensions summing to less than 62 inches (157cm), and weighing 25kg or less. For example, a container 70cm long, 50cm wide and 30cm tall has a total dimension of 70+50+30 = 150cm, and would be within the size limits. For convenience, we will also allow access to six standard domestic AC power outlets (United States standard NEMA 5-15, 110v, 15A, 60Hz).

The actual unexpected problem to be solved will be announced on the day of the competition. The problems will be constrained to have likely robotic solution that fit the spirit of the competition. For example, you will not be required to have the robot travel 100km to the site of the problem, or to construct a 10-person emergency habitat from freshly-mined regolith. The scope of the task might vary from a short 10 minute task, to one taking several hours. Specific tasks will be announced to all teams simultaneously, and they will work on their solutions independently.

Example Scenarios

To give an idea of the sorts of tasks, here are a few examples. In the past the competition had a space theme where tasks simulated Martian or lunar habitat emergencies. See: http://modlabupenn.org/icra/.

Antenna recovery

An antenna outside the habitat has been knocked over during a Martian storm. The antenna is crucial to the guidance of a resupply transport, which is scheduled to arrive in 4 hours and an EVA is not safe. The team must develop a robot that can reach the antenna, grasp it and reattach it to its receptacle. The antenna is 10 m from the habitat, sitting on top of a 1m by 2m rectangular base that is 1m tall. The base is visible from the habitat. The antenna is a 1cm cylindrical rod 1m long that fits as a peg into a hole 2cm deep in the base. You have a spare antenna and base in the habitat that can be used for testing purposes.

Base station repair

Sensors have discovered a tear in a thermal covering on the top of a storage shed which contains the habitat's store of liquid nitrogen. The team has 4 hours before the Martian morning arrives and starts to dangerously heat the nitrogen. The team must develop a robot that can crawl on top of the structure, use the supplied patching material, and patch the hole by dispensing a supplied glue. Unfortunately, the structure was not designed to support heavy weights, so the robot must weigh less than 5kg or risk collapsing the structure, with disastrous consequences.

Nuclear power plant repair

You must send a robot into a nuclear power plant and shut off a valve before the power plant explodes. The valve is standard 1/2" pipe ball valve shut off by rotating a 3" lever 90 degrees. The amount of torque required to shut off the valve is not trivial. Access to the critical areas has size constraints - e.g. going through pipes or small channels to reach the lever.

For more details, please contact Mark Yim (yim@grasp.upenn.edu).

Mobile Microrobotics Challenge

Recent advances in the design and fabrication of microelectromechanical systems (MEMS) have enabled the development of mobile microrobots that can autonomously navigate and manipulate in controlled environments. It is expected that this technology will be critical in applications as varied as intelligent sensor networks, in vivo medical diagnosis and treatment, and adaptive microelectronics. However, many challenges remain, particularly with respect to locomotion, power storage, embedded intelligence, and motion measurement. As a result, NIST has organized performance-based competitions for mobile microrobots that are designed to: 1) motivate researchers to accelerate microrobot development, 2) reveal the most pressing technical challenges, and 3) evaluate the most successful methods for locomotion and manipulation at the microscale (e.g., actuation techniques for crawling). This year's event will include two challenge tasks (mobility and micro assembly), a freestyle demo, and a poster session.

More details can be found at http://www.nist.gov/el/isd/mmc or by contacting Jason Gorman (jason.gorman@nist.gov).

DARwIn-OP Humanoid Application Challenge



Objectives

DARwin-OP is an open platform humanoid project supported by NSF. DAR-win-OP is a vision-capable humanoid with full functionality and scalability. Researchers are strongly encouraged to join an open source community for cooperative research to encourage creative applications from around the globe and maximize contribution for humanoid research. For more information, see: www.robotsource.org.

Registration

Teams (1-4 members) who use DARwin-OP robot to develop their own application are eligible. Projects using customized hardware or simulation only are also welcome.

Participants required to deliver

1 minute video demonstration (for online registration and review)

All participants are entitled to receive Webots Pro 90 day License (1 each)

Please contact info@robotsource.org to get license.

For Finalists selected to make presentation at ICRA

5 minutes free-style demonstration (within 1 meter x 1 meter square table)

5 minutes presentation of project (PPT explanation of robot's functions and technologies)

All necessary equipment and items must be prepared by each participating team.

Judging Criteria

Creative Idea - 40%

Technical Skills - 30%

Overall Completion - 30%

Judging Committee

Professor Dennis Hong (Virginia Tech)

Professor Daniel Lee (University of Pennsylvania)

For more details, please visit www.robotsource.org or contact Kayla Kim (info@robotsource.org)

The Manufacturing Challenge

This will be the fourth year of this simulation-based challenge which is designed to stimulate research in robotics dealing with problems related to mixed-palletizing and intra-factory package delivery and logistics.

CHALLENGE EVENTS

This year's events will include two challenges. Each challenge will have multiple events and teams can participate in one or more events.

(1) Mixed Palletizing Challenge:

This challenge is designed to explore algorithms and techniques to address the three dimensional cutting stock problem, a variant of the combinatorial non-deterministic polynomial-time hard (NP-hard) knapsack problem. Teams will create and evaluate pallet optimal packing plans using XML schemas, a Pallet Viewer application and the USARSim simulation framework.

(2) Mobility & Task Completion Challenge:

The events of this challenge are designed to address the need for one or more factory robots to operate in unstructured environments amongst dynamic obstacles. Teams will use the USARSim simulation framework to deliver completed pallets throughout a simulated warehouse environment.

TEAMS

Teams of one or more researchers, students and faculty may participate in the competition. Teams have the option to be physically present for the challenge events or, participate remotely from their home institution. New and multi-disciplinary teams that foster collaboration and include researchers from other disciplines (ex. operations research, systems engineering, applied mathematics) are especially encouraged to participate.

If you have any questions, contact George Dimitoglou (dimitoglou@hood.edu).

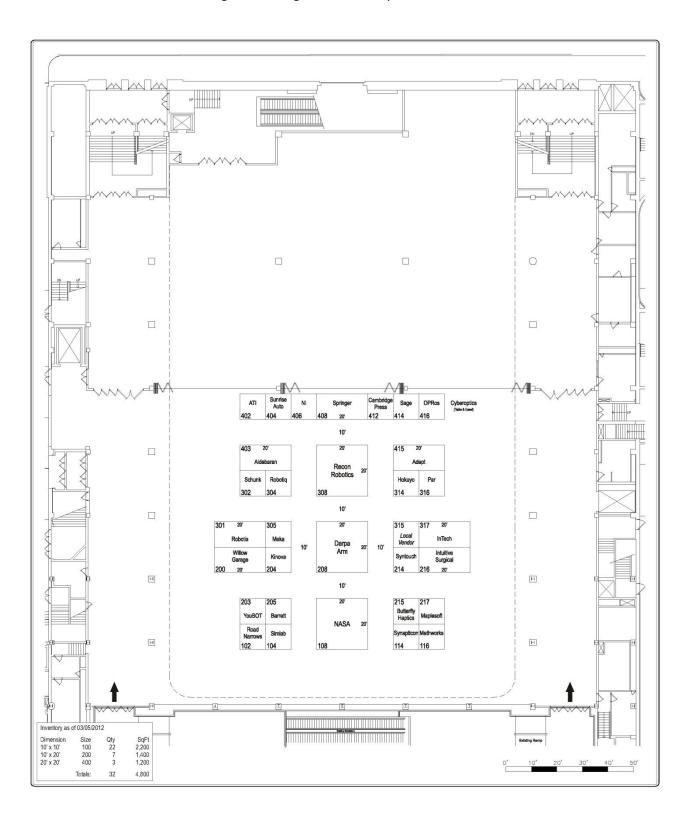
Schedule

Tuesday May 15	12:00 - 13:30 14:30 - 18:00 14:30 - 18:00	Indoor Robotic Contingency Mobile Microrobotics Task 1
Wednesday May 16 Thursday May 17	8:30 - 13:30 14:30 - 18:00	DARwin-OP
	8:30 - 13:30 14:30 - 18:00	Manufacturing
	8:30 - 12:00 14:30 - 15:30	Mobile Microrobotics Task 2
	12:00 - 13:30 14:30 - 18:00	Mobile Manipulation
	8:30 - 11:30	Mobile Manipulation
	9:30 - 11:00	Mobile Microrobotics Demos
	14:30 - 15:30	Robot Challenge Summaries

Exhibitions

Floorplan

The exhibitions and Robotic Challenges are being held in the Roy Wilkins Auditorium of RiverCentre in Saint Paul.



Robot Challenge Cambridge Sunrise NI **OPRos** ATI Springer Sage Cyberoptics Auto **Press** 402 404 406 408 412 416 403 415 Aldebaran Adept Recon Robotics Schunk Robotiq Hokuyo Par 304 302 308 314 316 Food & Beverage Food & Beverage 301 305 315 317 Local Robotis Meka InTech Vendor Darpa Arm Willow Intuitive Syntouch Kinova Garage Surgical 204 216 200 208 214 203 205 215 217 Butterfly Haptics YouBOT Barrett Maplesoft NASA Road Synapticon Mathworks Simlab Narrows 104 108 116 102 **Exhibits Entrance Entrance**



2012 IEEE International Conference on Robotics & Automation

St. Paul, Minnesota, USA May 14-18, 2012

Schedule

Tuesday May 15	12:00-18:00
Wednesday May 16	08:00-18:00
Thursday May 17	08:00-18:00
Friday May 18	08:00-12:00

Exhibitors



Aldebaran <u>www.aldebaran-robotics.com</u>



ATI www.ati-ia.com



Adept <u>www.adept.com</u>



Barrett Technology Inc. <u>www.barrett.com</u>



Butterfly Haptics <u>butterflyhaptics.com</u>



Cambridge Press <u>www.cambridge.org</u>



Cyberbotics <u>www.cyberbotics.com</u>



DARPA ARM

www.theARMrobot.com



Hokuyo Automatic Co., Ltd.

www.hokuyo-aut.jp



Kinova, Inc.

www.kinovarobotics.com



MEKA

www.mekabot.com



NASA

robonaut.jsc.nasa.gov



National Instruments

www.ni.com



OPRos

www.opros.or.kr



PaR Systems

www.par.com



Recon Robotics

www.reconrobotics.com



Road Narrows LLC

www.roadnarrows.com

ROBOTIS	Robotis	www.robotis.com
ROBOTIQ	ROBOTIQ	www.robotiq.com
\$SAGE	SAGE Publications Ltd.	www.sagepub.co.uk
SCHUNK	Schunk	www.schunk.com
	SimLab. Co. Ltd.	www.rlab.co.kr
2 Springer	Springer Publishers	www.springer.com
راهه برام المارية الم	Synapticon, Inc.	www.synapticon.com
syntouch	Syntouch LLC	www.syntouchllc.com
SUNRISE AUTO SAFETY FORCE/TORQUE SENSOR	Sunrise Auto	www.dummysensor.com
youBot Store	youBot	www.youbot-store.com

ICRA 2012 Awards

Best Automation Paper Award (sponsored by United Technologies Research Center)

The IEEE International Conference on Robotics and Automation (ICRA 2012) encourages research in automation by annually recognizing the Best Automation Paper for systems that operate autonomously in predictable environments over extended periods, or the explicit structuring of such environments.

Factors that will be considered are originality, depth, quality, presentation, and significance as related to automation, emphasizing efficiency, productivity, quality, and reliability, focusing on systems that operate autonomously in predictable environments over extended periods, or the explicit structuring of such environments.

Best Cognitive Robotics Paper Award (sponsored by CoTeSys)

This award is established to promote interdisciplinary research on cognition for technical systems and advancements of cognitive robotics in industry, home applications, and daily life.

Factors to be considered are: the significance of cognitive behavior and cognitive capabilities, interdisciplinary work, creativity, technical merits, originality, potential impact in applications in industry and at home, and clarity of presentation.

Best Manipulation Paper Award (sponsored by Ben Wegbreit)

The award wants to highlight innovative efforts in the planning and execution of manipulation tasks which take place in dynamic environments. The integration of humans is also critical. Numerous challenges need to be overcome and new applications are also highly sought after.

Best Medical Robotics Paper Award (sponsored by Intuitive Surgical)

This award will recognize outstanding work in the area of medical robotics and computer-assisted interventional devices and systems. Relevant topics may include the design and development of novel devices and robotic systems, and their integration with navigation and imaging technologies for enhanced clinical efficacy.

Best Service Robotics Paper Award (sponsored by KUKA)

This award promotes between robotics science research and industry R&D advancement in the area of service robotics applications (both professional and domestic).

Factors to be considered are: the significance of the new applications, technical merits, originality, potential impact on the field, and clarity of presentation.

Best Vision Paper Award (sponsored by Ben Wegbreit)

For the best paper relating to Vision presented at the IEEE International Conference on Robotics and Automation.

Best Video Award

This award recognizes the most outstanding video in the Video Proceedings of the annual IEEE International Conference on Robotics and Automation.

Factors to be considered are: Technical merit, originality, potential impact on the field, practical significance for applications, and clarity of the video presentation.

Best Student Paper Award (sponsored by United Technologies Research Center)

To recognize the most outstanding paper authored primarily by a student at the annual IEEE International Conference on Robotics and Automation.

Factors to be considered are: Technical merit, originality, potential impact on the field, practical significance of the applications, clarity of the written presentation in the proceedings, and quality of the oral presentation at the conference.

Best Conference Paper Award

The Best Conference Paper award recognizes the most outstanding paper in the Proceedings of the annual IEEE International Conference on Robotics and Automation.

Factors to be considered are: Technical merit, originality, potential impact on the field, clarity of the written paper, and quality of the oral or other presentation.

Industry Forum

Bridging the Gap between Academia, Industry, and Government to Benefit **End-Users**

Tuesday May 15, 2012, 08:30-17:30, RiverCentre Rooms 10-11 Organizers: Raj Madhavan (University of Maryland, College Park & National Institute of Standards and Technology, USA) & Rainer Bischoff (KUKA Laboratories, Germany)

The ICRA 2012 industrial forum will focus on bridging the gap between academia, industry and government by bringing together experts, leaders, and practitioners from diverse domains and from across the world to provide a truly global perspective. Similar efforts have been undertaken in the United States, Europe, and Asia with mixed results. You will hear from researchers, vendors, and funding agencies on their experiences and the roadblocks they have encountered. A panel discussion will conclude the forum to foster dialog between participants and speakers. Based on the discussions stemming from the entire day, a white paper will be published with an action plan to go from where we are to where we can. The target audience of the forum is end-users, developers, vendors, and anyone who is interested in robotics and automation technologies.

In addition to the main theme, the following topics will be addressed during the forum:

- How can industry and academia work together by actively collaborating and acknowledging differences in practices, implementations, and mindset?
- What can government agencies do to foster such collaboration and facilitate innovation and technology transfer?
- How can the end-users and the community at-large benefit from the above three groups working as a cohesive whole?
- What are known (and hidden) and not-so-widely discussed barriers and roadblocks?
- What is the role of standardization and ad-hoc standards and best practices?
- Can the support of entrepreneurship address some of the aforementioned problems?
- How can we leverage existing know-how and target the low-hanging fruit as well as long-term issues in a collaborative fashion?

Agenda

The final list of speakers is yet to be confirmed. Please check the ICRA 2012 website (http://www.icra2012.org) and IEEE-RAS IAB website (http://www.ieee-ras.org/industrial) for an updated final agenda.

08:30-08:40	Introduction & Welcome: Dr. Raj Madhavan & Dr. Rainer Bischoff
08:40-09:00	Opening Remarks: IEEE-RAS President, Prof. David Orin & IEEE President-Elect, Dr. Peter Staecker

09:00-10:30	Invited Talks (1)
10:30-10:45	Coffee Break
10:45-11:45	Invited Talks (2)
12:00-14:30	Lunch & ICRA 2012 Plenary
14:30-16:00	Invited Talks (3)
16:00-16:15	Coffee Break
16:15-17:15	Panel Discussion
17:30	Adjourn

NSF Presentation

Entrepreneurship and Innovation: The Next Decade NSF's Innovation Corps and the Future of Entrepreneurial Education

Wednesday May 16, 2012, 15:00-17:00, RiverCentre Rooms 10-11 **Organizer: Richard Voyles (National Science Foundation, USA)**

In the United States, the National Science Foundation (NSF) is developing a new program to reinvigorate entrepreneurship tied to federally-sponsored research. The Innovation Corps is an aggressive new program to train students and principal investigators in the subtleties of commercializing output of basic research. Researchers with NSF-sponsored research ideas that they believe are nearing commercial potential can apply for funding to help determine the business potential of ground-breaking ideas. To qualify for funding and make a go/no-go decision on commercialization potential, PIs must do two things: assemble an entrepreneurial team and commit the team to enroll in an NSF-supported entrepreneurship course tailored for engineers and scientists.

Education is a key pillar of the NSF mission and entrepreneurship and innovation are key drivers of the United States' and world economies. However, some believe entrepreneurial education has failed to deliver substantive changes in the success rate of technology-based start-up businesses in the United States. NSF has adopted an emerging new curriculum being championed at select universities that formulates business creation as a methodology familiar to engineers and scientists: hypothesis testing. By capturing this methodology and introducing it to educators, engineers and scientists, the Innovation Corps endeavors to construct an innovation ecosystem that more efficiently captures the fruits of government investment in long-term research for job creation and economic development. This bold new program has been garnering deep interest from government agencies and entrepreneurial educators around the world. In an economic climate that presents increasing challenges due to the accelerating pace of technological change, dwindling natural resources, rising unemployment, and spiraling populations, greater efficiency in translating academic advances into meaningful impact on society is relevant to all.

In this presentation, the NSF Innovation Corps for U.S. researchers will be described, as well as personal perspectives on how the program has shaped PI plans.

http://www.nsf.gov/news/special reports/i-corps/

Social Events

Monday, May 14

Two parallel gatherings will take place at the Crowne Plaza.

- Student Social: Students pre-registered for this welcome party will be treated to local food from the MN State Fair, and enjoy a presentation by Jorge Cham.
 - Location: Minnesota Ballroom, Lower Level (18:00 20:00)
- ICRA 2012 Reception: An opportunity for workshop attendees and early arrivals to socialize and network before the start of the conference

Location: Great River Ballroom, First Level (18:00 – 20:00)

Tuesday, May 15

• Women in Engineering Luncheon: This event is organized by the IEEE Women in Engineering (WIE) and Membership Activity Board (MAB), and sponsored by IEEE. The ICRA "Birds of a Feather" Women Luncheons offer the opportunity to young female researchers to discuss informally with senior faculty members around a free lunch. "Birds of a Feather" Women Luncheon has been held as one of social events during ICRA since 2007, and will be held as part of services served by WIE and MAB since 2011. Free lunch will be available on a first-come, first-served basis to ICRA women attendees.

Location: Crowne Plaza, Great River Ballroom (12:00 – 13:00)

Welcome Reception.

Location: Minnesota Science Museum (19:30 – 21:30)

Wednesday, May 16

• GOLD Lunch: A lunch for all Graduates of the Last Decade (GOLD) will be organized at the Continental Ballroom level. This luncheon was initiated within the RAS Technical Activities Board (TAB) as a means to let graduates be aware of what the society has to offer, and to network with each other. The opportunity is also used to present the structure of the society, and introduce the various Technical Committees forming TAB. RAS members will have first priority. If you are not yet a member, you can sign up now at www.ieee-ras.org. Pre-registration required.

Location: Crowne Plaza, Great River Ballroom (12:00 – 13:00)

• Lunch with the Leaders: (for 100 RAS student members) This event is organized by the IEEE Robotics and Automation Society (RAS). Lunch with Leaders (LwL) was initiated by the Student Activities Committee with the aim to provide students with an opportunity to get in contact with leaders and get advice and mentoring on their career and research. Leaders in attendance will include: Antal Bejczy, T. C. Steve Hsia, Paolo Dario, David Orin, Vincenzo Piuri, Kazuhiro Kosuge, Bruno Siciliano. Note that this activity is

intended for current students. RAS members will be prioritized. Pre-registration required.

Location: Crowne Plaza, Windows on the River (12:00 – 13:00)

Banquet:

Location: RiverCentre Grand Ballrooms (19:00 – 21:30)

Thursday, May 17

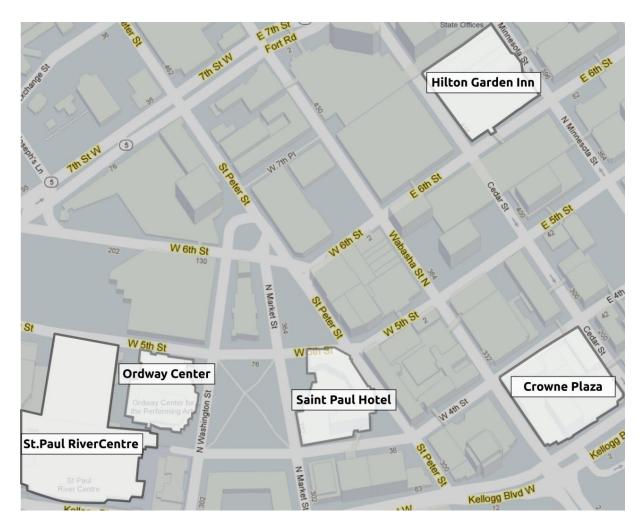
Awards Lunch:

Location: RiverCentre Grand Ballrooms (12:00 – 13:00)

Farewell Reception:

Location: RiverCentre Roy Wilkins Auditorium (18:30 – 20:30)

Conference Locations



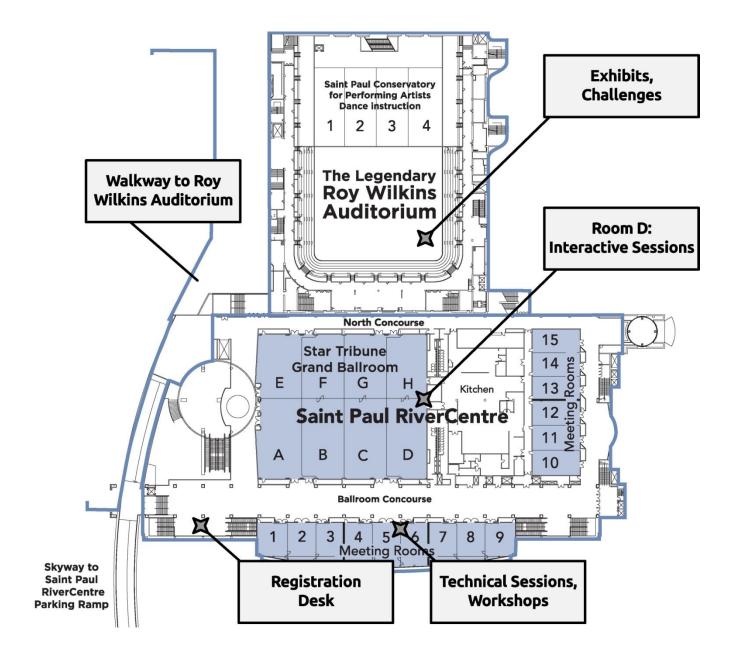
The IEEE International Conference on Robotics and Automation (ICRA) 2012 will kick off on May 14. From May 14 to May 18, the conference will showcase technical sessions, workshops, tutorials, and exhibits reflecting advances in our rapidly developing field.

ICRA 2012 will take place at the RiverCentre in Saint Paul, Minnesota, USA. The convention center is located in downtown Saint Paul overlooking the Mississippi River. The walk from RiverCentre to Crowne Plaza, the main conference hotel, takes about eight minutes along Kellogg Boulevard.

All workshops, technical sessions, exhibits and robotics challenges will be held at the RiverCentre. The Crowne Plaza will host the Robotics and Automation Society (RAS) meetings, as well as some of the social events. On Monday, Tuesday, Wednesday and Friday, lunchboxes will be available for purchase at the Ordway Center.

Minneapolis and Saint Paul constitute a vibrant metro area known as the Twin Cities. The Cities are home to a number of Fortune 500 companies including Target, Best Buy, 3M, Medtronic, and Xcel Energy. The area is also a major hub for arts, sports, education and entertainment. Together with its numerous parks, lakes, biking and hiking trails, the Twin Cities have something fun and exciting for any taste. As the ICRA 2012 Organization Team, we hope that you enjoy your time in the Land of 10,000 Lakes!

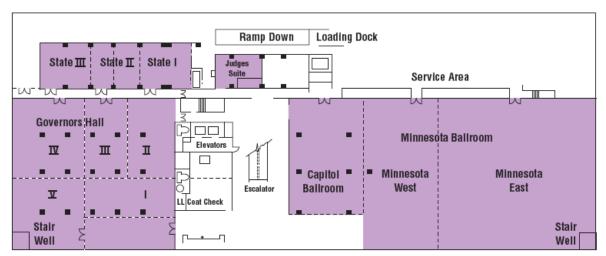
Conference Venue: Saint Paul RiverCentre



Meeting Locations at the Crowne Plaza

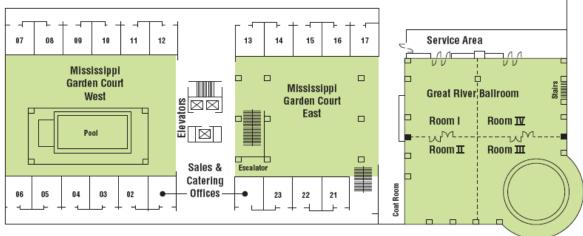
The events will be spread out across the Lower Level, Lobby Level and the First Floor.

Lower Level: Minnesota Ballrooms, Governors Hall, State Rooms



Lower Level

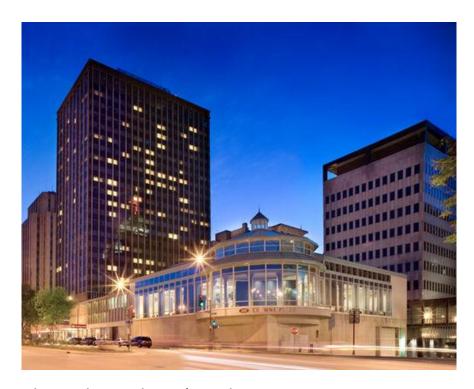
- Lobby Level: Kellogg I, II, II (layout not shown)
- First Floor: Great River Ballroom



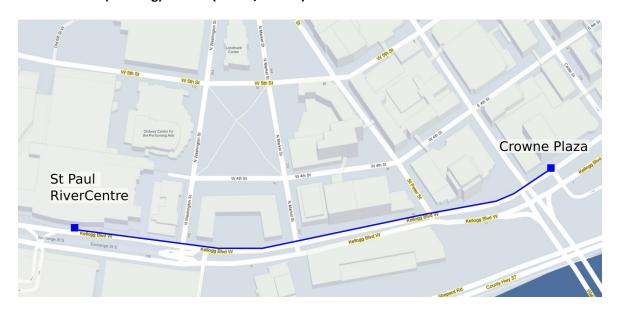
First Floor

Accommodations

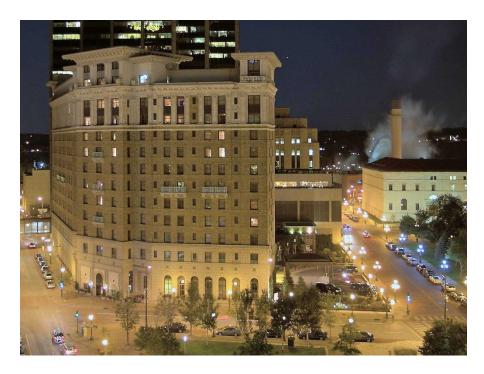
Crowne Plaza St. Paul Riverfront Hotel



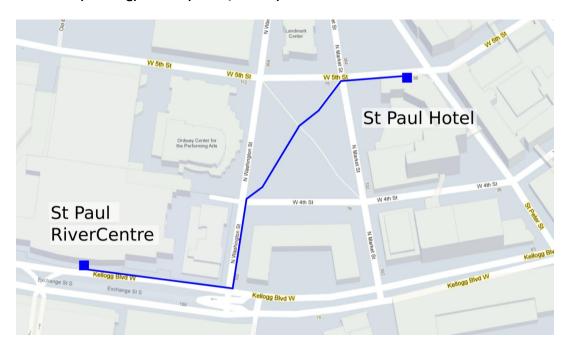
Distance from Venue (Walking): ~8min (0.4mi / 0.6km)



St. Paul Hotel



Distance from Venue (Walking): ~5min (0.3mi / 0.5km)



In case that you have problems with the online reservation system of the Saint Paul hotel, please call or email the hotel and mention the IEEE code 486144.

Phone (Toll Free): 1-800-292-9292 Email: reservations@saintpaulhotel.com

■ The Science Museum of Minnesota



On Tuesday May 15, the ICRA 2012 Welcome Reception will take place at the Science Museum of Minnesota. Located on Kellogg Boulevard and overlooking the Mississippi River, the Science Museum of Minnesota offers guests a unique opportunity to explore all kinds of science learning. With nearly nine acres of indoor space devoted to hands-on science activities, a state-of-the-art giant screen theater, and an outdoor exhibit gallery featuring science-themed mini-golf and a 17,000 square-foot prairie maze, the Science Museum of Minnesota has something for visitors of all ages

and backgrounds to enjoy.

In the Science Museum of Minnesota's Experiment Gallery, visitors can carry out simple experiments and find the joy of discovery as they uncover the fundamental properties of physical events. They can explore energy transformation, weather, air dynamics, light, waves and resonance, and more. The Science Museum of Minnesota's Cell Lab offers visitors an opportunity to don a lab coat and gloves to explore the world of cells through creative experiments.

One of the highlights of the museum's Dinosaurs and Fossils Gallery is an 82-foot-long **Diplodocus**, a plant-eating dinosaur from the Jurassic





period. With St. Paul's roots originating from the Mighty Mississippi, the Science Museum of Minnesota's authentic towboat, the Charles E., serves as a viewing platform overlooking the river that gave the city its life. A perennial summer visitor favorite, the Big Back Yard features a science-style mini-golf course, a 17,000-square foot prairie maze, gardens, and an award-winning solar-powered building. During the conference, SMM will also feature a Pirates exhibit!

Local Attractions: Sample Itineraries

Have some time to spare? Try out one of these sample itineraries, as recommended by our volunteers!

Downtown Saint Paul

If you will miss the welcome reception, you can visit the **Science Museum of Minnesota** (http://www.smm.org/) which is right across from the RiverCentre (be sure to see the pirate exhibit). Alternatively, you can visit the Minnesota History Center: http://www.minnesotahistorycenter.org/.

The **Minnesota History Center**, which opened in October of 1992, is home to the Minnesota Historical Society's collections and provides a place for visitors to discover their connections to the past. This landmark building houses a museum, library, classrooms, and conference rooms, the 314-seat 3M Auditorium, two museum stores and a café.

During the conference, a new exhibit featuring a rare, early published version of the U.S. Constitution and an even more rare draft of the Bill of Rights, along with the original editions of the two state of Minnesota Constitutions, will be on display.





How to get there: The walk from the RiverCentre takes about ten minutes. We recommend taking the following path which is slightly longer, but includes Mickey's Dining Car. Listed on the national register of historic places and featured in several movies, the Food Network and travel TV programs, Mickey's is an authentic 1930's Art Deco diner. The diner has been serving up breakfast, lunch and dinner 24 hours a day for nearly 70 years. For more see www.mickeysdiningcar.com.





Other Saint Paul Activities

Cathedral of St. Paul: Take a fifteen minute walk from the RiverCentre to see one of the most prominent attractions of St. Paul.

Jonathan Padelford: Enjoy the splendor of the Mississippi with a ride on the Jonathan Padelford, an authentic sternwheeler riverboat. A historically narrated public sightseeing excursion departs at 2P.M. on Saturdays and Sundays beginning May 12. The tour runs for 90 Sights on the way include: the St. Paul High Bridge, Fountain Cave, Pike Island, and Fort Snelling. Tours depart from Harriet Island, which is directly across the river from the Science Museum. The Jonathan Padelford is a twenty minute walk from the Crowne Plaza (twenty-five from the RiverCentre). Visit http://www.riverrides.com/pages/public/sightseeing.html.



Wabasha Street Caves: These manmade caves have historically been used for growing mushrooms and for the storage of food. In the 1920s, they were converted into a nightclub, and frequented by gangsters such as John Dillinger (OK, it's just a rumor). The caves are said to be haunted (this one is definitely true). The walk is about fifteen minutes from the Crowne Plaza, and twenty from the RiverCentre.

Summit & Grand Avenues: In the mid-1800s, St. Paul was transitioning from a town to a city, and the business leaders of the day used their newfound wealth to build themselves mansions on the hill overlooking their empire. Many of these mansions are still standing today, under the shade of broad trees, stretching from the Cathedral of St. Paul down Summit Avenue for 4 1/2 miles. This is the longest stretch of Victorian houses in the US. Highlights include the James J. Hill House, the Minnesota Governor's Mansion, and the row house where the author F. Scott Fitzgerald lived. If you get tired of houses and trees you can stop for a bite to eat on Selby Avenue near the Cathedral, or alternatively near the intersection of Grand Avenue and Victoria (a block south of Summit Ave). Both areas were once streetcar stops which allowed commercial districts to build up in mostly residential areas. Though the street car is long gone, the commercial areas remain, and they are popular local destinations.

Mall of America & Summit Brewery



The **Mall of America** features a wide range of dining and entertainment options including an indoor theme park, a water park, a 1.2 million gallon aquarium, 4.3 miles of store fronts, and over 50 restaurants. Visit www.mallofamerica.com for more information.

How to get there: The conference is planning to provide shuttles to MoA. Please check the information booth by the registration area in RiverCentre for departure information. You can also take Bus 54 Express Route on 5th Avenue. The trip there is about half an hour.

Summit Brewery: If you are taking public transportation, you can stop by the Summit Brewery along the way. Summit is a uniquely Minnesotan beer, and a local favorite. The Brewery offers free tours and free samples, and has a gift shop on site. Book the tour in advance at: http://www.summitbrewing.com/culture/tours.



How to get there: Route 54 takes 20 minutes from the Saint Paul River Centre. Disembark on Otto Avenue.





Minneapolis

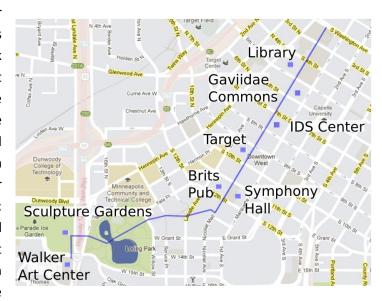


Our suggested itinerary for Minneapolis starts from the Minneapolis Central Library (make sure to peek inside!) and ends at the Minneapolis Sculpture Gardens and Walker Art Center. The walk takes about thirty minutes. Our starting point, the Minneapolis Public Library, marks the north end of Nicollet Mall – a pedestrian mall lined with restaurants and shops. You can walk outside or indoors, through the skyways - a complex web of tunnels used by Minnesotans in the winter.

The best place to enter the skyway system is through the Gaviidae Commons home to Nieman Marcus, the premium outlet Saks Off 5th, and other upscale shopping and dining areas. Continuing down the mall you'll encounter the IDS

center, the tallest skyscraper in the Twin Cities. The Center is home to a nice indoor plaza and to more

affordable lunch options. Between the IDS center and Target flagship store, you can stop by Barnes and Noble (bookstore), go to Panera for quick sandwich, or enjoy Zelo; an upscale restaurant featuring American and Italian fusion cuisine. The next block features the Target flagship store along with a rich selection of bars and restaurants including: The News Room, an American pub and restaurant with decor showcasing news events in Minneapolis' history; Barrio, a tequila bar with Mexican appetizers; and The Local, a famous Irish pub. The Local is a great spot to catch the latest European soccer match on TV. In the following blocks, there is the



Minneapolis Symphony Hall, which is separated from the street by a large open plaza, and Brit's Pub, a classic English watering hole complete with the largest rooftop patio in the city and its own lawn bowling pitch. In the middle of the next block, Loring Greenway leads away from the street to the west. The Greenway provides a quick, shady path to Loring Park and the pedestrian bridge over Highway 94 to the Minneapolis Sculpture Garden and Walker Art Center.

Featuring over 40 permanent art installations, the Minneapolis Sculpture Garden is one of the largest urban sculpture gardens in America. The Walker Art Center is one of the nation's five biggest museums showcasing modern art. It features work by Georgia O'Keeffe, Andy Warhol, Cindy Sherman, and Frank Gaard. The Museum Shop is worth a visit, as is the restaurant 'Gather,' with its inventive, locally-sourced American cuisine. For more information see www.walkerart.org.

How to get there: In the evening take one of the conference-provided shuttles (planned – please check the info desk), or catch the 94 bus on the corner of Minnesota and 6th Street. From the Crowne Plaza, walk east along Kellogg Blvd to Minnesota St. (two blocks), then walk along Minnesota St. to 6th (three blocks). There are many other direct buses from Downtown Saint Paul to Downtown Minneapolis (e.g. Route 16 and 50), but 94 is the fastest.

Other Minneapolis Activities near the Nicollet Mall:

- Baseball fans can catch a Minnesota Twins game at the new Target Center in Minneapolis:
 - May 13 (1:10pm) against the Blue Jays
 May 14 (7:10pm) and 15 (12:10pm) against the Indians
- The Twin Cities support more live theater per capita than any other city in the U.S. with the exception of New York City. There are about one hundred theaters in the Twin Cities. Most are located on Hennepin Avenue in downtown Minneapolis
- The Minnesota Orchestra, now in its second century and led by Music Director Osmo Vänskä, ranks among America's top symphonic ensembles, with a distinguished history of acclaimed performances. During the conference, you can catch:
 - o Romeo and Juliet Sat May 12, 2012 8P.M.
 - Vänskä, Sudbin and Mozart Thu May 17, 11A.M.; Fri May 18, 8P.M.; Sat May 19, 8P.M.; Sun May 20, 2P.M.





University of Minnesota Campus & Riverfront District (Minneapolis)

The Mississippi river runs through the University of Minnesota's Minneapolis campus dividing the campus into the East Bank and West Bank. The Washington Avenue Bridge connects the two banks with dedicated pedestrian and bike lanes. The bridge provides excellent views of the Mississippi and of downtown Minneapolis.



The Northrop Mall is the heart of the campus, with the Northrop Memorial Auditorium on one end, and the Coffman Memorial Union at the other. The Union is a hub of recreational student activities. The campus is also home to the Weisman Art Museum and the Bell Museum of Natural History, both on the East Bank. Notable architecture on campus includes the Weisman building (picture below) and the Armory building. Visit http://www.umn.edu/ to learn more.

How to get there: You can join the campus tours organized by the ICRA committee. You can also take buses Route 3, 16, and 50 from the Crowne Plaza Hotel to the campus (about 55 minutes). Pleasant Street and Eddy Hall (East Bank) is the stop you want. The University operates a regular, free shuttle service around the campus.



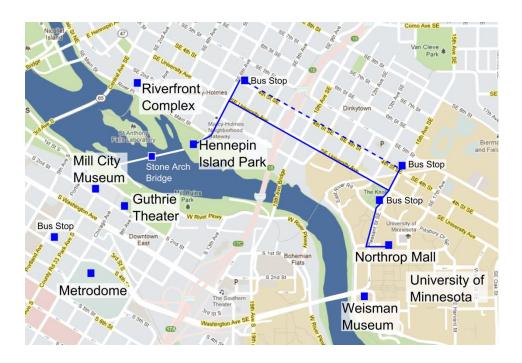


Riverfront District: Close to the University of Minnesota is the historic Riverfront district featuring a museum, observation decks,

restaurants with live outdoor music, jogging and biking trails. The Guthrie Theater building features a cantilevered lobby open to all visitors, dubbed "the endless bridge", with an observation site overlooking the Mississippi River and the Minneapolis skyline. The Mill City Museum, built into the ruins of what was once the world's largest flour mill, features multimedia shows, movies and self-guided exhibits about the intertwined histories of the flour industry, the river, and the city. The Saint Anthony Riverfront complex situated next to

the Hennepin Island Park offers numerous sports restaurants and bars with live outdoor music in the summer. Biking trails run across both banks of Mississippi, and rental bikes are available at nearby locations from Nice **Ride MN**. Visit http://stanthonymain.com/.

How to get there: From St. Paul, you can take Bus Route 94 and get off the bus at 4th Street S and Portland Avenue (about 35 minutes). If you are coming from the university campus, you can walk directly (about 15 minutes), or take bus route 6 at the 4th Street and 15th Avenue SE bus stop and get off at the 4th Street and 4th Avenue SE bus stop (this takes about six minutes).



Don't want to walk?

- From the St. Anthony Main (near the Riverfront complex above) you can rent bikes, or take a guided Segway tour:
 - o https://www.niceridemn.org
 - o http://www.humanonastick.com
- Minneapolis was recently named America's most bike friendly city by Bicycling Magazine

Other Local Information/Activities

Conference Registration

A conference registration desk will be set up and opened at the RiverCentre during the following hours:

Monday May 14	07:30-18:00
Tuesday May 15	07:30-18:00
Wednesday May 16	07:30-17:00
Thursday May 17	07:30-17:00
Friday May 18	07:30-13:00

Conference Hot-Line

During the registration hours, you can reach our information desks by calling +1-651-726-1802

Wireless Network Access

Wireless network access will be provided for all participants during the conference. There will be two SSIDs (secure and open access):

- ICRA2012 SSID for open authentication
- ICRA2012-secure SSID for WPA2 with PSK

To ensure excellent quality of service, we will support 2400 connections in meeting rooms 1-15 and the hall outside these rooms.

Technical Tours

Technical tours will take place at the University of Minnesota Digital Technology Center (DTC) on the morning of Monday, May 14 and on Friday, May 18 in the morning and afternoon. The tours will give participants the opportunity to visit research exhibits and attend robotics and computer vision demonstrations from the research groups of faculty at the UMN including, among others: Maria Gini, Volkan Isler, Bernice Mettler, Nikos Papanikolopoulos, and Stergios Roumeliotis. The tours are free and include transportation. Pre-registration is required. Please view the conference website for more information after May 1st.

Children

Minnesota offers some wonderful activity options for families with kids. Both the Science Museum (across from the conference venue) and the Children's Museum (a couple of blocks North) provide all day fun and learning. The Mall of America is a must-see. You might also consider visiting Como Park. Once there, be sure to see the Como Ordway Memorial Japanese Garden – a living symbol of the peace and friendship between Saint Paul and its sister city Nagasaki, Japan. Como Park also houses a small zoo, which is free and open every day of the week. You can catch Bus 3 from downtown Saint Paul to Como Park.

The main zoo is the Minnesota Zoo which is ~20 miles south of the Cities, and has lots of fun exhibits and activities.

Weather/Time Information

The average temperature for St. Paul in the middle of May is a high of 70°F (21°C) and a low of 49°F (9.4°C). The weather is highly variable. Temperatures in the mid-80s or the 30s are not unheard of for this time of the year. Most days are sunny but intense rainstorms can arrive with little warning. Humidity ranges from medium to high. Dressing in layers is advisable.

Saint Paul is in the US Central Daylight Time zone (GMT -5).

The North Country

Metro Connections will offer tours to Northern Minnesota: http://www.metroconnections.com/transportation/tours/

Check out the information booth at the conference for details.

More Saint Paul Information

The City of Saint Paul (http://www.visitsaintpaul.com/) will staff an information booth located in the RiverCentre lobby during the core conference hours to answer questions about Saint Paul activities.

Shuttles

The conference is planning to provide shuttles to downtown Minneapolis in the evening and the Mall of America during the day. The shuttles will pick up and drop off from the RiverCentre on Kellogg Boulevard. A shuttle to the Minneapolis/St. Paul International Airport is available for a fee (please see below for discount information).

Discount on SuperShuttle and ExecuCar MSP Airport Transfers

Online Group Discount Code: QT4QC valid for travel 5/9-5/22, 2012)

To receive your group's discounted rate:

- Make your roundtrip reservation by following this link: https://www.supershuttle.com/default.aspx?GC=QT4QC
- Provide the requested information your name, flight details (from and to the airport), and your local contact phone number.
- Select your hotel/landmark from the drop-down listing of hotels (type 3-5 letters of name in search box)
- Choose your preferred service and pricing: (additional \$1 per person fuel surcharge may apply)
 - SuperShuttle Shared-Ride (\$13 one way, \$22 round trip per person) savings of \$1 or \$6 RT
 - Exclusive Van Save on Service, up to 10 passengers (\$85 plus 18% gratuity)
 - ExecuCar Sedan Service (\$49 plus 18% gratuity per direction for up to 4 passengers)
 - ExecuCar baggage claim "Meet and Greet" additional \$25
- Provide a credit card for payment and print your confirmation page [or e-mail it to yourself]

Reservations from MSP are not required for SuperShuttle service, but are recommended. ExecuCar must be reserved and pre-paid in advance.

Terminal #1: Upon arrival to MSP International airport, claim your luggage at Baggage Claim. From "Baggage" follow the signs for Hotel Shuttles and Scheduled Vans to the Ground Transportation Atrium. The SuperShuttle service desk is centrally located and open 24/7.

Terminal #2 (Southwest, Sun Country, Air Tran): Proceed across the street from the terminal; the ground transportation center is located on the ground floor of the parking ramp. Pick up the courtesy phone at the blue and yellow SuperShuttle Kiosk and you will be automatically connected to a local agent.

Please note, these are non-commissionable discount rates. A \$2 fee may be assessed for 1-800# reservations.

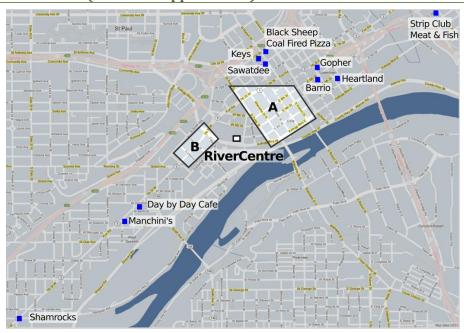
Coffee



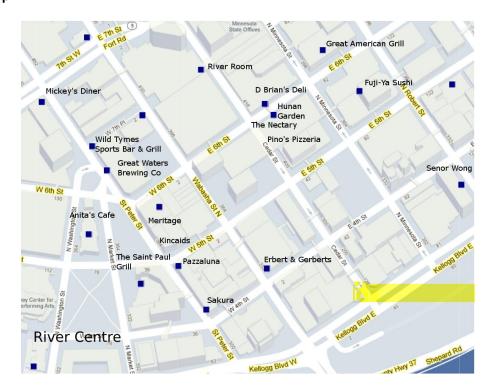
Dunn Bros Coffee	Caribou Coffee	Starbucks	Caribou Coffee
367 Wabasha St	56 6 th St E	411 Cedar Street	444 Cedar Street
St Paul, MN 55102	St Paul, MN 55101	St Paul, MN 55101	St Paul, MN 55101
(651) 767-0567	(651) 225-0844	(651) 292-5187	(651) 222-3130
Dunn Bros Coffee	Caribou Coffee	Starbucks	Claddagh Coffee
242 7 th St W	401 Robert Street	380 St Peter St	459 7 th St W
St Paul, MN 55102	St Paul, MN 55101	St Paul, MN 55101	St Paul, MN 55102
(651) 222-3445	(651) 295-8686	(651) 222-7118	(651) 600-3400

Other places to get a cup of Joe: St Paul RiverCentre, Crowne Plaza Riverfront Hotel (has a Starbucks on site), St Paul Hotel

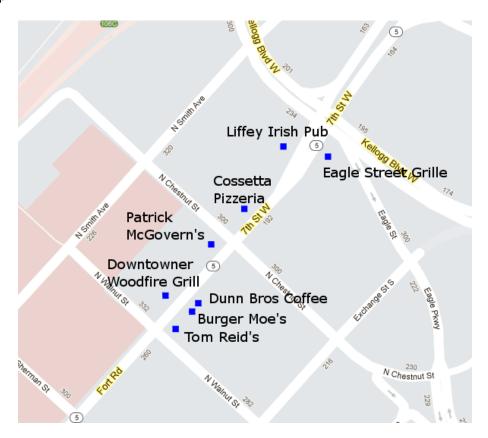
A Map of Area Restaurants (Locations Approximate)



Area A Close-Up



Area B Close-Up



Where to eat in Saint Paul (\$)

The Twin Cities are home to many great restaurants, theaters, and bars. This is just a small sampling of what Saint Paul has to offer. The places listed below are perfect for those on a student budget:

American Cajun Grill

56 6th Street East, Suite 210 (651) 222-3738

Cajun/Creole; Open for lunch on weekdays.

Anita's Cafe

75 5th Street West, Suite 101 (651) 292-4160

For \$7.25, Anita's offers lunch in a box: a deli sandwich, and homemade side salad. Dine-ins are also welcome.

Black Sheep Coal Fired Pizza

512 North Robert Street

(651) 227-4337

Minnesota's first coal fired pizza place. Simple, good food.

Burger Moe's

242 West 7th Street

(651) 222 - 3100

Patio seating. Sixty beers from around the world forty of them on tap. Just two blocks from the Xcel Energy Center.

Cossetta's Italian Market & Pizzeria

211 7th Street West

(651) 222-3476

Generous portions. Kid-friendly. Cafeteria-style Italian deli and pizzeria. Rooftop seating offered.

D. Brian's Deli

444 Cedar Street

(651) 223-7979

Fast service. Across the street from Bruegger's Bagels and Potbelly Sandwich Shop. Emphasis on healthy, natural ingredients.

Day by Day Cafe

477 7th Street West

(651) 227-0654

Locally renowned breakfast served until close at 3PM. Patio seating. Soups/sandwiches/salads.

Erberts & Gerberts

334 Wabasha Street North

(651) 298-1919

Soups and sandwiches. Erberts is a Wisconsin-based chain.

The Four Inns

101 East 5th Street, Suite 220

(651) 291-7939

Skyway diner. Around since 1970. Lots of character.

Gastrotruck

(763) 607-6055

A food truck, serving pub-style treats including sliders, crudo, and tacos. Call to find out where they are parked!

Jimmy John's

5 7th Place West

(651) 291-5000

Sandwich chain, headquartered in Champaign, Illinois.

Maison Darras

401 Robert Street North

(651) 379-2770

Open Monday - Friday until 2P.M. A French bistro in the sky(way)! All sandwiches are under \$6.

Meritage Crepe Stand

410 St. Peter Street

(651) 222-5670

Check Twitter (@meritage_stpaul) daily to see what's on the menu. The Stand is open Tuesdays - Fridays, 11A.M. to 2 P.M. Both sweet and savory crepes are available.

Mickey's Diner

36 7th Street West (651) 222-5633

Serving St. Paul around-the-clock since 1939. A classic diner experience.

The Nectary

56 E 6th Street, Suite 211 (651) 292-9963

Skyway location. Quick service. The salads are recommended.

Pinos Pizzeria

55 E 5th Street, Suite 1400 (651) 228-0673

NY-style pizza. Food court location.

Potter's Pasties and Pies

(612) 819-3107

Parks weekdaily in downtown St. Paul. Both sweet and savory pies offered.

Where to eat in Saint Paul (\$\$)

The eateries listed here are perfect for those looking for a fine dining experience that won't break the bank.

Barrio

235 6th Street East (651) 222-3250

Latin American street food. Small plates. Great bar. Lively atmosphere.

Mancini's

531 7th Street West (651) 224-7345

Char house and lounge.

Downtowner Woodfire Grill

253 West 7th Street (651) 228-9500

American bistro. Signature dishes include fire-roasted meats, fish cooked in the Persian tradition.

Eagle Street Grille

174 W 7th Street (651) 225-1382

Across the street from the Xcel Energy Center. American fare. Free wireless. Sixteen TV screens.

Fuji Ya Japanese Restaurant

465 Wabasha Street (651) 310-0111

Full bar. Most award-winning sushi restaurant in the Twin Cities.

Great Waters Brewery

Hamm Building 426 St. Peter Street (651)221-BREW

Brewpub. Handcrafted beer. Patio dining. Very close to Xcel Energy Center.

Keys Cafe & Bakery

500 Robert Street North

(651) 222-4083

of nine Twin Cities locations. "Created-from-scratch" recipes that "you grew up with."

Meritage (for lunch)

410 Saint Peter Street (651) 222-5670

Open for lunch Tuesday - Friday with Happy Hour 3-6 on those days. Urban bistro. French.

Pazzaluna Urban Italian Restaurant & Bar

360 Saint Peter Street

(651)223-7000

Trattoria. Dinner Only.

Sakura Restaurant & Sushi Bar

350 Saint Peter Street, Suite 195 (651) 224-0185

Can get crowded on weekend nights. Newly remodeled. Full-length sushi bar.

Sawatdee

486 Robert Street North (651) 528-7106

Voted "Best Thai 2011" by MPLS St Paul Magazine Readers' Poll. Happy Hour everyday, 4-6P.M.

Senor Wong

111 East Kellogg Boulevard (651) 224-2019 Asian/Latin fusion.

The St. Paul Grill

350 Market Street (651)224-7455

Exceptional bar. New American. Grill.

Where to eat in Saint Paul (\$\$\$)

For a memorable Saint Paul-fine dining experience try:

Heartland Restaurant

289 E 5th Street (651) 699-3536

Sustainable, locally raised and grown ingredients used. Organic. Menu changes nightly. Two pre fixe options. Dining room opens at 5P.M., with last seating at 9:30P.M. Closed Mondays. Executive chef is a 2010/2011 James Beard Award nominee. Reservations are recommended.

Kincaid's Fish, Chop & Steak House

380 Saint Peter Street (651) 602-9000

Steak (USDA prime-aged), seafood, and chop house. Classic American dining.

The Strip Club (It's not what you think!)

378 Maria Avenue

(651) 793-6247

Specializing in seasonal fare (especially meats), they boast excellent service and a cozy atmosphere. Open for dinner only, reservations recommended.

Meritage (for dinner)

410 Saint Peter Street

Open for lunch Tuesday - Friday with Happy Hour 3-6 on those days. Urban bistro. French.

Pubs and Bars in Saint Paul

Eagle Street Grille

174 7th Street West (651) 225-1382

Located right across from the RiverCentre. Traditional American. Full bar. Outdoor seating.

Shamrocks

995 7th Street West (651) 228-9925 Live music. Great burgers.

The Artist Quarter

408 Saint Peter Street (651) 292-1359

A favorite for local and professional musicians. They specialize in jazz, and have a small cover charge, but the 7P.M. shows on Monday, Tuesday and Wednesday are free. Located in the heart of downtown Saint Paul.

Gopher Bar

241 7th Street East (651) 291-9638

Cheap beer, Coney dogs, and a dive bar-crowd. A Red State-bar in a state that is Blue!

The Hat Trick Lounge

134 E 5th Street (651) 228-1347

Inexpensive bar food. A true Saint Paul 'dive' bar. Drinks are cheap. Service is not fussy.

Where to eat in Minneapolis

A nightly shuttle service will be offered to transport ICRA participants to downtown Minneapolis. The shuttle will pick up and drop off on Nicollet Mall and 9th Street. This is a very small sampling of what Minneapolis has to offer:

Hell's Kitchen

80 South 9th Street (612) 332-4700

Unique underground, chef-owned restaurant. Open for breakfast, lunch, dinner and drinks 7 days a week. Live (free) music most evenings and during brunch on weekends. Late night "rock-the-house" shows offered on Thursdays, Fridays and Saturdays until 2A.M.

MASA

1070 Nicollet Mall (612) 338-6272

Contemporary Mexican. Voted Best Mexican Restaurant by Minneapolis St. Paul Magazine for two years running.

Solera

900 Hennepin Avenue (612) 338-0062

Spanish. Locally-sourced ingredients. One of the largest collections of Spanish wine in the U.S. Solera is in the heart of the Minneapolis Theater District.

Vincent A

1100 Nicollet Mall (612) 630-1189

New American. Tasting menus offered. Reservations recommended.

Zelo

831 Nicollet Mall (612) 333-7000

Neo-Italian. Offers late-night seating. White linen. Large and small plates. Emphasis on sustainable ingredients.

Saffron

123 N 3rd Street (612) 746-5533

A contemporary presentation of Mediterranean cuisine, inspired by Moroccan, Spanish, and French flavors.

112 Eatery

112 N 3rd Street (612) 343-7696

New American. Winner: Best Chef, Midwest (James Beard Award). Late night dining.

Fogo de Chao

645 Hennepin Avenue (612) 338-1344

Brazilian steakhouse chain.

Acknowledgments and Credits

• Cover Art: Nikhil Karnad

• **Digest Volunteer**: Jimmy Chen

• Images: City of Saint Paul ("Visit Saint Paul"), City of Minneapolis ("Meet Minneapolis"), Google Maps and Street View, Paul Robertson, Dan Anderson; Crowne Plaza, Hotel Saint Paul, RiverCentre and the Science Museum of Minnesota

Program at A Glance

	ICRA 2012 Technical Program Monday May 14, 2012														
	Room 1	Room 2	Room 3	Room 4	Room 6	Room 7	Room 8	Room 9	Room 10-11	Room 12					
08:30 - 17:30	Workshop 1 Variable Impedance Actuators	Workshop 2 Bio-Bots	Workshop 3 Many-Robot Systems	Workshop 4 Wearable Robotics	Workshop 5 Software Development SDIR-VII	Workshop 6 Haptic Teleoperation	Workshop 7 Robotics and Performing Arts	Workshop 8 Robotic Satellite Servicing	Workshop 9 Semantic Perception - Service	Tutorial 1 Motion Planning	Tutorial 2 Industry Issues				
18:00 - 20:00	ICRA	2012 Rece _l	otion	Great R	wne Plaza iver Ballroor rst Level	n	Student	Social	Mi	Crowne Pla innesota Bal Lower Lev	lroom,				

ICRA 2012 Technical Program Tuesday May 15, 2012

	Room 1	Room 2	Room 3	Room 4	Room 5	Room 6	Room 7	Room 8	Room 9	Room 10-11	Ballroom D	Auditorium			
	TuA01	TuA02	TuA03	TuA04	TuA05	TuA06	TuA07	TuA08	TuA09		TuA10				
00.00	Estimation	Bipedal Robot	Learning and	Under-	Path Planning	Applied	Robust and	Redundant	Collision		Interactive				
08:30	and Control	Control	Adaptive	actuated	and	Machine	Adaptive	Robots		Industry	Session				
10:00	for UAVs		Control of	Robots	Navigation	Learning	Control of			Forum					
			Robotic				Robotic								
			Systems				Systems								
	Coffee Break														
	TuB01	TuB02	TuB03	TuB04	TuB05	TuB06	TuB07	TuB08	TuB09		TuB10				
10:30	Control and	Human Like	Grasp	Pose	Sensor	Minimally	Micro and	3D Surface	Localization	Industry	Interactive				
-	Planning for	Biped	Planning	Estimation	Networks	Invasive	Nano Robots	Models, Point		Forum	Session				
12:00	UAVs	Locomotion				Interventions		Cloud		rorum					
								Processing							
12:00															
-	Women in Engineering Luncheon Crowne Plaza Crowne Plaza Crowne Plaza														
13:00															
13:15	KIVELENITE														
- 14:15	Professor Brad Nelson, ETH-Zürich, Swiss Pallycome A. B. C. E. F. and C.														
	TuC01	TuC02	TuC03	TuC04	TuC05	TuC06	TuC07	TuC08	TuC09		TuC10	12:00			
14:30	Autonomy	Planning and	Haptics	Micro -	Multi-Robot	Biologically	Climbing	Human	Mapping		Interactive	- 18:00			
14.30	and Vision for		Traptics	Nanoscale	Systems I	Inspired	Robots	Detection and	Mapping	Industry	Session	18:00			
16:00	UAVs	Biped		Automation	Systems i	Robotics	Robots	Tracking		Forum		<u>Exhibits</u>			
	UAVS	Walking		Automation		Robotics		Tracking				And			
		Wanting .			Cot	ffee Break						<u>Challenges</u>			
	TuD01	TuD02	TuD03	TuD04	TuD05	TuD06	TuD07	TuD08	TuD09		TuD10				
16:30	Force &	Humanoid	Cable-Driven	Force, Torque	Multi-Robot	Needle	Perception	RGB-D	Sensing for	Industry	Interactive				
-	Tactile	Motion	Mechanisms	and Contacts	Systems II	Steering	for	Localization	Manipulation	Forum	Session				
18:00	Sensors	Planning and		in Grasping		o cooring	Autonomous	and Mapping		rorum					
		Control		and Assembly			Vehicles	ana mapping							
19:30	<u> </u>	l	l				<u> </u>		l	I					
21:30	Welcome Reception														



ICRA 2012 Technical Program
Wednesday May 16, 2012

	Room 1	Room 2	Room 3	Room 4	Room 5	Room 6	Room 7	Room 8	Room 9	Room 10-11	Ballroom D	Auditorium		
	WeA01	WeA02	WeA03	WeA04	WeA05	WeA06	WeA07	WeA08	WeA09		WeA10			
00.20	Learning and	Multi-Legged	Medical	Novel Robot	Embodied	Trajectory	SLAM I	Motion Path	Surveillance		Interactive			
08:30	Adaptation	Robots	Robotics I	Designs	Inteligence -	Planning and		Planning I			Session			
10:00	Control of				Icub	Generation								
	Robotic													
	Systems II													
	Coffee Break													
	WeB01	WeB02	WeB03	WeB04	WeB05	WeB06	WeB07	WeB08	WeB09		WeB10			
10:30	Parallel	Hybrid	Grasping:	Networked	Rehabilitation	Micro and	Sampling	Parts	Localization		Interactive			
-	Robots	Legged	Learning and	Robots	Robotics	Nano Robots	Based Motion	Handling and	II		Session			
12:00		Robots	Estimation			II	Planning	Manipulation						
12:00	30													
12:00	COLD Lunch Crowne Plaza Lunch with the Leaders Crowne Plaza													
13:00														
13:15	Plenary Lecture: Bio-Bots: Bio-Integrated Robotics Using Live Cells As Components RiverCentre Pollwooms A. B. C. F.													
-	Drofesson Herry Acade Messeshusetts Institute of Technology (MIT) IICA Rallrooms A R C F													
14:15	Chair: Rüdiger Dillmann Professor Harry Asada, Massachusetts Institute of Technology (MT1), USA Chair: Rüdiger Dillmann F, and G													
	VIV. 004	VIV. 000	VIV. 000	VIV. 00.4	, , , , , , , , , , , , , , , , , , ,	VIV. 00.6	VIV. 00.7	VIV. 000	VIV. 000		VIV. 04.0			
	WeC01	WeC02	WeC03	WeC04	WeC05	WeC06	WeC07	WeC08	WeC09		WeC10			
14:30	Micro/	Compliance	Underactuated		Image-Guided		Environment	SLAM II	Visual		Interactive			
16:00	Nanoscale	Devices and	Grasping	Motion	Interventions	Manipulation:	Mapping		Tracking	15:00-17:00 NSF	Session			
	Automation II	Control		Planning		Planning &				Presentation				
					Cod	Control fee Break				Tresentation				
										NSF				
	WeD01	WeD02	WeD03	WeD04	WeD05	WeD06	WeD07	WeD08	WeD09	Presentation	WeD10			
16:30	Non-	Grasping and	Modular	Embodied	Minimally	Space	Results of	Visual	Video Session		Interactive			
- 18:00	Holonomic	Manipulation	Robots &	Intelligence -	Invasive	Robotics	ICRA 2011	Learning			Session			
20.00	Motion		Multi-Agent	Complient	Interventions		Robot							
	Planning		Systems	Actuators	II		Challenge							
19:00				_							RiverCent	re		
- 21:30				Co	nference B	anquet				Ballro	ooms A, B, C,			
41:30											,			

	ICRA 2012 Technical Program Thursday May 17, 2012													
	Room 1	Room 2	Room 3	Room 4	Room 5	Room 6	Room 7	Room 8	Room 9	Room 10	Room12	Ballroom D	Auditorium	
	ThA01	ThA02	ThA03	ThA04	ThA05	ThA06	ThA07	ThA08	ThA09			ThA10		
08:30	Data Based	Medical	Novel	Simulation	Octopus-	Intelligent	Physical	Calibration	Motion	** .1		Interactive		
-	Learning	Robotics II	Actuation	and Search	Inspired	Manipulation	Human-	and	Planning II	Youth Outreach		Session		
10:00			Technologies	in Grasping	Robotics	Grasping	Robot	Identification		Outreach				
							Interaction							
	Coffee Break													
	ThB01	ThB02	ThB03	ThB04	ThB05	ThB06	ThB07	ThB08	ThB09			ThB10		
10:30	Mechanism	Grasping:	Biologically	Stochastic in	Teleoperation	Continuum	AI	Range	Vision-Based	Youth		Interactive		
-	Design of	Modeling,	Inspired	Robotics and		Robots	Reasoning	Imaging	Attention	Outreach		Session		
12:00	Mobile	Analysis and	Robotics II	Biological			Methods		and	0 0000				
	Robots	Planning		Systems					Interaction				08:00	
12:00														
- 13:00	Awards Lunch Rivercentre Rallrooms A. R. C. F. F. and C. 1												18:00	
	Plenary Lecture: Development Outline of the Humanoid Robot: HUBO II													
13:15 -													<u>Exhibits</u> <u>And</u> Challenges	
13:15 - 14:15				rea Advanc	ed Institute		nd Technolo				RiverCent ooms A, B, C,			
-				rea Advanc	ed Institute	of Science a	nd Technolo				ooms A, B, C,		<u>And</u>	
14:15	ThC01	Professor Ju	ThC03	orea Advanco Chair: F	ed Institute Ienrik Iskov	of Science and Christenser	nd Technolo 1 ThC07	gy (KAIST),	Korea			E, F, and G	<u>And</u>	
-	P	ThC02	n Ho Oh , Ko	rea Advanco Chair: F	ed Institute Ienrik Iskov ThC05 Robotic Software,	of Science an Christenser	nd Technolo 1	gy (KAIST),	Korea ThC09	Ballro Youth	14:30	E, F, and G ThC10	<u>And</u>	
14:15	ThC01	ThC02 Control of	ThC03 Soft Tissue	ThC04 Formal	ed Institute Ienrik Iskov ThC05 Robotic Software, Programming	of Science and Christenser ThC06 Compliant	nd Technolo ThC07	ThC08	ThC09 Marine	Ballro	14:30	E, F, and G ThC10 Interactive	<u>And</u>	
14:15 14:30	ThC01 Micro/ Nanoscale	ThC02 Control of	ThC03 Soft Tissue	ThC04 Formal	ed Institute Ienrik Iskov ThC05 Robotic Software,	of Science and Christenser ThC06 Compliant Nano-	ThC07 Multi Robots: Task	ThC08 Navigation and Visual	ThC09 Marine	Ballro Youth	14:30 - 15:30	E, F, and G ThC10 Interactive	<u>And</u>	
14:15 14:30	ThC01 Micro/ Nanoscale Automation	ThC02 Control of	ThC03 Soft Tissue	ThC04 Formal	ThC05 Robotic Software, Programming Environments,	of Science and Christenser ThC06 Compliant Nano- positioning	ThC07 Multi Robots: Task	ThC08 Navigation and Visual	ThC09 Marine	Ballro Youth	14:30 - 15:30 Challenge	E, F, and G ThC10 Interactive	<u>And</u>	
14:15 14:30	ThC01 Micro/ Nanoscale Automation III	ThC02 Control of UAVs	ThC03 Soft Tissue Interaction	ThC04 Formal Methods	ThC05 Robotic Software, Programming Environments, and Frameworks	ThC06 Compliant Nano- positioning Coffee Bre	ThC07 Multi Robots: Task Allocation	ThC08 Navigation and Visual Sensing	ThC09 Marine Robotics I	Ballro Youth	14:30 - 15:30 Challenge	ThC10 Interactive Session	<u>And</u>	
14:15 14:30 - 16:00	ThC01 Micro/ Nanoscale Automation III ThD01	ThC02 Control of UAVs ThD02	ThC03 Soft Tissue Interaction	ThD04	ThC05 Robotic Software, Programming Environments, and Frameworks	ThC06 Compliant Nano- positioning Coffee Bre ThD06	ThC07 Multi Robots: Task Allocation	ThC08 Navigation and Visual Sensing	ThC09 Marine Robotics I	Youth Outreach	14:30 - 15:30 Challenge	ThC10 Interactive Session ThD10	<u>And</u>	
14:15 14:30 - 16:00	ThC01 Micro/ Nanoscale Automation III ThD01 Animation &	ThC02 Control of UAVs ThD02 Semiconductor	ThC03 Soft Tissue Interaction ThD03 Biomimetics	ThD04 Hand	ThC05 Robotic Software, Programming Environments, and Frameworks ThD05 High Level	ThC06 Compliant Nano- positioning Coffee Bre ThD06 Localization	ThC07 Multi Robots: Task Allocation ThD07 Industrial	ThC08 Navigation and Visual Sensing ThD08 Embodied	ThC09 Marine Robotics I ThD09 Marine	Ballro Youth	14:30 - 15:30 Challenge	ThC10 Interactive Session ThD10 Interactive	<u>And</u>	
14:15 14:30 - 16:00	ThC01 Micro/ Nanoscale Automation III ThD01	ThC02 Control of UAVs ThD02	ThC03 Soft Tissue Interaction ThD03 Biomimetics	ThD04 Hand Modeling	ThC05 Robotic Software, Programming Environments, and Frameworks ThD05 High Level Robot	ThC06 Compliant Nano- positioning Coffee Bre ThD06	ThC07 Multi Robots: Task Allocation	ThC08 Navigation and Visual Sensing	ThC09 Marine Robotics I	Youth Outreach	14:30 - 15:30 Challenge	ThC10 Interactive Session ThD10	<u>And</u>	
14:15 14:30 - 16:00	ThC01 Micro/ Nanoscale Automation III ThD01 Animation &	ThC02 Control of UAVs ThD02 Semiconductor	ThC03 Soft Tissue Interaction ThD03 Biomimetics	ThD04 Hand	ThC05 Robotic Software, Programming Environments, and Frameworks ThD05 High Level	ThC06 Compliant Nano- positioning Coffee Bre ThD06 Localization	ThC07 Multi Robots: Task Allocation ThD07 Industrial	ThC08 Navigation and Visual Sensing ThD08 Embodied	ThC09 Marine Robotics I ThD09 Marine	Youth Outreach	14:30 - 15:30 Challenge Summaries	ThC10 Interactive Session ThD10 Interactive Session	<u>And</u>	
14:15 14:30 - 16:00	ThC01 Micro/ Nanoscale Automation III ThD01 Animation &	ThC02 Control of UAVs ThD02 Semiconductor	ThC03 Soft Tissue Interaction ThD03 Biomimetics	ThD04 Hand Modeling and Control	ThC05 Robotic Software, Programming Environments, and Frameworks ThD05 High Level Robot	ThC06 Compliant Nano- positioning Coffee Bre ThD06 Localization and Mapping	ThC07 Multi Robots: Task Allocation ThD07 Industrial	ThC08 Navigation and Visual Sensing ThD08 Embodied	ThC09 Marine Robotics I ThD09 Marine	Youth Outreach	14:30 - 15:30 Challenge Summaries	ThC10 Interactive Session ThD10 Interactive	And Challer	

	ICRA 2012 Technical Program														
	Friday May 18, 2012														
	Room 1	Room 2	Room 3	Room 4	Room 5	Room 6	Room 7	Room 8	Room 9	Room 10	Room 11	Room 12	Ballroom D	Auditorium	
	Workshop 10	Workshop 11	Workshop 12	Workshop 13	Workshop 14	Workshop 15	Workshop 16	Workshop 17	Workshop 18	Tutorial 3	Tutorial 4	Tutorial 5	13:00	08:00	
08:30	Future of HRI	Bio Assembler	Replicable Experi-	Long-term Autonomy	Clinical Needle	Stochastic Geometry in	Modular Surgical	ECHORD Project		Point Cloud Processing		Robot Operating	- 15:30	12:00	
17:30			ments		Steering	SLAM	Robotics		Exploration		Learning	System	Fukushima Workshop	Exhibits And Challenges	