

# 2020 IEEE Robotics and Automation Technical Field Award Recipient

We extend heartfelt congratulations to Vijay Kumar, the recipient selected for the prestigious 2020 IEEE Robotics and Automation Technical Field Award for “contributions to cooperative robotics; networked mobile manipulation systems, particularly unmanned aerial vehicles; and leadership in robotics research, policy, and education.” He will receive his award at the 2020 IEEE International Conference on Robotics and Automation (ICRA) in Paris, France, 31 May–4 June 2020.

As one of the top roboticists of his generation, Kumar’s vision and technical accomplishments have shaped the fields of cooperative and networked robotics and autonomous microaerial vehicles. He developed several novel capabilities for swarms



Vijay Kumar

of ground and aerial vehicles, ranging in size from micro to macro, capable of moving in formation, transporting objects, and operating indoors and outdoors. Central to his work is the synthesis of the decentralized controllers that enable robots to produce a desired global behavior coordinating only with their immediate neighbors. Kumar served as an advisor to the

White House Office of Science and Technology Policy, which was instrumental in increasing federal funding for robotics and cyberphysical systems. A Fellow of the IEEE and a member of the National Academy of Engineering, Kumar is the Nemirovsky Family Dean in the School of Engineering and Applied Science at the University of Pennsylvania, Philadelphia.

The IEEE Board of Directors established the IEEE Robotics and Automation Technical Field Award in 2002. It is presented for contributions in the field of robotics and automation and includes, but is not limited to, manufacturing automation; robotics and automation in unstructured environments; sensor design; integration and fusion; robot design, modeling, planning, and control; and methodologies for robotics and automation. The IEEE Robotics and Automation Society sponsors this award.

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## Robots Connecting People: IROS 2019 in Macau, China

By Dong Sun and Fumihito Arai

The 2019 IEEE/Robotics Society of Japan International Conference on Intelligent Robots and Systems (IROS 2019) was held at the Venetian Macao, China, on 4–8 November 2019 (Figure 1). The conference attracted 3,500 participants from 53 countries and regions.

IROS is one of the largest and most important robotics conference venues for researchers, educators, and practitioners



**Figure 1.** (From left) IROS Program Chair Fumihito Arai, Steering Committee Chair Shigeki Sugano, Honorary Chair George Lee, Honorary Chair Fumio Harashima, Honorary Chair Toshio Fukuda, Honorary Chair Yonghua Song, and General Chair Dong Sun open IROS 2019.

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**Figure 2.** IROS 2019 plenary speakers: (a) Joseph Sung, Chinese University of Hong Kong; (b) Kristen Grauman, University of Texas at Austin; (c) Satoshi Tadokoro, Tohoku University, Japan; and (d) Katherine J. Kuchenbecker, Max Planck Institute for Intelligent Systems, Stuttgart, Germany.

to present their latest work. With the theme Robots Connecting People, IROS 2019 received 2,494 full-length submissions and accepted 1,108, an acceptance rate of 44.9%. To promote *IEEE Transactions on Robotics (TRO)* and *IEEE Robotics and Automation Magazine (RAM)*, 13 TRO and six RAM submissions were received for presentation. All of the papers were organized for oral presentations in 20 parallel tracks during the three conference days. In addition, IROS 2019 included two sessions for 148 late-breaking-results posters to highlight their robotics research results.

The IROS program was anchored by four plenary talks and 12 keynote presentations across a broad range of topics in robots and systems from leaders of the IROS community (Figures 2 and 3). We were honored to invite three pioneers, Christian Laugier, Toshio Fukuda, and George Lee, to share their



**Figure 3.** IROS 2019 keynote speakers: (a) Sangbae Kim, Massachusetts Institute of Technology, Cambridge; (b) Marcia O'Malley, Rice University, Houston; and (c) Yunhui Liu, Chinese University of Hong Kong.



experience and philosophy to enlighten young researchers.

Nine forums were held to enhance interaction between speakers and the audience (Figure 4). The Industrial Chief Executive Officer (CEO) Summit Forum, organized by Ren Luo, invited industry leaders and visionaries to present and discuss real-world implications of the ways emerging technologies are driving a paradigm shift in the robotics industry and its business landscape. The Government Forum was co-organized by Bill Hamel and Guang-Zhong

Yang. They invited program managers from the European Union, Japan, Singapore, South Korea, and the United States to give overviews of their robotics and artificial-intelligence programs and discuss the technological and sociological factors that shape government priorities and investments. The Industrial Forum, a special forum focused on human-centered robot systems, and five other cutting-edge forums were also held.

The conference included 41 workshops and tutorials (32 full day and

nine half day) on the first and last days (Figure 5). It featured a robot competition with categories for drones, humanoid/simultaneous localization and mapping, and grasping and manipulation (Figure 6). Students were strong participants in the seven competitions. Moreover, IROS attendees had the opportunity to visit the research buildings and laboratories at the University of Macau.

There were 77 exhibitors from industry, academia, publishers, and technical societies (Figure 7). The



**Figure 4.** The (a) Industrial CEO Summit Forum and (b) Government Forum.



**Figure 5.** Participants cooperate and share their work during an interactive workshop.

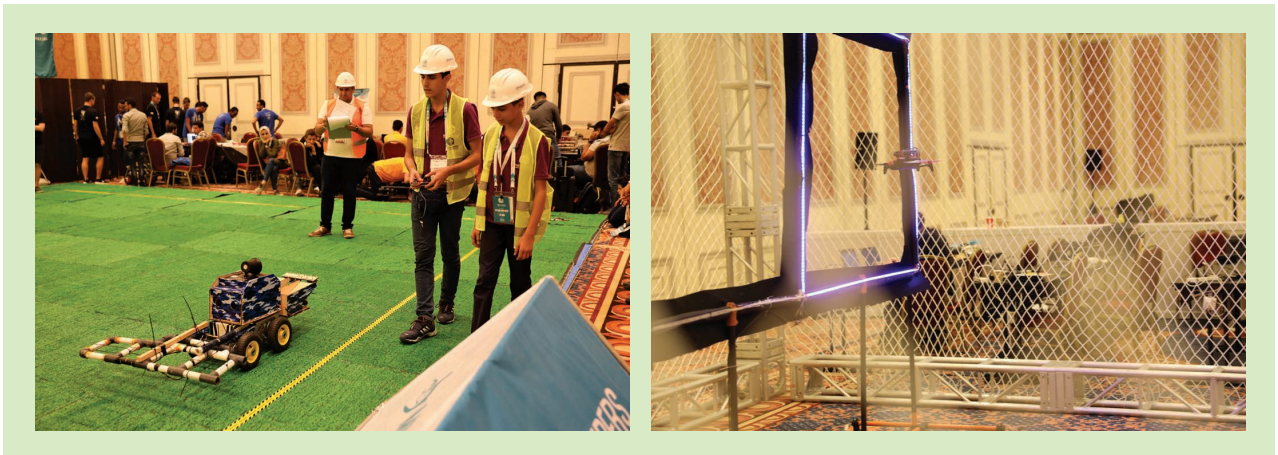
exhibition was located near the technical session venue, providing a valuable opportunity for exhibitors and conference attendees to build networks and connections.

An awards luncheon was held to present various awards recognizing the highest-quality technical papers and outstanding contributions to

robotics. See page 128 for a full list of awards.

Social events at IROS 2019 included a welcome reception, conference banquet, and farewell party at the Venetian ballroom. The conference banquet, themed a Night in Venice, included three performances, Chinese cuisine, and fine wine for the attendees

(Figures 8 and 9). The organizers were happy to see the IROS community come together and grow successfully and prepared a video for the opening ceremony and conference banquet about the conference's development during the 32 years since it was founded. The video is available on the IEEE Robotics and Automation Society's YouTube



**Figure 6.** IROS 2019 attendees participate in the conference's numerous competitions.



**Figure 7.** Exhibitors display their products and services during the conference.



**Figure 8.** IROS 2019 delegates enjoy the food and music during the welcome reception.





**Figure 9.** The conference banquet was themed a Night in Venice.

channel at <https://www.youtube.com/watch?v=cet1LeVojs>.

We extend special thanks to the IROS 2019 Organizing Committee chairs and members; Steering Commit-

tee; Conference Paper Review Board; *IEEE Robotics and Automation Letters* editor-in-chief, editors, associate editors, and reviewers; and student volunteers for their strong support. We would

also like to thank the authors, speakers, and attendees who made IROS 2019 a worthy and enjoyable conference. We look forward to another great success at IROS 2020 in Las Vegas, Nevada.

## 2020 IEEE Robotics and Automation Society Fellow Class Announced

Congratulations to the following IEEE Robotics and Automation Society (RAS) members who were elevated to Fellow effective 1 January 2020! Nominees for IEEE Fellow must hold the grade

of Senior Member or Life Senior Member to qualify for elevation to Fellow status.

### 2020 IEEE Fellows Evaluated by the RAS

- Aude Billard, Swiss Federal Institute of Technology Lausanne, for contributions to robot task learn-

ing and programming by human demonstration

- Satyandra Gupta, University of Southern California, Los Angeles, for contributions to the development of decision-making tools for manufacturing automation
- Tarek Hamel, University of Nice Sophia Antipolis, France, for