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The 2016 IEEE Systems, Man, and Cybernetics Conference

Following San Diego (2014) and Hong Kong (2015), Budapest played host to the annual IEEE Systems, Man, and Cybernetics Society (SMCS) flagship conference, the IEEE International Conference on Systems, Man, and Cybernetics 2016 (SMC 2016). The event was held 9–12 October on the Danube promenade, the most visited part of the city at the Hotel InterContinental Budapest and the Sofitel Chain Bridge Budapest luxury hotels. Organization of the conference was accomplished in collaboration with Óbuda University (Hungary), Taiwan Tech, and the IEEE Hungary Section.

This year, SMC 2016 was dedicated to the Hungarian-born John von Neumann, “A Pioneer of Modern Computer Science.” In his honor, the theme of the conference was “A Theory That Transformed the World into a Cyberspace.”

Interest in SMC 2016 was outstanding. According to the registration data, 1,052 internationally recognized scientists, researchers, engineers, and students from all over the world attended the conference. The number of total submitted papers was 1,506, one of the highest in the conference's history. After the reviewing process, 637 oral and 196 poster presentations were accepted. Thus, the acceptance ratio was 55%, the lowest in recent years (Figure 1).

Countries with the highest number of participants were China, Japan, the United States, Tunisia, Taiwan, and Germany (Figure 2). However, many other countries from around the world were represented by participants as well; in total, attendees represented 59 different countries.

As usual at the flagship SMCS event, the contributions covered theoretical

developments and practical applications in systems science and engineering, human-machine systems, and

cybernetics. The SMC 2016 program consisted of 49 oral sessions [including regular, special, workshop, brain-machine

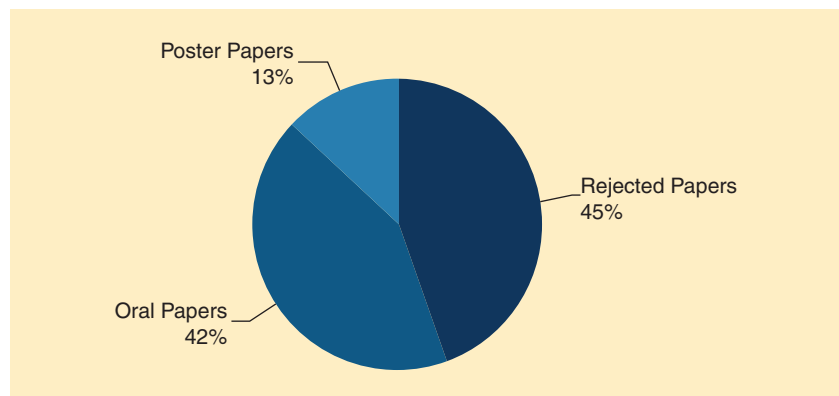


Figure 1. SMC 2016 paper submission statistics.

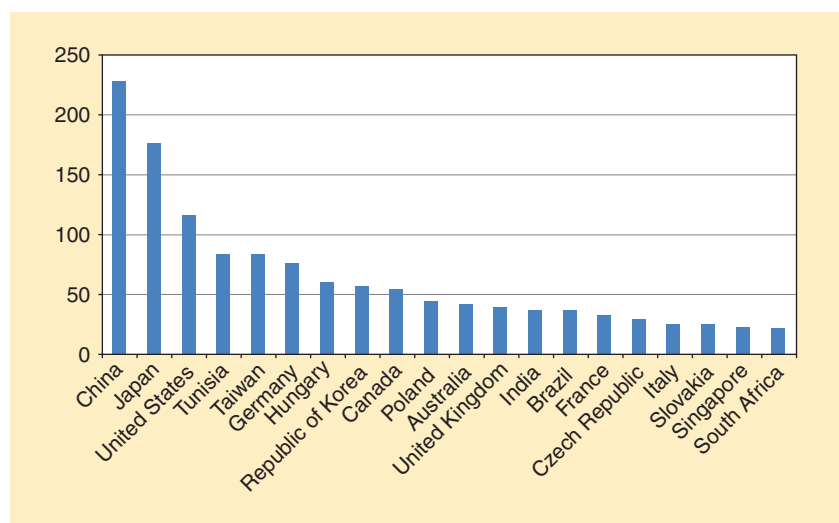


Figure 2. Submissions from the 20 countries with the most submissions out of 59 total countries. (Image courtesy of Shun-Feng Su.)

Table 1. The types of submitted papers (core statistics).

Track	Submissions	Accepted	Rejected
Regular sessions	844	410	434
Special sessions	429	288	141
BMI sessions	134	81	53
Junior sessions	78	36	42
Workshops	19	16	3
Demo session	2	2	0
Total paper number	1,506	833	673
Number of countries		59	

(Table courtesy of Shun-Feng Su.)

1,052 internationally recognized scientists, researchers, engineers, and students from 59 countries attended the conference.

interface (BMI), and junior sessions] and 24 e-poster sessions. The oral session program contained 410 regular, 288 special, 81 BMI, 36 junior, 16 workshop, and two demonstration presentations. The types of submitted papers can be found in Table 1.

The Organization Committee took social media activities into great consideration. For that purpose, two dedicated pages were used on both Facebook and Twitter, one for SMC 2016 and another for the SMC Junior 2016 conference. These social media tools generated impressive activities in the weeks surrounding the conference (Figure 3).

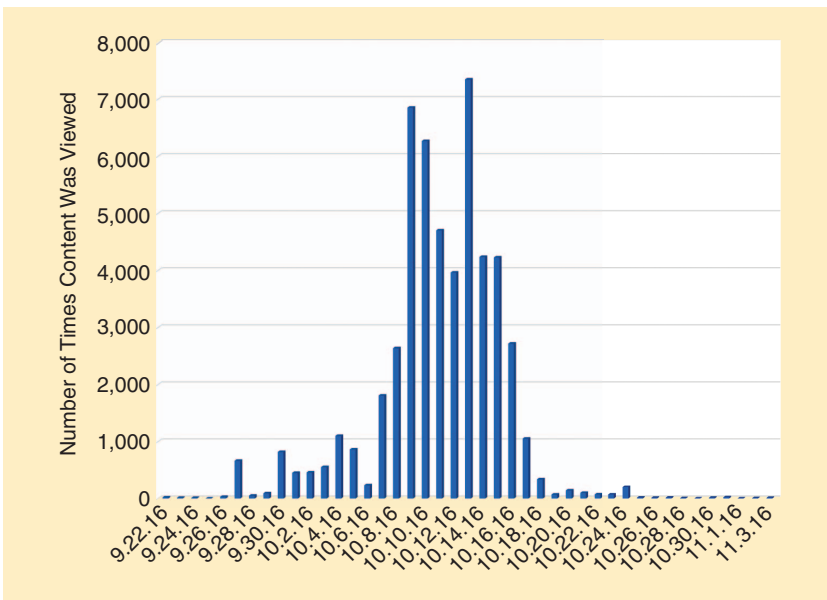


Figure 3. Facebook activity in the period surrounding the conference.



Figure 4. The Brain and Vision Hackathon: a hack in progress. (Photo courtesy of Krisztina Némethy.)

Conference Support

Three international firms exhibited their latest products during SMC 2016. The Hungarian company Lombiq introduced its newest development called Hastlayer. ANT Neuro, a Dutch firm, advertised its solutions for high-performance electroencephalograms (EEG), electromyograms, transcranial magnetic stimulation, and other signal detection and processing techniques. Finally, g.tec from Austria introduced its new EEG systems. At the same time, g.tec sponsored one of the awards of the first organized Brain and Vision Hackathon as well.

International Brain and Vision Hackathon

For the first time in the SMCS's history, the international Brain and Vision Hackathon student competition was held, 8–9 October, at the conference venue (Figure 4). Both SMC 2016 attendees and non-SMC 2016 attendees participated in activities involving BMI, brain-computer interfacing



Figure 5. The winners, organizers, and supporters of the Brain and Vision Hackathon. (Photo courtesy of IEEE Brain Initiative.)

(BCI), robotics, augmented and virtual reality (AR/VR), machine learning, and many other similar areas. The project topics included integration of neurotechnology with the Internet of Things, closed-loop cognitive games (including VR/AR), sensors for cloud communications and advanced artificial intelligence for analysis; active control of robotic devices using BMI; integration of wearable EEG brain sensing into mobile, personal computer, and web-based apps and games (including AR/VR); and robotic systems. Prizes were more than US\$8,000 in cash and hardware.

The event was successful not just from the standpoint of a conference but from the brain community's point of view as well, since this was the biggest Brain Hackathon in recent years. While the total number of attendees was around 190, with 12 people participating with their teams online along with the 141 in-person participants. Thirty teams competed, although one team joined online only. Twenty-five teams presented valuable results, which is an enormous outcome considering the fast development time and limited resources. To sum up, the teams comprised 82 students and 71 older attendees.

The following teams earned prizes (Figure 5):

- ◆ Vizzario and Vision Service Plan prize (US\$2,000): Nemanjini Sino-vi (Slovenia), project: Sapir



Figure 6. Dessert specialties at the welcome reception. (Photo courtesy of Krisztina Némethy.)

- ◆ first-place prize (US\$2,000): Brai-Nerds (Hungary), project: BCI-controlled robotic arm
- ◆ third-place prize (US\$1,000): De-fault Company (Slovenia), project: SlideHill
- ◆ IEEE Brain Initiative Brain Hackathon prize (US\$1,000): Neuro-feedback Loop (Slovenia), project: neurofeedback loop
- ◆ IEEE SMC Brain Hackathon prize (US\$1,000): BraiNerds (Hungary), project: BCI-controlled robotic arm
- ◆ Qusp Brain Hackathon prize: Arti-ficial Neurons (Hungary).

Welcome Receptions and Commemorative Panels

Two welcome receptions were included in the SMC's program (Figure 6). The official welcome reception was on Sunday, and an exclusive BMI welcome was organized by the Organization Committee of the BMI workshop on Monday.

The official opening ceremony of the conference took place on 9 October (Figure 7). SMC 2016 was opened by Imre J. Rudas (general chair of SMC 2016), Barry L. Shoop (president of the IEEE), Dimitar Filev (president of the IEEE SMCS), Mihály Réger



Figure 7. The opening ceremony panel. (Photo courtesy of Krisztina Némethy.)



Figure 8. The John von Neumann panel. (Photo courtesy of Krisztina Némethy.)



Figure 9. Jose M. Carmena provided the first keynote talk. (Photo courtesy of Krisztina Némethy.)

(president of Óbuda University), Shun-Feng Su (Technical Program Committee chair of the SMC 2016), and Domokos Szász (vice president of the Hungarian Academy of Sciences).

The program also included a panel session dedicated to John von Neumann, moderated by Ferenc Friedler, president of the Hungarian John von Neumann Society (Figure 8).

Keynote Speeches

Three keynote speeches from various areas of research were included in the SMC 2016 program. The first keynote talk, “Advances in Brain–Machine Interface Systems,” was presented by Jose M. Carmena, University of California, Berkeley (Figure 9). The speech focused on the BMI and related topics, namely, what BMI technologies are and how they can be used with neuroscience.

The second keynote talk, “Spiking Neural Networks and Spatio-Temporal Data Machines: Methods, Systems, Applications,” was presented by Nikola Kasabov, Auckland University of Technology, New Zealand. The main theme was neural networks and their application in daily professional life. The third keynote talk, “Networked Control Systems with Industrial Applications,” was given by Huijun Gao, Harbin Institute of Technology, China. Gao summarized the importance of networked control systems and their connection with Industry 4.0 through illustrative examples and applications.

Workshops and Tutorials

The seven workshops and three tutorials during SMC 2016 were very successful. The workshop on BMI systems organized by Michael H. Smith (University of California), Seong-Whan Lee (Korea University), Vinod A. Prasad, (Nanyang Technological University, China), Ricardo Chavarriaga (Ecole Polytechnique Fédérale de Lausanne, Switzerland), and Ljiljana Trajkovic (Simon Fraser University, Canada) was the largest workshop at SMC 2016, with 81 papers and various individual sessions.

The independent workshop on Women in Engineering was the first in the SMCS's history.

The workshop Big-Data-Based Technological Innovations on Intelligent Health Service in the Clouds organized by Hamido Fujita (Iwate Prefectural University, Japan), Enrique Herrera-Viedma (University of Granada, Spain), Ali Selamat (Universiti Teknologi Malaysia), Amedeo Cesta (Research Council of Italy), and Francisco Chiclana (De Montfort University, Leicester, United Kingdom) attracted substantial interest from attendees.

The Inaugural Independent Workshop on Women in Engineering

The independent workshop on Women in Engineering organized by Levente Kovács (Óbuda University) and Clara Ionescu (Ghent University, Belgium) was the first in the SMCS's history (Figure 10).

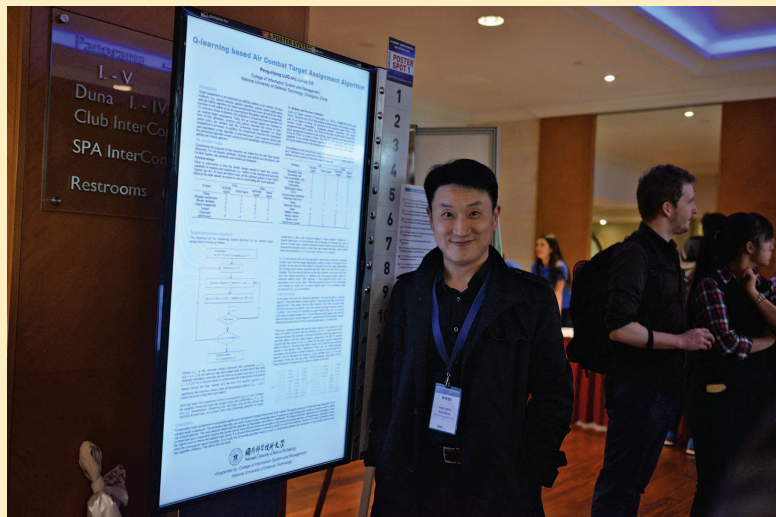
E-Poster Technology

New e-poster technology was introduced for the poster presentations so that printed posters were not necessary. The format of the presentation process was similar to the oral presentations, and, as a result, the poster presenters received the same attention as oral ones. During the conference, the poster presentations ran on an e-poster board, which presenters used to showcase their high-quality work (Figure 11).

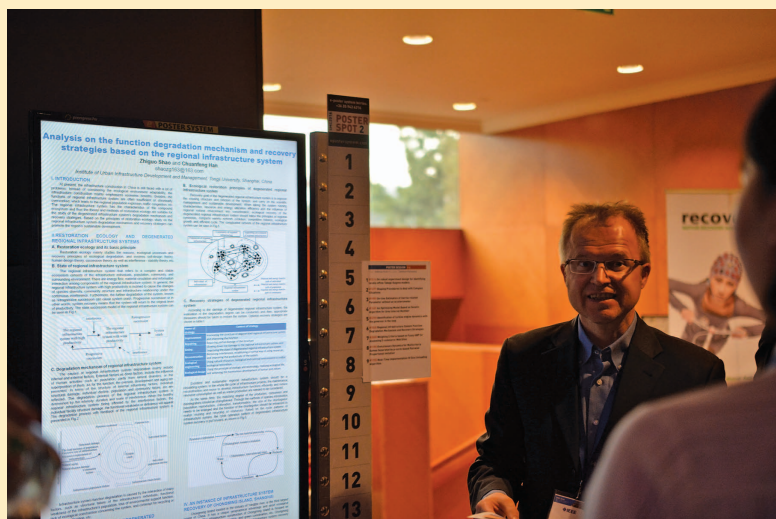
SMC 2016 also developed a conference mobile application containing useful information with all of the most needed functions integrated in one place: online tracking and commenting on sessions, presentations, an online payment system, online calendars, and information on important places, among other functions. Based



Figure 10. The Women in Engineering workshop attendees. (Photo courtesy of Krisztina Némethy.)



(a)



(b)

Figure 11. (a) and (b) Two e-Poster presentations at SMC 2016. (Photo courtesy of Krisztina Némethy.)



Figure 12. A traditional Hungarian rascal at the horse show during the conference banquet. (Photo courtesy of Krisztina Némethy.)



Figure 13. A segment of the Hungarian horse show. (Photo courtesy of Krisztina Némethy.)



Figure 14. The awards ceremony. (Photo courtesy of Krisztina Némethy.)

on the surveys, conference attendees have found this service very useful, and they expressed interest in having it in the future.

The Banquet, Show, and Awards

This year, the marvelous Lázár Equestrian Park was the venue for the conference banquet, which began with a traditional Hungarian horse show (Figures 12 and 13). This fantastic location is near Gödöllő, which was one of the former residences of rulers of the Habsburg Austrian-Hungarian monarchy. The park is a traditional Hungarian ranch next to the restaurant and operates as a farm.

The next event after the horse show was the awards ceremony, during which Prof. Phillip Chen, chair of the Awards Committee, presented the winners with their prizes (Figure 14). The Organization Committee congratulates the winners for their incredible results!

- ◆ Andrew P. Sage Best Transactions Paper in *IEEE Transactions on Cybernetics*: Hongyi Li, Xingjian Jing, Hak-Leung Lam, and Peng Shi, “Fuzzy Sampled-Data Control for Uncertain Vehicle Suspension Systems,” vol. 44, no. 7, pp. 1111–1126, July 2014
- ◆ Andrew P. Sage Best Transactions Paper in *IEEE Transactions on Systems, Man, and Cybernetics: Systems*: Ignacio Javier Pérez, Francisco Javier Cabrerizo, Sergio Alonso, and Enrique Herrera-Viedma, “A New Consensus Model for Group Decision Making Problems with Non-Homogeneous Experts,” vol. 44, no. 4, pp. 494–498, April 2014
- ◆ Andrew P. Sage Best Transactions Paper in *IEEE Transactions on Human-Machine Systems*: Zihong Kang and S.J. Landry, “An Eye Movement Analysis Algorithm for a Multielement Target Tracking Task: Maximum Transition-Based Agglomerative Hierarchical Clustering,” vol. 45, no. 1, pp. 13–24, 2015
- ◆ Outstanding SMC Student Chapter Award: Long Island University Student Branch Chapter

- ◆ Outstanding SMC Chapter Award: Taipei Chapter, chair: Yo-Ping Huang, National Taipei University of Technology
- ◆ Norbert Wiener Award: Hong Yan for contributions to image and biomolecular pattern recognition techniques
- ◆ Joseph G. Wohl Outstanding Career Award: Michael H. Smith for outstanding and long service to the SMCS and the profession
- ◆ Outstanding Contribution Awards:
 - Daniel Yeung for outstanding contributions to the SMC 2015 annual conference as the general chair
 - Sam T.W. Kwong for outstanding contributions to the SMC 2015 annual conference as the general chair
 - William Gruver for outstanding contributions to the SMC 2014 annual conference as the general chair
 - C.L. Philip Chen for outstanding contributions to the SMC 2014 annual conference as the program chair
 - Ellen J. Bass for contributions to human-performance research by serving as the founding editor-in-chief of *IEEE Transactions on Human-Machine Systems*
 - György Eigner for contributions and outstanding services to the student activities of the SMCS
- ◆ Best Associate Editor for *IEEE Transactions on Systems, Man, and Cybernetics: Systems*: Shao-cheng Tong
- ◆ Best Associate Editor for *IEEE Transactions on Cybernetics*: Wei-Yen Wang
- ◆ Best Associate Editor for *IEEE Transactions on Human-Machine Systems*: Vittorio Fuccella
- ◆ Most Active Technical Committee Award in Systems Science and Engineering: Intelligent Power and Energy Systems, chairs: Loi Lai Lai and Kit Po Wong
- ◆ Most Active Technical Committee Award in Human-Machine Systems: Brain-Machine Interface Systems,

chairs: Michael H. Smith, Seong-Whan Lee, Vinod A. Prasad, and Ricardo Chavarriaga

- ◆ Most Active Technical Committee Award in Cybernetics: Computational Collective Intelligence, chair: Ngoc Thanh Nguyen
- ◆ SMC 2016 Best Student Paper Award: Xuan Chen, Binh Phu Nguyen, Chee Kong Chui, and Sim-Heng Ong, “Automated Brain Tumor Segmentation Using Kernel Dictionary Learning and Superpixel-Level Features”
- ◆ SMC 2016 Franklin V. Taylor Memorial Award: George Bucsan, Michael Balchanos, Dimitri N. Marivs, Jae Seung Lee, Masanori Ishigaki, and Atsushi Iwai, “Management of Technologies for Electrical Vehicle Efficient towards Optimizing Range.”

The SMC Junior Conference in 2016

The IEEE SMC Junior 2016 conference, a newly established SMCS initiative, was held in Budapest parallel with the flagship SMC 2016. The main purpose of this event was to serve as a satellite conference of the Society’s flagship event, dedicated to students, graduate students, and young professionals (YPs). Although this event was parallel to the SMC 2016 flagship conference, it was not separate from it.

The main goals of SMC Junior 2016 were to provide an opportunity for student, graduate student, and YP members to build a strong, professional, and international network; meet with experts; and learn from professionals in the same field. The SMC Junior initiative was very successful in its inaugural outing. More than 70 papers were submitted by authors from different backgrounds and countries. Seventy-eight papers were sent directly to the SMC Junior 2016; however, based on the reviewers’ opinions, only 36 studies were accepted for presentation (oral and poster).

The regular SMC Junior sessions were grouped based on the three main SMC 2016 topics: cybernetics, system

The IEEE SMC Junior 2016 conference, a newly established initiative of SMCS, was held in Budapest this year for the first time parallel with the flagship IEEE SMC 2016.

science and engineering, and human-machine systems. For the first time, a junior special session was successfully organized by a member of the Student Activities Subcommittee and the General cochair of the SMC Junior 2016 with the topic “Cybernetics in Applied Sciences.” From 36 accepted papers, 32 were included in the program (Figure 15).

The SMCS Young Reviewer (YR) program, which was established in 2015, has turned out to be a great help in the reviewing process. The first applicants for the YR program were collected last year in Hong Kong during the SMC 2015 conference. Almost 50 young reviewers with various fields of expertise were involved in the reviewing process for the SMC Junior 2016. Including student, graduate student, and YP members, the reviewing process was smooth and successful. Without strong promotion, ten more people applied to the YR program at SMC 2016.

To increase attention, independent social media sites were dedicated to SMC Junior 2016. Facebook served as the main platform for announcements and advertisements regarding SMC Junior programs. Without targeted and paid campaigns, the page reached (in different ways) almost 2,600 people in the weeks surrounding the conference, which showed that people were interested in SMC Junior 2016 and other junior programs. Moreover, it proved that attendees and other interested individuals follow events and happenings on social

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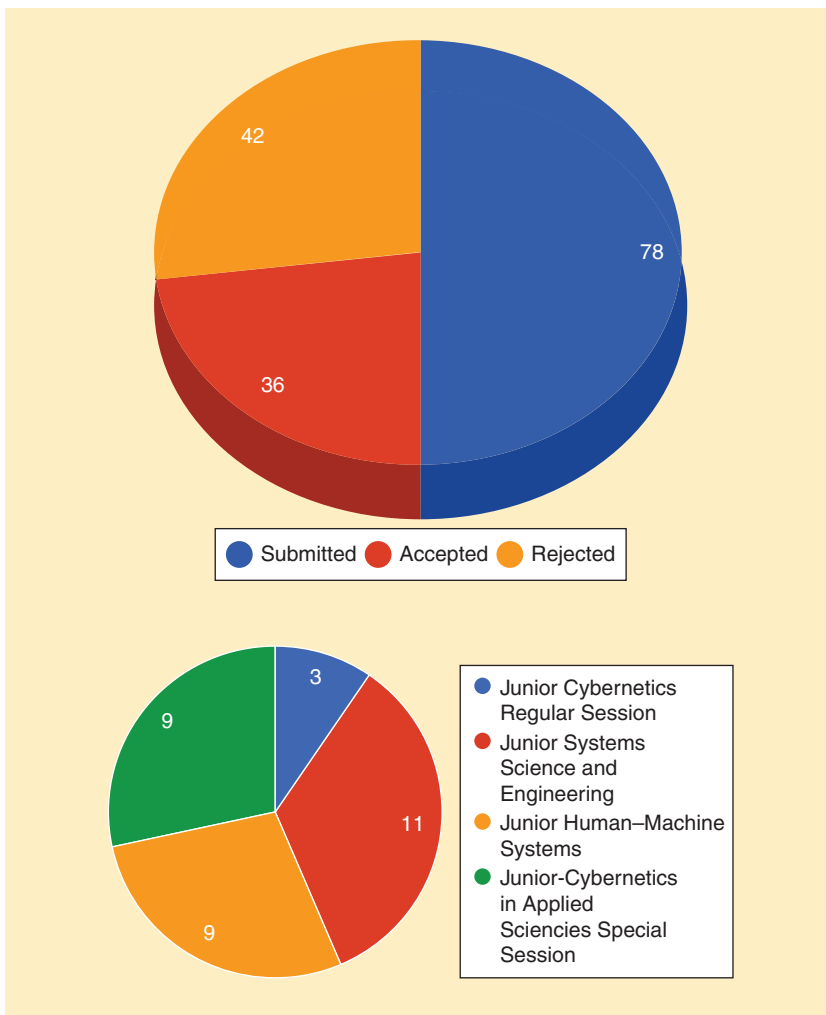


Figure 15. Statistics for SMC Junior 2016: papers submitted to sessions.

media. One of the main advantages of SMC Junior 2016 was that attendees could participate in all the scientific, professional, and social events of SMC 2016 as well, which was attractive for participants according to on-site interviews.

Two invited keynote talks were included in SMC Junior programs, which were given by scientific experts on 10 October. The first keynote speech was by Tamás Haidegger from Óbuda University, “Robots, Men, and Cybernetics.” Haidegger highlighted human-robot interactions and the possibilities of medical robotics, and he took a look at opportunities in the near future from the robotics point of view (Figure 16).

The second keynote speaker, Prof. Clara Ionescu (Ghent University), provided an overview of the possibilities of the control of anesthesia through modern control engineering methodologies. The title of her presentation was “Regulating Depth of Anesthesia: We Are So Different, Yet So Much Alike.”

The SMC Junior Post-Conference Tour

A unique social event was organized for the first time in the history of SMCS conferences: the SMC Junior Post-Conference Tour. The organizers of the event consisted of the global and local SMCS-related organizations: the SMC Student Activities Subcommittee, the SMC YP Subcommittee, the SMC Óbuda Student Branch Chapter, and the IEEE Hungary Section YP.

All members of the student and YP communities could attend regardless of their status, not just the SMC Junior



Figure 16. The junior keynote speakers and chair; from left: Tamás Haidegger (first keynote speaker), Prof. Clara Ionescu (second keynote speaker), and Prof. Levente Kovács (chair of the junior keynote talks). (Photo courtesy of József Klepitz.)



Figure 17. The participants in the Junior Post-Conference Tour. (Photo courtesy of Gábor Szögi.)

Every SMC Junior participant could attend every event of the SMC 2016 as well.

2016 attendees (Figure 17). Accompanied by the local organizers and the SMC helper team, nearly 50 people attended the event. The goal of the Post-Conference Tour was to strengthen social connections and interactions among the young generation of the SMCS, which can be a basis for future collaboration between members. The tour began with slices of pizza at the InterContinental. Afterward, the participants headed out to explore the nightlife and ruin pub culture of beautiful Budapest.

SMC 2016 Assessment

The Organization Committee developed a questionnaire to evaluate attendees' opinions about SMC 2016. The form was completed by 151 (80.1% male and 19.9% female) attendees with various fields of expertise and IEEE memberships, which is helpful in identifying best practices. It revealed that the main reasons of attendance were the professional content

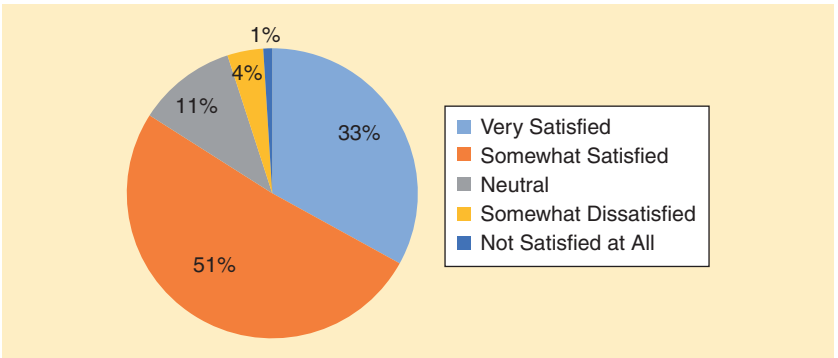


Figure 18. Respondents' opinions about the scientific content at SMC 2016.

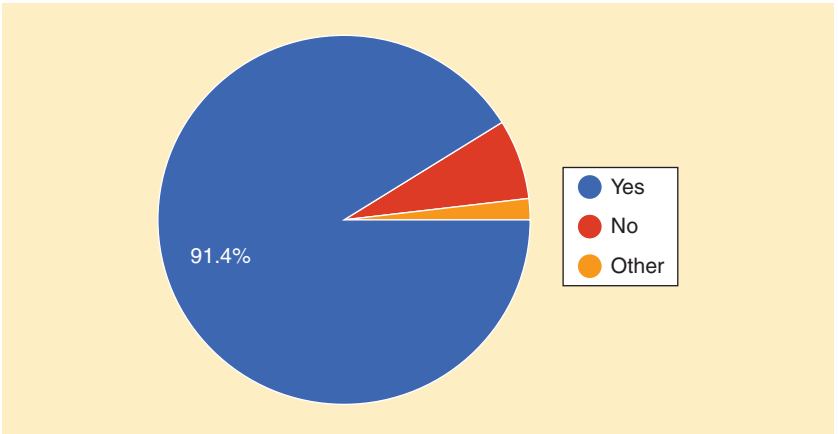


Figure 19. Survey results regarding whether respondents would recommend the SMC 2016.

and personal growth; however, networking was also important. To sum up, most of the respondents were satisfied with all the programs,

and 93.4% of them would recommend this conference to others (Figures 18 and 19).

SMC