
November 5, 2018

[Overview]

- Sponsored by: The Robotics Society of Japan (RSJ)
- Cosponsored by: Japan Robot Association and Nikkan Kogyo Shimbun Ltd.
- Date: Friday October 19 and Saturday October 20, 2018
- Venue: Tokyo International Exhibition Center, room 607 and room 608
- Executive committee of IRH 2018:
  Chair: Nobuto Matsuhira, Vice-President of RSJ, Shibaura Institute of Technology
  Secretary: Yuji Hosoda, Director and secretary-general of RSJ
  Members: Tetsuo Noda, Osaka Institute of Technology
  Kazuhiro Nakadai, Director of RSJ, Honda Institute of Japan
  Tetsuya Inamura, Director of RSJ, National Institute of Information
  Shinya Kotosaka, Saitama University
  Satoshi Muramatsu, Toukai University
  Norihiro Kamamichi, Toyo Denki University
  Hideo Hayashi, Nikkan Kogyo Shimbun Ltd.
  Masayuki Yamamoto, Nikkan Kogyo Shimbun Ltd.
  Shigeaki Yanai, Japan Robot Association
  Tomonori Yano, Ohmsha, Ltd.
  Shiori Kaga, Ohmsha, Ltd.

- Award Committee of IRH 2018
  Chair: Nobuto Matsuhira, Vice-President of RSJ, Shibaura Institute of Technology
  Secretary: Yuji Hosoda, Director and secretary-general of RSJ
  Members: Norihiro Kamamichi, Toyo Denki University
  Toshihiro Sawa, President of RSJ, Yaskawa Electric Co.
  Norio Kodaira, Supervisor of IRH 2013, Mitsubishi Electric Co.
  Hisashi Ohsumi, Chair of executive committee of IRH 2013, Chuo Univ.
【Purpose】
・Robotics educational project of RSJ for high school students in the world
・Study and report of the World Robot Summit 2018 (WRS 2018) and Japan Robot Week 2018 (JRW 2018)
・Awards for outstanding presentations
・Information sharing of robotics educational trial on each school and experience of international communication
・Encourage of future robotics researcher and engineer

【Performance】
・"Robot high school" that was an educational program for Japanese high school students using real industrial robot as learning resource were held in 2009 and 2011. These were corroboration with iREX 2009 and 2011.
・1st International Robotics Forum for High School Students (IRH 2013) was held as one of globalization actions in 2013 when IROS 2013 was held at Tokyo. Since IRH 2013, series of IRH have been held in every odd year that is the year of iREX until 2019. In this year, IRH 2018 was held as collaboration event with WRS 2018 and JRW 2018. Performances of each IRH are as follows. So many participants and schools have joined in every time, and IRH is growing up as an international education event.

Table 1 Performances of each IRH

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Participants</th>
<th>Total Schools</th>
<th>Japan</th>
<th>Over sea</th>
<th>Countries</th>
<th>Supporters</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st in 2013</td>
<td>109</td>
<td>19</td>
<td>91</td>
<td>18</td>
<td>China, Japan, Norway, USA</td>
<td>2</td>
</tr>
<tr>
<td>2nd in 2015</td>
<td>115</td>
<td>13</td>
<td>34</td>
<td>91</td>
<td>Brazil, China, Japan, Korea, Mexico (2 Schools), USA</td>
<td>5</td>
</tr>
<tr>
<td>3rd in 2017</td>
<td>129</td>
<td>13</td>
<td>36</td>
<td>93</td>
<td>Brazil, China, Japan, Korea, Philippine, Singapore, Mexico, USA</td>
<td>4</td>
</tr>
<tr>
<td>4th in 2018</td>
<td>90</td>
<td>9</td>
<td>68</td>
<td>22</td>
<td>Japan, Philippine, Mexico</td>
<td>5</td>
</tr>
</tbody>
</table>

【Entrant school】
Hida­Kamioka High school: Japan
CETIS 26 Technical High School: Mexico
National Institute of Technology, Wakayama College: Japan
National Institute of Technology, Toyota College: Japan
Ritsumeikan Keisho Senior High School: Japan
Caritas Don Bosco School: Philippines
Clark Memorial International High School Akihabara IT Campus: Japan
Christian Academy in Japan: Japan
【Report】
1. Schedule:
   - Friday October 19, 2018
     - Investigation and Study of WRS 2018 and JRW 2018
   - Saturday October 20, 2018
     - Presentation: Study report of the exhibition and competition
     - Award ceremony
2. Study of the exhibition and themes of the study
All schools had done the study before IRH 2018 based on one theme that was selected by their self from following study themes. All students investigated real robots exhibited in WRS and JRW 2018 site in the afternoon of the Day One, and completed their study report that are presented at the Day Two open presentation with adding the result of the investigation.

<Field study at the exhibition site>
<Valuations of the study themes>

**Theme 1: Systematization of fundamental technologies in industrial robots for manufacturing use**

Aim of this theme is to learn fundamental technologies consisting industrial robots.

Please select one category from following three fundamental technologies in industrial robots for manufacturing use.

Please investigate variety of technologies, base principles and etc. included in the selected category, then classify and sort out the investigation results so as to clarify total image of the selected fundamental technology.

<Candidates of category selection>
1) Sensor technologies
2) Mechanical elements; e.g. actuators, reduction gears, structures, mechanisms, materials, and system constructions
3) Robot operating technologies; e.g. safety technologies, and system integration technologies

**Theme 2: Relation between applications of robots and their performance**

Aim of this theme is to learn design philosophies of robots optimized for its purposes and application environments.

Please select one category from following three robot applications, and investigate relations between robot applications and performances of robots; e.g. special features, functions, structures, constructions, and specifications.

<Candidates of category selection>
1) Manufacturing use; e.g. automobile, electric equipment, electronics components, medicines, cosmetics, foods
2) Service use; e.g. building cleaning, disaster response, infrastructure maintenance, security, medical treatment, care for old persons, agriculture, fisheries industry, amusements, guidance
3) Home use; e.g. floor cleaning, security, watch and guard for old persons, interactive home appliances, information terminals

**Theme 3: Most advanced technologies of robots**

Aim of this theme is to learn most advanced technologies of robots.

Please investigate the most advanced technologies for robots, and explain novelties, and/or usefulness of the technology, then how robots have been improved by the technology. If it is possible, please picture how the world will be changed by the robot evolution.

Technologies have some phases from basic research level to practical use level and there are individual most advanced technologies in the each phase as shown in following reference materials. First of all, please recognize the phase in which your focusing robot belong to. Then please investigate what is the most advanced technology in that phase.

<Hints of study>

For a description of novelty, there is a way to state that it is solved the problems by a method which has not
been used so far, the combination of principles, law, methods, individual way, or why there is a way to discuss whether now possible to use the way.

For a description of the usefulness, there is a way to argue that it has the same functionality at a lower cost, implementation of more functions at the same cost, functions which could not be realized until now although it cost more.

For changing the world, there is a way to discuss changes in the views of the site, the ways how people works, changes in lifestyle, changes in the common sense, expansion of the work efficiency by the robot, the effect of reducing the programming time and effort of the robot.
3. Presentation

Presentation was held at the room 607 on Saturday October 20, 2018.

Representatives of 9 schools presented their study. The presentation time of each school was 15 minutes, and all schools punctually finished in the limit time. Time of the field study at exhibition site and preparation time for the presentation was limited in short time, however every student made excellent presentation.
<table>
<thead>
<tr>
<th>School name</th>
<th>Selected study theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hida-Kamioka High school; Japan</td>
<td>Theme 3: Most advanced technologies of robots</td>
</tr>
<tr>
<td>CETIS 26 Technical High School; Mexico</td>
<td>Theme 2: Relation between applications of robots and their performance 2) Service use</td>
</tr>
<tr>
<td>National Institute of Technology, Wakayama College; Japan</td>
<td>Theme 2: Relation between applications of robots and their performance 2) Service use</td>
</tr>
<tr>
<td>National Institute of Technology, Toyota College; Japan</td>
<td>Theme 1: Systematization of fundamental technologies in industrial robots for manufacturing use 3) Robot operating technologies</td>
</tr>
<tr>
<td>Ritsumeikan Keisho Senior High School; Japan</td>
<td>Theme 1: Systematization of fundamental technologies in industrial robots for manufacturing use 1) Sensor technologies</td>
</tr>
<tr>
<td>Caritas Don Bosco School; Philippines</td>
<td>Theme 2: Relation between applications of robots and their performance 3) Home use.</td>
</tr>
<tr>
<td>Clark Memorial International High School Akihabara IT Campus; Japan</td>
<td>Theme 1: Systematization of fundamental technologies in industrial robots for manufacturing use 3) Robot operating technologies</td>
</tr>
<tr>
<td>Christian Academy in Japan; Japan</td>
<td>Theme 3: Most advanced technologies of robots</td>
</tr>
<tr>
<td>Ichikawa Gakuen, Incorporated School Ichikawa Senior High School; Japan</td>
<td>Theme 2: Relation between applications of robots and their performance 2) Service use: care for old persons</td>
</tr>
</tbody>
</table>
4. Awards ceremony:

a) Following four schools were selected as outstanding presenter in all 9 presentations of the “Study report” and RSJ presented them “IRH 2018 Best Study Report Award”.

   Winners: • Caritas Don Bosco School; Philippines
     • CETIS 26 Technical High School; Mexico
     • Christian Academy in Japan; Japan
     • National Institute of Technology, Wakayama College; Japan

b) We presented temporally an IRH 2018 Special Committee Award to following school that made a unique viewpoint research.

   • Clark Memorial International High School

c) “Testimonial for Study Report of IRH 2018” was presented to all teachers with regarding their excellent leading of their students.

d) “Certificate of IRH 2018” was presented to all participants.

e) General comment:

   We assessed the presentations to select award winners. However, all presentations were excellent and level difference between all presentations was negligible. All speakers were exactly punctual to the presentation limit time with well controlled speaking. Attitude, utterance and manners of presentation might be better than those of university students in many conferences. Though the preparing time of pre-study and investigation time in the exhibition site wasn’t so enough, all study contents were brushed up well and all presentations were well summarized and easy to understand. We believe that these excellent presentations depend on daily student’s effort and good leading of teachers. We would like to give honor to their great activity.
5. Announcement about next IRH:

IRH 2019 will be held in December 2019 at Tokyo!

In IRH 2019, participants will be able to find and study world advanced robots, because it will collaborate with International Robot Exhibition 2019 (iREX 2019).

We would be grateful, if you could confirm the detail of them with following sites and join to IRH 2019.

IRH 2019 official site: https://www.rsj.or.jp/education/irh2019
iREX 2019 official site (Coming soon an English site) : https://biz.nikkan.co.jp/eve/irex/english/