December 3, 2016
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Rescue Robot Contest Executive Committee

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The 17th Rescue Robot Contest
Requirements for Applicant Teams

Organized by: Executive Committee of Rescue Robot Contest Kobe Sambo Hall
Gold Sponsor: TOKYO ELECTRON DEVICE LIMITED
Official Supplier: Sanritz Automation Co., Ltd.

Osaka Preliminary Challenge Date: June 25, 2017 (Sun)
Venue: Kita-Osaka Polytechnic College,
2-11-40 Tsudayamate, Hirakata City, Osaka Prefecture

Tokyo Preliminary Challenge Date: July 2, 2017 (Sun)
Venue: Arakawa Campus of the Tokyo Metropolitan College of Industrial Technology,
8-17-1 Minami-Senju, Arakawa Ward, Tokyo

Final Challenge Dates: Friday, August 11 (Fri) - 12 (Sat), 2017
Venue: Kobe Sambo Hall, 5-1-32 Hamabedori, Chuo Ward, Kobe City, Hyogo Prefecture

1. Purpose of the Event

The "Rescue Robot Contest (abbreviation: ResCon)" is a robot contest for life-saving rescue activities in large-scale urban disasters. It is planned and operated by the Rescue Robot Contest Executive Committee which enlightens disaster prevention with the phrase "Learning technology, talking with people, and creating a world that is resistant to disasters" as slogan. The contest includes important technical essentials for realizing rescue robots: "remote control technology," "technology to handle objects gently," "cooperation technology for multiple robots" and the like. Furthermore, maneuvering skills and teamwork are also important factors.

As in conventional robot contests, ResCon has the meaning of providing a place or opportunity for nurturing creativity, but also aims to educate and publicize disaster prevention and response to many people through the contest. Furthermore, we expect that new rescue ideas will be born that researchers and engineers developing rescue equipment would not have thought of.

In the 17th ResCon, the teams' first choice of venue for Preliminary Challenge is assigned in order of review of the application documents. If the venue capacity (*) is exceeded, teams are assigned to their second choice venue. If the capacity of both venues is exceeded, no further teams can participate in the preliminary or final challenge. At the 17th ResCon, we plan to change the partial identification factor of the rescue dummy. In the preliminary and final challenge, it is obligatory to transport the robot to the venue the day before the team assembly. As for the handling of flying robots, as with the 16th ResCon, please note that limits will be made to comply with the Aviation Law. In addition, we will continue to provide support with team supporters (sponsoring organizations whose main purpose is to support the participating teams). The content of the support is shown in the attached sheet.

* There is an upper limit (capacity) in the number of teams that can participate at each qualifying venue due to space restrictions, etc.

2. Philosophy of ResCon (Idea)

The philosophy of ResCon is published on the ResCon website. Participating teams should understand it well. The basic approaches and restrictions are summarized as follows.

Basic approach 1) Relative victory or defeat versus other teams is not the first priority.
Basic approach 2) It is the policy to intentionally not set precise rules or restrictions.
Basic approach 3) As a result of 2), we believe that problems the occur in the contest are reflective of real rescue situations.
Restriction 1) Ensure the safety of competitors and spectators from the view that the event is a contest.
Restriction 2) Avoid the damage to the contest venue as much as possible.

3. Outline of the Contest

ResCon will conduct relief activities using an experiment field designed as an experimental facility of the "International Rescue Engineering Institute (Note 1)". The experiment field simulates a large city earthquake disaster on one-sixth scale, and assumes that robot rescue teams from many organizations enter one disaster area. Two teams simultaneously carry out the rescue activities in the experiment field.

At the disaster site, " dummy victim" (nickname: Daiyan), which simulate earthquake victims, are left behind. Because there are dangers such as secondary disasters on the site, it is impossible for humans to approach, so the Damiyans must be rescued with robots alone and be brought to a safe place. Participating teams are located in a place separated from the experiment field by walls, and must remotely control the robot only using movie from cameras mounted on the robots and fixed cameras installed at high places provided by the Executive Committee (assuming live movie from helicopters). However, it is also possible to use an autonomous robot. Sensors are built into the Damiyans and they can detect whether or not they have been handled roughly. Also, the Damiyans have individual differences such as a chest symbol pattern (QR code), sound and light emission from the eyes, to simulate gaining information on the condition of the victim. Identification of the individual differences can be done by reading the symbol pattern, analyzing the frequency of the sound, analyzing the intermittent pattern of the dial tone, and identifying the light emission color. In the contest, the condition of the victim is deemed to have been determined if the robot can identify the individual differences. Therefore, the gentleness of handling the Damiyan and the correctness of assessing the Damiyan's condition are important evaluation criteria in addition to rapid rescue. Also, prior to the rescue activities, it is obligatory for the team to give a presentation that promotes its ideas on rescue and robots.

Based on philosophy of ResCon, several awards will be given such as the Rescue Engineering Grand Prize. In particular, the Rescue Engineering Grand Prize is the most meaningful award at ResCon that not only determines the completeness of the robot and the result of the contest, but also comprehensively evaluates the way of thinking about rescue and the performance.

(Note 1) Currently it is a fictitious laboratory.

4. Contest Arena

One experiment field and two control rooms will be set up at the contest arena, and the two teams will compete at the same time in the experiment field. In the experiment field (about 9,000 mm × 9,000 mm), there are roads which are the passageways of the robot and blocks where the Damiyans are placed.

The control room is separated from the experiment field by a partition, and the captain, operator, and inter-control room communicator work from the control room. In the control room, there is a monitor for video from the helitele (Note 2) which is a fixed camera installed at a high place, a monitor for displaying the evaluation points, a PC for inter-control room communication, a PC for individual identification input, and a robot base (1,200 mm × 1,200 mm) on which the robot is placed when it is dispatched. The robot base is connected to the road inside the experiment field, and the robot is dispatched from the robot base through the base gate (height 600 mm, width 700 mm) to the experiment field. The image display from the robot and the PC for remote control needs to be prepared and brought in by the team.

The block is composed of multiple areas. The Damiyans are placed in one of the areas, and the team must find the Damiyan from within the indicated area and rescue it. There may be multiple obstacles arranged around the Damiyan. Among the obstacles, there may be a special obstacle of about 3 to 5 kg covering the Damiyan. This simulates a collapsed house. The road is 700 mm in width, and two robots may pass each other. In addition, there are irregular bump plates on the road, slopes of about 20% inclination, raised areas connected by slopes, and obstacles on the road. The status of this experiment field cannot be confirmed until the briefing immediately before the rescue operation (see section 7). For details about the contest venues and the sizes and materials of obstacles, please refer to the contest regulations shown in section 8.

(Note 2) “Helitele” refers to a helicopter equipped with a camera that videos a disaster area from a height. The entire experiment field is not always videoed.

5. Robots

Robots shall be remotely operated or autonomous. There are no restrictions on the size, weight, and number of robots, but the whole robot must be able to be placed on the robot base, and pass through the base gate to the experiment field. For remote control of the robot, only the specified ResCon board can be used. Teams can use their own program on the ResCon board if they wish. However, problems arising from self-made programs shall be the responsibility of the team. There are separate restrictions for flying robots, so please read the regulations carefully.

For batteries, use of lithium iron phosphate rechargeable batteries, NiCd rechargeable batteries, nickel hydride rechargeable batteries, sealed lead-acid batteries and dry batteries is permitted. However, these batteries shall be in a commercially available state (Note 3). Lithium iron phosphate rechargeable batteries are safer, because they do not release combustion matter even in the event of an accident, and we recommend to use them.

(Note 3) With self-made battery packs made from rechargeable battery cells bonded by soldering, etc., there is a possibility that the internal structure of the rechargeable battery becomes damaged and charging control may not be performed normally, so they are prohibited from the viewpoint of safety. When connecting in series or parallel, be sure to use a battery case or connector, etc. In particular, be sure to charge batteries such that you can reach the state of charge in the battery's instruction manual.

6. Composition of the members performing the contest

Up to eight people can take part in the contest with the following roles.

- Captain: Takes command of the team. Requests restarts.
- Speaker: Makes the presentation.
- Operator: Operates and maintains the robot.
- ResCon Board Manager: In order to facilitate the operation of the ResCon board during the contest, the ResCon Board Manager manages the ResCon board used by the team and related equipment.
- Inter-Control Room Communicator: Keeps in touch with the opponent's team during the contest so that the rescue activities can be carried out smoothly.
- Helper: Removes the robot from the experiment field and does other tasks. **Since the Helper enters the experiment field during the contest, he/she cannot concurrently have any other role other than as Speaker.**

Based on our experience at the contest so far, it seems that four people is the minimum number of members in practice (e.g., three robots = three operators, and the operators are concurrently responsible for Captain and ResCon Board Manager, and one Helper).

In addition, it is desirable for different team members to have the role of Captain and ResCon Board Manager. The above number of persons does not include personnel for carrying equipment into the control room.

7. Flow of the Final Challenge

The final challenge will be held with 14 teams. Each contest shall have the following flow.

1) Presentation about key points of rescue activities and robot characteristics 2 minutes x 2 teams
2) Briefing based on the image of the experiment field from the helitele 3 minutes
3) Rescue activities 10 to 12 minutes
4) Reporting of rescue activity result About 2 minutes

8. Contest Regulations

Refer to the "17th Rescue Robot Contest Regulations." In order to reduce ambiguity or deal with unexpected matters, there is a possibility of two release revisions after document review (Before the Osaka preliminary Challenge and before the final challenge). The contest will be conducted according to the latest regulations.

9. Document Review, Qualifying Contest

In the 17th ResCon, one team shall be selected from among all teams that apply as the organizer's team. We will review the documents for all teams and assign the desired preliminary venue based on the order of review. Teams can also choose not to select a second choice venue. However, because there is an upper limit of the number of teams in the qualifying venue due to circumstances such as space restrictions, etc. (Note 4), if the number of selected teams reaches the upper limit for each venue, the lower order teams will not be able to participate in the qualifying or final contests. At the same time, for teams who will take part in preliminary who wish to borrow equipment, we will decide up to 20 teams who can borrow equipment in the order of document review.

Prior to the final challenge, the preliminary challenge will be held in Osaka and Tokyo. The preliminary challenge will be conducted to select 14 teams to compete in the final contest from all teams that participate in the preliminary challenge. The breakdown of the 14 teams is 1 organizer's team, 9 teams selected based on contest points (1 team with the highest contest points from each venue, and the top 7 teams for both venues, however, this is limited to teams that won contest points), and 4 teams whose ideas were rated highly. **All the selected teams must participate in the specified qualifying contest.**

There will be no partition or raised areas at the preliminary challenge venue. Therefore, remote control by visual observation from within the control room is permitted. In addition, contests may be held for each team. Other than that, teams must rescue and transport the Damiyan within a certain time according to the same rules as the final challenge. In the evaluation, the damage which the Damiyan receives will be converted into points (physical points), and set as a confirmed score. Even for the organizer's team, if the degree of completion in the preliminary challenge is extremely low, a recommendation for renunciation of rights may be made.

(Note 4) At the time of publication of the application guidelines, it is assumed that there will be about 16 teams at the Osaka preliminary challenge and about eight teams at the Tokyo preliminary challenge.

10. Regarding Lending of Equipment

Teams who requested to borrow equipment, and who were selected through the document review process to be permitted to borrow, will be lent three sets of ResCon boards (all TPIP3), three sets of PWM expansion boards, and a lithium iron phosphate dedicated charger from the Executive Committee for robot building. Details of TPIP3 and the charger are shown separately. Teams not selected as being permitted to borrow equipment will not be lent equipment, so the participating teams must prepare the equipment themselves. Only wireless devices approved by the Executive Committee, including the ResCon board, can be used at the contest.

The number of uses of the ResCon board is unlimited, but operation with more than five sets is not currently guaranteed, and there is a possibility that video delay, inoperability, etc. may occur. In addition, you can purchase ResCon boards by applying to the Executive Committee. After the contest, borrowed equipment must be returned in the same state as the time of lending. If the borrowed equipment is damaged, lost, etc., the participating team shall pay compensation.

11. Participation Application and Contact Information

Download the participation application form from the ResCon website mentioned below, fill out the necessary information, and send a CD-R or DVD-R with the complete set of documents and a print-out for confirmation of the contents. Documents must arrive **by January 31, 2017 (Tue)** at the address below. For details on how to fill in the documents, please refer to the "17th Rescue Robot Contest Application Form." Before applying, please obtain the "Philosophy and Story of the Rescue Robot Contest" and the "17th Rescue Robot Contest Regulations" on the ResCon website and read them carefully. In principle, all copyrights and portrait rights related to the team's submission required for the operation of ResCon shall belong to the Executive Committee. Inquiries and questions regarding participation in ResCon are accepted by email. In addition, time will be made available at the ResCon Symposium 2016 of Robot × Rescue Forum 2016 held at the Bando Kobe Science Museum and the Arakawa Campus of the Tokyo Metropolitan College of Industrial Technology on December 3 (Sat) to provide an explanation about the 17th contest and answer direct questions.

The contents of applications are used only within the scope necessary for the operation of the Rescue Robot Contest.

URL of ResCon website: http://www.rescue-robot-contest.org/
Website URL for participating teams: http://www.rescue-robot-contest.org/forTeam/
(Since up-to-date information is posted from time to time, please check the website on a regular basis.)
Contact: Email: office@rescue-robot-contest.org

Address for participant application form
Executive Committee of Rescue Robot Contest Applications
Care of: Hitoshi Yamauchi, Faculty of Computer Science and System Engineering, Okayama Prefectural University
111 Kuboki, Soja City, Okayama, 719-1197

12. Schedule

The future schedule is as follows:

· December 3, 2016 (Sat)	Robot × Rescue Forum 2016 (Applicants who wish to participate must apply in advance) Includes a briefing session on the 17th ResCon. Kobe Venue: Bando Kobe Science Museum http://www.kobe-kagakukan.jp/ Tokyo Venue: Arakawa Campus of the Tokyo Metropolitan College of Industrial Technology http://www.metro-cit.ac.jp/
· January 31, 2017 (Tue)	Participation application deadline
· February 20, 2017 (Mon)	Notification of document review (Notification by email to all teams that apply) Publication of document review results (published on web)
· February 27, 2017 (Mon)	Detailed notification of document review, etc. (Notification by email to all teams that apply)
· Mid-March, 2017	Shipment of loaned equipment
· March 25, 2017 (Sat)	ResCon Board Workshop (held simultaneously in Kobe and Tokyo)
· June 25, 2017 (Sun)	Osaka preliminary challenge
· July 2, 2017 (Sun)	Tokyo preliminary challenge
· August 11 (Fri) - 12 (Sat), 2017	Final challenge
· December 2017	Return of loaned equipment

Operated by: RxR COMMUNITY