IEEE Region 10 Robotics Competition 2023

Robots for Managing Climate Change
For a Better World

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Table of Content

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1. Introduction

R10 Robotics Competition is an opportunity for all IEEE Student members and Graduate Student members in IEEE Region 10 (R10) to showcase their innovative robot projects designed for combating climate change and humanitarian challenges. It is also an opportunity for IEEE student members to compete at an international level and demonstrate their capabilities.

A robot designed to assist or deal with natural disaster, mitigate climate change threats, eliminate/reduce human sufferings or improve life or living for common persons will be considered suitable for the 2023 R10 Robotics Competition.

Entries to the competition can be a final year project for undergraduate students, or a research project for postgraduate students and Young Professionals (YP). For undergraduate students, the robot development must not have commenced prior to June 2022. Projects based on work done prior to June 2022 may be considered if the significant amount of work has been carried out in the second half of 2022 and in 2023. For postgraduate students and YP, the robot or enabling automation technology must have been developed during the period 2022-2023.

The competition aims for participants to showcase their technical ingenuity and abilities by:

- Application of classroom knowledge and enabling methodologies to develope innovative robot design for practical purposes,
- Demonstrated abilities to:
  - Study and understand the problem,
  - analyze and decompose requirements,
  - develop hardware and software for the development robot, and
  - dissemination of scietific knowledge.
- Demonstrated team work for the robot development.
- Evidence of Sound Engineering Practices – Documentation and recording keeping for (a) robot design features requirements, (b) design decisions, i.e. different options considered and the reasons for selected options, (c) ability to trace and rectify technical errors if any, and troubleshooting, (d) foundations for future developments, and (d) proof of originality, and ownership of the work.

2. Competition Outline

This competition will be organized in three stages.

Stage 1 will be arranged locally by the IEEE Sections with an overall guideline from R10. In Stage 1, each IEEE Section in R10 may select up to two teams to represent the Section and compete in Stage 2. R10 will issue general guidelines for judging and selecting the teams, but Sections will be allowed to use their selection process and criteria to nominate team(s) to represent the Section in the Stage 2.

In Stage 1 IEEE Sections are encouraged to organize robotics activities such as workshops and technical talks, and arrange robotics competitions and hands-on workshops for school children to inspire young people to STEM disciplines. Sections will also be urged to invite local industry leaders and Government officials to these events. These local robotics related activities should also be used as an opportunity to recruit new members, and to enhance IEEE's visibility in the local community.

Stage 2 will be held online, and organized by R10. For Stage 2, the competing teams will build the physical prototype of the robot. They will also create a video presentation and a poster to illustrate technical details of the project, and functionalities of the robot.

Stage 3 (Final stage) – At Stage 3, teams will be required to demonstrate the full functionality of the robot at a physical gathering organized by IEEE Region 10. If the physical gathering is not possible for any reason, then the final stage will be held online.

For Stage 2 & 3, R10 will specify the assessment rubrics to evaluate the performance of the robots as well as the team performance in meeting the competition aims. At each stage, entries will be judged for the technical content, innovation, practical implementation, and potential for further development into a marketable product.

3. Eligibility Criteria

The R10 Robotics Competition is open to IEEE Student Members, Graduate Student Members (GSM) and Young Professionals (YP) in the IEEE Region 10. Non-members must join the IEEE to be eligible to participate in the competition.

All contestants in the competition must belong to one of the IEEE Sections or Subsections in Region 10. Contestant(s) can be an individual or a team as explained below:

- Individual must be an active IEEE Student/GSM/YP member.
- All participating YP must have graduated within the last five years.
- Team-based. The number of team members nominated for the competition must not be more than four for any project. One of the team members must be designated as the team leader. If selected, a maximum of two members will be allowed to attend the final rounds.
- A senior volunteer in the Section or from the industry can act as an Advisor for the team but must not carry out the tasks related to robot hardware or coding the algorithms. It is not necessary for the Advisor to be an IEEE member.
- To qualify as a WIE team, the majority of team members must be female IEEE WIE members, that is, the team can NOT have an equal or more number of males than female members.
- Teams must not include any member from outside the Region 10.

4. General Rules

1. Submissions should be of innovative and useful robotics and automation technology applicable to tackle climate change challenges and/or humanitarian purposes.
2. The scope may include but is not limited to mechanical design, software algorithms, hardware development, sensory technology etc.
3. The participants cannot use a commercially available assembled robot for the competition.

4. Robots must operate autonomously and must not be operated via any remote control system.

1. For Stage 2, assessments and selection for the final round of the competition, the nominated teams will be required to submit by the **announced closing date**:
    a. A registration form (available on the competition website).
    b. A electronic copy of an A1 (59 cm x 84 cm) size scientific poster consisting of an abstract, short list of key words, brief introduction of the robot project and appropriate diagrams/images to illustrate the robot design and functions. Poster must be appropriately titled with the names of the project team members, and their educational institute's name(s) if appropriate.
    c. A video presentation no longer than 6-minute in MP4 format, showing the performance of the Robot system or an innovative automation technology with explanation of key innovative feature incorporated into the robot design and autonomously working robot for carrying out tasks successfully. Any video more than 6 minutes long may result in disqualification of the team.
    d. Endorsement from the IEEE Section to whom the majority of team members belong. R10 will accept a maximum of two teams endorsed by each IEEE Section.
    e. A testimonial letter from the Academic supervisor should be included to confirm the project starting date and anticipated finish date. Academic supervisor must also mention any prior work on which the current project is based.
2. Stage 2 judging will be conducted online where the team members will be required to give a live demonstrations of the robot working, and to answer judges' questions. Academic supervisors can be present during the online judging, but must NOT operate the robot or answer the judges' questions.
3. In Stage 3, a fully functional system should be demonstrated during the final competition rounds at a physical gathering organized by IEEE Region 10 at a venue.
4. It will be the responsibility of the team to arrange appropriate set-up to demonstrate the robot system functions and working performance.
5. The final rounds of the competition are expected to be held around November and December 2023. Depending on budget availability, R10 may provide partial or full financial assistance for participation in the final rounds.
6. The competition will be conducted in English, i.e., all submissions, including project documentation must be in English. However teams will be allowed to arrange the services of a translator to answer judges' questions during the competition.
7. The judges' decision will be final and no appeal against the judges' decision will be entertained.

5. Judging Criteria

The judging criteria given below are broad standards and the judging panel may look into other factors if required, particularly when there is an issue of a tie between multiple teams. The decision of the judges is final at every stage of the competition.

5.1 Robot Projects Selection

For selecting the robot projects for the final round following judging criteria will apply:

1. Video Presentation (Clarity and quality of video, quality of technical content, and factual and technical accuracy),
2. The originality of the research process and solution to meet the stated objectives shown in the poster. The poster must contain Abstract and Keywords.
3. Evidence of thought process and team work for developing the project plans, identification of potential risks, and risk mitigation strategies (from submitted documents),
4. Design innovation and cost-effectiveness
5. Commercial viability,
6. Safety features,
7. Testing accuracy and
8. Quality of documentation (Design details, software code, and testing procedures with results).
9. Satisfactory replies to judges' questions.

5.2 Final Round Judging

In the final round all robots will be judge according to the follow broad criteria:

1. Robot project objectives and practical usefulness related to healthcare and Humanitarian causes.
2. Working functions of the robot,
3. Design innovations & simplicity with cost effective solution,
4. Safety features,
5. Demonstrated team work,
6. Quality of documentation.
7. Answers to judging panel's questions

6. Prizes

The selected projects for the final round will be categorized based on robot functionalities or enabling technologies. For each competition category, the winners will be declared as First, Second and Third positions, and the prizes will be:

First Position Winner – A cash prize of USD 500 plus a plaque.

In case of a team winning the first position, one cash prize of USD 500 plus a plaque will be given out for the whole team. Additionally each team member will receive a certificate.

Second Position Winner – A cash prize of USD 350 plus a plaque.

In case of a team winning the second position, one cash prize of USD 350 plus a plaque will be given out for the whole team. Additionally each team member will receive a certificate.

Third Position Winner – A cash prize of USD 250 plus a certificate.

In case of a team winning the second position, one cash prize of USD 250 plus certificates for each team member.

Every individual and team member reaching the final round but not able to win a position will receive a certificate of participation in the R10 Robotics Competition.

Contacts for further Information:

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