



RoboCupJunior OnStage - Rules 2018

Onstage Technical Committee 2018

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These are the official rules for RoboCupJunior OnStage event 2018. **Changes from the 2017 OnStage rules are highlighted in red.** HOWEVER, teams should make sure they review all the pages of these rules. The rules have been changed to deepen and broaden the educational benefits of competing in RoboCupJunior. It also considers the evolving technologies available in our time.

The International English rules have priority over any translations. They are the official rules of the RoboCup Federation. The rules, score sheets, and all forms of documentation can be downloaded from the official RoboCupJunior website (<http://rcj.robocup.org>). Each team has a responsibility to verify the latest version of these documents prior the competition, changes may be made at any moment. Teams are encouraged to study them in detail.



Preface

RoboCupJunior OnStage invites teams to develop a creative stage performance using autonomous robots that they have designed, built and programmed. The objective is to create a robotic performance of 1 to 2 minutes that uses technology to engage an audience. The challenge is intended to be open-ended. This includes a whole range of possible performances, for example dance, storytelling, theatre or an art installation. The performance may involve music but this is optional. Teams are encouraged to be as creative, innovative and entertaining, in both the design of the robots and in the design of the overall performance. **The performance may involve up to two team members on the stage at any one time but this is optional. The emphasis must be on the robotic performance rather than the human performers.**

OnStage teams will be judged in two categories based on the previous experience of the team in OnStage competitions. The concept is to provide an **entry level competition for novice teams with limited experience of the league (OnStage Novice) whilst providing a more challenging **Open** category within which experienced teams can compete (OnStage Advanced). Teams will be considered novice at the international level, for unless they have one or more members who have attended two international RoboCupJunior competitions in any league. Novice does not imply teams are performing at a 'novice/beginner' level – they have to be skilled enough to qualify. The age limits for both categories are 12-19 at the date specified in the registration.**

The rules, for the most part are the same for both OnStage Novice and OnStage Advanced teams; however, OnStage Novice league is allowed to have line follow and use mats on the floor. The score sheets are used to reflect the level of challenge for each category. Teams must ensure they develop their performance using the score sheets for the correct category.



All teams must comply with the rules for competing in RoboCupJunior 2018, including the age requirements and team sizes stated. It is the responsibility of the participating team(s) and regional representatives to verify the participants' eligibility requirements, which are as follows:

- Age requirement (age as of 1st of July). All team members must be aged 12 to 19 years old
- Team size: Each team must have 2 to 5 members.
- Membership: Each team member needs to carry a technical role within the team. Every participant can join only one team. No member can be shared between teams or leagues.

Overview

Teams are judged in the following areas: technical demonstration, technical interview, OnStage performance and a Technical Description Paper (TDP)

Technical demonstration: a 5-minute stage demonstration to showcase the capabilities of their robots. Teams should demonstrate and describe the capabilities of their robots such as interaction with humans or with each other using mechanisms, a sensor system and algorithms that has been developed by the team. The robots should be presented without their costumes and key features of the technologies used shown to the audience. The team should explain how the capabilities have been developed, the challenges overcome and the technologies involved.

The technical demonstration is assessed on the robot demonstrations, description of robot(s) capabilities, and the quality of the presentation. See the Open Technical Demonstration Score Sheet.

Technical interview: Up to 15 minutes' face-to-face interview between the team and the judges in which all robots and programming are judged against technical criteria.



This can be held on the stage immediately following the Open technical demonstration. The judges will speak with the team members without any microphones on. Creative and innovative technical aspects are rewarded with higher scores. Judges are interested in determining students' understanding of the robotic technologies they have used. Teams must show authenticity and originality regarding their robots and performance in this interview.

All team member must be prepared to answer questions about the technical aspects of their involvement in the robot design. See the Technical Interview Score Sheet.

OnStage performance: 1-2-minutes stage performance in which a performance routine is judged according to creative, innovative and entertainment criteria. Teams must show originality, creativity and innovation throughout their performance routine. It is expected that all participating teams perform their performance at their best. See the Performance Score Sheet.

Technical Description Paper (TDP): Each team is required to submit a TDP (2 - 4 pages) two weeks before the official starting date of the RoboCupJunior competition. The TDP should explain the robot hardware, software, communication, and algorithms used. The TDP is used to establish the authenticity of a team's robotic performance. A template for the onstage TDP will be available for download from the RoboCupJunior website.

At the International RoboCup Junior OnStage competition, teams will also take part in a SuperTeam Performance.

SuperTeam Technical challenge: a robotic performance created by a group of cooperating teams. SuperTeams comprise of two or more participating teams. The SuperTeams are given a short period of time for collaboration at the competition venue. During this time, each SuperTeam must create a new performance that incorporates the work of each participating team. SuperTeams are encouraged to create an exciting and entertaining robotic performance, expressing their friendship and cooperation and demonstrating what they have learnt from each other.



The SuperTeam Challenge is a special program for the international event and is not obligatory for regional events. The rules of the SuperTeam challenge are provided in a separate document, teams who participate in the international event are strongly encouraged to carefully read the SuperTeam 2018 rules in advance of the international finals.



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1 Robots

1.1 Robot technology

1.1.1. Teams are encouraged to use technologies creatively. Innovative or unusual use of technology (including sensors) is encouraged and will be rewarded. For example, laptops, notebooks, mobile phones, tablets, Raspberry Pi and other similar devices can be used as robotic controllers, that process autonomous programming – NOT remote controllers, on stage as part of the performance.

Teams are encouraged to use technology in unusual, innovative or inspired ways to create an engaging performance. If you are unsure whether the technology you are using is appropriate, please contact the Technical Committee before the competition (refer to 8.1).



1.1.2. Teams are encouraged to construct a team's own robot rather than using a commercial kit. This means that commercial kits may be used but must be substantially modified by the team. **It is not permitted to mainly follow a construction manual, nor to just change unimportant parts.**

1.1.3. Robots must perform autonomously.

1.2 Size & number

1.2.1. Robots may be of any size. Participants should design their robot(s) in sizes which they can carry by themselves. A team may have and use any number of robots. However, using multiple robots does not necessarily result in obtaining higher points. Large robots do not count for more. Advice: embedding many systems in one robot often leads to failure, because of the complexity of the build and the not being able to quickly fix problems. It is advised to high light interactive systems between robots.

1.2.2 Robots should be of a weight that a team member can carry and lift onto the stage with ease.

1.3 Design, Construction and Safety

1.3.1. Teams should design their robot in consideration of the safety. For example, every moving part should be covered with proper materials so as not to happen accidental human contact. When batteries are transported or moved, it is recommended that safety bags be used. Reasonable efforts should be made to make sure that in all circumstances robots avoid short circuits and chemical or air leaks. **Appropriately sized and power of motors should be used with regard to health and safety requirements of a performance.**

1.3.2. Teams should build a robust robot, not falling apart easily.

1.3.3. Teams are encouraged to design their robot appearance by themselves. If a team wants to use a famous character as their robot, the team should pay attention to the copyright of the character.



1.3.4. Under no circumstances will mains electricity be allowed to use on the stage. Every robot should be equipped with some sort of battery. **A maximum of 15 volts battery should be used. Lead acid batteries are not considered appropriate unless the team has gained permission before attending the competition from the Technical Committee for a specific reason.**

1.3.5 Robots with flying capabilities should gain permission from Technical Committee before attending the competition. They should be designed with consideration of safety and include an automatic shutdown facility if they leave the stage (including the practice stage) areas. All rotor blades must be encased.

1.4 Communication

1.4.1. Teams are encouraged to design their robot(s) with a communication function. Robots are encouraged to communicate with each other on stage, for example, with a Bluetooth communication option (refer to 2.7 and 2.8). **There must be no communication between off-stage and on-stage devices.**

The only allowed communication protocols are infrared (IR), Bluetooth (LE and classic) and ZigBee. It is the team's responsibility to make sure that their communication function does not interfere with other teams' robots when practicing or performing. No team is permitted to use other radio frequency (RF) signals (like Wi-Fi or Z waves) as this may interfere with robots in other leagues. If you are unsure, please check with the Technical Committee before your performance (refer to section 8).

1.5 Additional advice for designing and constructing robots

1.5.1. While floor joints will be made to be as smooth as possible, robots must be prepared for irregularities of up to 5 mm in the floor surface. Whilst every effort will be made to make the stage flat, this may not be possible and teams should be prepared to cope with this uncertainty.

1.5.2. Although the RoboCup Junior organizers endeavour to make variable lighting including spotlights available, there is no guarantee that direct or intense spotlights will



be available. Teams should come prepared to calibrate their robots based on the lighting conditions at the venue. Teams using compass sensors should be aware that metal components of the staging may affect the compass sensor readings. Teams should come prepared to calibrate such sensors.

2 OnStage Performance (40% of total score)

2.1 Overview

The OnStage performance is an opportunity to demonstrate the technical aspects of the robot(s), design and construction through a stage show. This could be, for example, a magic show, theatre performance, storytelling, comedy show, dance or art installation. Teams are encouraged to be creative, innovative and take risks in their use of technology and materials when creating their performances. Refer to the Performance Score Sheet for more details.

2.2 OnStage performance judging

2.2.1. All prepared teams will be given **two** opportunities to perform before the judges. The top scoring teams may be invited to perform again in a finals competition. Depending on the number of teams, a finals competition might not occur, in which case the highest performance score will be used to help determine the winner.

2.2.2. The stage performance will be judged by a panel of at least three officials. At least one of these judges is a RoboCupJunior official who has judged the Technical Interview as well.

2.3 Stage performance

2.3.1. The duration of the performance routine must be no less than 1 minute and no more than 2 minutes.

2.3.2. Each team will have a total of 5 minutes for their performance. A judge starts a stopwatch when a team member takes a step on the stage. This time includes stage set-up, introduction and performance routine, including any restarts due to factors



under the team's control. It does not include time needed for packing up and clearing the stage. If the time limit is exceeded due to circumstances outside the team's control (for example problems with starting the music by the technicians) there will be no penalty. The judges have the final say on any time penalties.

2.3.3. Following each performance, a team must fully tidy up the stage, pack up and remove any objects related to their performance. The performing team has a maximum of one minute to clear the stage after the end of their performance. The maximum total time on stage is therefore six minutes.

2.3.4. A technician designated by RoboCupJunior officials will start the music and the audio visual/multimedia presentation for the performance routine.

2.3.5. Teams are strongly encouraged to use the time while they are setting up on the stage to introduce to the audience the performance and the features of their robots.

2.4 Restarts

Teams can restart their routine if necessary, at the discretion of the judges. There is no limit on the number of restarts allowed within their 5 minute-performance time. Penalty marks will be deducted from the score. (refer to 2.10) The team will be asked to leave the stage after 5 minutes.

2.5 Music & video

2.5.1. Teams may use music to complement their performance. Teams may find it useful to include a "beep" at the beginning of their music as a start signal.

2.5.2. If music is used teams must provide their own audio music source. If a team uses copyrighted music, they should follow the Copyright Law of the region where the event is held. The preferred transport method is to place the sound file on a memory stick as a MP3 file. The memory stick should be clearly labelled with the team name and category (**Novice or Advanced**) and should hold only the MP3 file.



It is essential that the music be given to a sound technician or a RoboCupJunior official before the team's practice period. Teams are encouraged to bring multiple copies of the audio source file.

2.5.3. The music should start at the beginning of the audio music source with a few seconds of silent lead-time.

Teams are encouraged to provide a visual or multimedia presentation as part of their performance. This can take the form of a video, animation, slideshow, etc. However, the content should be made by the team themselves. A projector and screen will be provided. The organizers cannot guarantee the height of the projection screen above the stage or the size of the projection.

2.5.5. Interaction between the robots and the visual display is allowed and encouraged. A VGA and HDMI cable will be available on stage to which a laptop or other device can be connected to the projector. The length of the cable cannot be guaranteed.

2.6 Stage

2.6.1. The size of the performance stage area will be marked in a rectangular area of 4 x 3 meters (m) for robots with the 4m side facing the judges. This rectangular area is within a stage with a minimum size of 5 x 4 meters. 2.6.2. The boundary of the performance stage area will be marked with a 50 millimetre (mm) black tape-line. Teams are allowed to use the black boundary to identify the performance stage area. The floor provided shall be made of flat (non-glossy) white painted MDF (compressed wood fiber).

2.7 Scenery

2.7.1. Static props which do not form an integral part of the performance are discouraged since the focus of the performance should be on robots. The kind of props that are considered "interactive" are:

- Props interact with robots via sensors



- Props interact with robots via communication (refer to 1.4).

2.7.2. If a team decides to use static props, they should be placed on the periphery of the defined stage performance area. Robots can sense static props to perform a certain task or trigger a performance as long as they are placed on the periphery of the defined stage performance area.

2.8 Human-robot and robot-robot interaction

2.8.1. Robots may be started manually by human contact, sensor interaction or with remote control at the beginning of the performance (refer to 1.4 for allowed wireless communication). This is the only physical contact humans may have with their robots during the performance. Any clarifications regarding this ruling should be directed to the judges before the competition to ensure the interaction is permitted.

2.8.2. Human-robot interaction is encouraged; humans cannot physically touch the robot, just interact with the robot's sensors. Interaction which is used to alter the robot's behaviour directly, e.g. to keep it inside the black lines, will be rewarded far less in comparison to more intelligent interaction (e.g. a robot following human using a camera).

2.8.3. Interaction between robots is highly encouraged. Robots are allowed to physically touch one another, and can interact through sensors and wired/wireless communication (refer to 1.4).

2.9 Humans on stage

A maximum of two human team members may perform with their robots on the stage at any one time during the performance. There is no penalty for humans not performing with their robots. Human performers may be inside and/or outside the marked area but should keep to the 5 x 4-meter area.

2.10 Penalties

2.10.1. If a team exceeds the time limits explained in 2.3, the team will be penalized by the loss of points (see performance score sheet).



2.10.2. If all the robot's contact points (e.g. wheels) move outside the marked boundary of the performance area the team will receive a penalty score. A contact point is the point at which a robot touches the stage. If in doubt of "contact point" in relation to your robot design, please consult with the Technical Committee (refer to 8.1).

For robots with no contact points on stage the boundary area is considered to be the cuboid located on the marked boundary to a height of 2.5 metres. Above this height the robot will incur a score penalty. Teams should carefully check the rules in the host country to ensure there are no licensing restrictions before considering the use of an autonomous flying robot. Additionally, they MUST seek approval from the Technical Committee in advance, no later than one month prior to the event.

2.10.3. Unless a problem is not the fault of the team, any restart will result in a score penalty.

2.10.4. Teams who, in the opinion of the judges, have knowingly produced duplicate robots, costumes or performance movement (duplicate music is allowed) of another team or reused previous years' robots (with or without modifications), costumes or performances will be subject to penalties. This applies to any previous RoboCupJunior Dance or OnStage performances.

2.10.5. A team who cannot be punctual will be penalized. If a team cannot get ready for their turn on time and the organizer has to reschedule, the team will be allowed to show their performance after the end of the last judgment of the day, though it will result in a score penalty. If the team repeats unpunctual behaviour, disqualification may be applied.

2.11 Preparation for the stage performance

2.11.1. It is the responsibility of the team to ensure that the music and video/presentation is playing correctly before their first performance by liaising with the RoboCupJunior OnStage officials.



2.11.2. Depending on the configuration of the stage and the sound system at the venue, it is possible that the human starting the robot will not be able to see the RoboCupJunior OnStage official starting the audio source; and vice versa. Teams should come prepared for these conditions.

2.12 Practice on the main stage

2.12.1. The main performance stage will be made available for teams to practice on. In fairness to all teams who may wish to practice, a booking sheet will be used to reserve the stage for a short practice time. Please be respectful of the allocated time.

2.12.2. Every team who practice on the main stage is responsible for cleaning it after use; the stage must be fully cleaned for the next team willing to use it. Especially, the team who uses the main stage just before starting the performance judging should clean up at least 3 minutes before the judging start

2.13 Content

2.13.1. Any performance that includes violent, military, threatening or criminal elements will be excluded. Any team using an inappropriate words or images will also be excluded.

2.13.2. Participants are asked to carefully consider the wording and messages communicated in any aspect of their performance. What seems acceptable to one group may be offensive to friends from a different country or culture.

2.14 Security and safety of the performance

2.14.1. To protect participants and comply with occupational health and safety regulations of the host country, RoboCupJunior officials and bystanders, routines may not include explosions, smoke or flame, use of water, or any other hazardous substances.

2.14.2. A team whose routine includes any situation that could be deemed hazardous, including the possibility of damaging the stage, must submit a report outlining the content of their performance to the Organizing Committee 25 days before arriving at



the competition. The Organizing Committee may also request further explanation and a demonstration of the activity before the stage performance. Teams not conforming to this rule may not be allowed to present their routine.

2.15 Authenticity and originality

The performance is to be unique and have never been used in any other RoboCupJunior International competitions. Teams are encouraged to carefully check that all robots and costumes conform to this rule.

3 Open Technical Demonstration (40% of total score)

3.1 Overview

The description of the robots' capabilities should explain to the audience how the robot's capabilities have been achieved. Teams for whom English is not their first language will be provided with a translator to present their written words if required. Teams may use a video or other recorded aid to present the description.

3.2 Demonstration procedure

3.2.1. Teams will have 5 minutes on stage to give their demonstration. They will additionally have 1 minute to enter and set-up on stage and an additional 1 minute to clear the stage.

3.2.2. The technical capabilities of their robot(s) should be demonstrated by both describing what has been developed and demonstrating this capability. This could cover any aspect of the performance or technical capabilities of the robot(s), such as interaction with humans, interactions with other robots or the use of a particular sensor. **All teams must discuss how they considered safety whilst developing their robotic performance.**

3.2.3. Teams are encouraged to remove robots' costumes for showing detailed design. If this is difficult, teams should prepare some photos or movies of inner mechanisms as an electronic presentation. Be aware that not being able to



demonstrate how a robot works because the costume prevents this, will result in a lower score.

3.2.4. The technical demonstration will be judged by at least two judges.

3.2.5. The Open Technical Demonstration Score Sheet is used in the judging. It is strongly suggested for teams to read the Score Sheet before the demonstration to make good use of the demonstration. This assesses both the content and presentation of the demonstration.

3.3 Stage

3.3.1. The same stage will be used for performance and the technical demonstration. Limits described in section 2.6 apply for the Open Technical Demonstration.

3.4 Demonstration presentation

3.4.1. Two microphones will be available for teams to use. Teams are encouraged to produce presentations, videos or use music or a pre-recorded commentary to accompany and assist with their technical demonstration. There is no limitation on the number of team members allowed on the stage.

3.5 Translator

3.5.1. The Open Technical Demonstration will take place in English. If teams require a translator, they should inform the RoboCupJunior OnStage officials or Local Organizing Committee prior to the event to allow translators to be organized.

4 Technical Interview (20% of total score)

4.1 Interview procedure

4.1.1. All teams will have up to 15 minutes' technical interview judging during the competition.

4.1.2. Interviews will be judged by at least two RoboCupJunior officials.



4.1.3. The Interview Score Sheet is used in the interview judging. It is strongly suggested for teams to read the Technical Interview Score Sheet before the interview to make good use of the interview.

4.1.4. Teams should ensure that they bring all their robots, and copies of all their programs in a format that can be easily viewed.

4.1.5. Each team member must be prepared to answer questions about the technical aspects of their involvement in the robot design and programming.

4.2 Translator

4.2.1. Same as the Open Technical Demonstration. Please refer to 3.5.

4.3 Second technical interview

4.3.1. If the judges consider it necessary, teams may be asked to complete a second technical interview. If this occurs, the score from the second interview will be used to calculate the total score.

5 Technical Description Paper and Technical Poster

5.1 Technical Description Paper (TDP):

5.1.1. The **Technical Description Paper (TDP) must be completed by teams attending an** international event. This allows teams to provide a summary of the robots and technology used. This information will be used by the judges to assist with scoring the performance, technical demonstration and interview. It is also used for authentication purposes.

5.2 Technical Poster (optional)

5.2.1. Teams will be given public space to display a **technical poster**. The size of the poster should be no larger than A1 (60 x 84 cm). The interview the poster should be



displayed in the designated location. Teams may bring the poster to the interview if they contain useful information, however the poster will not be judged during the interview. Electronic posters will not be accepted.

5.2.2. The purpose of the poster is to introduce the team, explain the technology used to develop the robots and document the preparation work. Posters should be made in an interesting and engaging format. They will be viewed not only by the judges, but also by other teams and visiting members of the public.

5.2.3. Areas that are useful to include are: team name, division (**Novice or Advanced**), and your region/country, annotated pictures of the robot under development at various stages and an explanation of the innovative robot technologies used.

6 Judging and Commenting

6.1 Judging criteria

6.1.1. The judging criteria and allocation of marks are given in the respective score sheets.

6.2 Totalling

6.2.1. The total score of each team is calculated by combining the scores from the team's technical interview and the open technical demonstration, and the score from the OnStage performances. The finals, if scheduled, will be used to determine the "Best Stage Performance" award only.