

# CoSpace OnStage Rules 2017

CoSpace Robot Technical Committee

This document contains the official rules for the CoSpace OnStage to be used in the 5th Singapore National CoSpace and RoboMaker Challenges. They are released by the CoSpace Technical Committee. The English rules have priority over any translations.

## **PREFACE**

CoSpace Performance means one or more real robots, virtual robots, human come together to present a 1 to 2 minutes performance (theatre show or dance) in a creative designed real and virtual coexistence world.

The CoSpace Performance Challenge is intended to be very open-ended. The CoSpace Technical Committee would like to encourage teams to be creative, innovative and use the full capacity of robotics technology and interactive digital media to create their performance. The CoSpace Performance Rules provide a framework on how to structure a CoSpace Performance routine.

The CoSpace Dance Simulator can be found at <http://www.cospacrobot.org> . All communications can be realised using the CoSpace Dance simulator. All the rules are incorporated into the simulation environment.

## **1. GENERAL INFORMATION**

### **1.1. Age Group**

1.1.1. Primary age group – all members are under 13 year old. Secondary age group – any member has to be between 13 – 19 year old. Age as on 1<sup>st</sup> Sept in the year of competition.

### **1.2. Authenticity and Originality**

1.2.1. The performance must be unique and original. They should never been used in any other CoSpace Performance Challenge in any previous year's round of regional or international competition.

1.2.2. Teams who reused previous year's robots, costume or performance movement shall inform the judging panel.

1.2.3. Teams are encouraged to bring a learning journey or any form of documentation describing their preparation efforts including photographs of the different stages of robot development or virtual environment design.

### 1.3. Content

1.3.1. Any performance that includes violent, military, threatening or criminal elements will be excluded. Any team using an inappropriate name or logo will also be excluded. Participants are asked to carefully consider the wording and messages communicated in their presentations. What seems acceptable to one group may be offensive to friends from a different country or culture.

### 1.4. Security and Safety

1.4.1. In order to protect participants, officials and bystanders, routines must not include real explosions, smoke or flame, use of water, or any other hazardous substances. (All extraordinary effects can be added in the virtual environment if teams wish to do so).

### 1.5. Competition

1.5.1. In CoSpace Performance, the main emphasis is on

- Real robot design and construction (sensors, actuators, and programming)
- Virtual robot design (appearance and programming)
- Virtual environment set-up (creative 3D design)
- Cinematography (Creative use of virtual cameraman)
- Communication (real-virtual and virtual-virtual communication)

1.5.2. The CoSpace Robot Technical Committee would like to encourage teams to be creative, innovative and inspire the audience.

1.5.3. All teams are judged in 2 segments. These are the technical demonstration and the original performance.

- **Technical Demonstration** to show how the robot's capabilities have been achieved. 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.
- **Original Performance** is judged from creative, innovative and entertainment aspect. Teams must show originality, creativity and innovation through their performance routine. It is important for teams to execute and demonstrate what they planned. It is expected that all participating teams perform their performance at their best.

## **2. PERFORMANCE AREA**

### **2.1. Size**

2.1.1. The size of the performance area will be marked in a rectangular area of 3 x 4 meters for real robots with the 4m side facing the judges. If the whole body of a real robot (main body of robot not including any large extensions from the body) moves outside the marked boundary of the performance area the team will receive a penalty score.

If in doubt please consult with the Chief Judge for clarification of “robot body” in relation to your robot design.

2.1.2. Human performers may be inside and outside the marked area.

2.1.3. The boundary of the performance area will be marked with a 50 mm black line tape. This can also allow teams to use the black boundary to program a real robot to identify the performance area.

### **2.2. Surface**

2.2.1. The floor of the performance area shall be made of flat (non-glossy) white painted MDF (compressed wood fibre).

2.2.2. While floor joints will be taped to make them as smooth as possible, real robots must be prepared for irregularities of up to 3 mm in the floor surface.

### **2.3. Lighting**

2.3.1. The organizers will endeavour to make variable lighting including spotlights available. Teams should come prepared to calibrate their real robots based on the lighting conditions at the venue.

## **3. ROBOTS AND COMMUNICATION**

### **3.1. Real Robots and Virtual Robots**

3.1.1. There will be two types of robots – real robots and virtual robots. Teams are encouraged to use sensor technology and communication innovatively while making real robots. Teams are also encouraged to design and program virtual wheeled robots and humanoid robots creatively. Unusual, innovative or inspired ways to create an engaging performance is encouraged with reward. If you are unsure whether the technology you are using is appropriate please contact the Chief Judge before the competition.

### **3.2. Number of Robots**

3.2.1. There may be any number of real robots and virtual robots on a team. The creative design and real/virtual communication/interaction is one of the judging criteria.

### **3.3. Size**

#### **3.3.1. Real Robots**

Real Robots may be of any size. Any props should not distract the audience view of the backdrop for the virtual robots and environment projection.

#### **3.3.2. Virtual Robots**

Virtual Robots may be of any size and any design. For example, the virtual robot(s) can be designed as a car, a moving-tree, a Barbie, a spider-man, etc. The virtual robots should move and act in the virtual environment.

### **3.4. Control**

3.4.1. Both real and virtual robots must be controlled autonomously. Except the communication specified in section 3.6.1, no other form of wired/wireless communication is allowed. No member of the team may make physical contact with the real robot during its performance UNLESS it has been discussed and approved by the judges PRIOR to the performance.

3.4.2. Real robots may be started manually by human contact or with a remote control at the beginning of the performance. Virtual robots may start automatically according to the sequence of the performance. (Refer to section 4.4)

### **3.5. Costumes**

3.5.1. Costumes for real robots and human performers are encouraged, and points will be awarded.

### **3.6. Communication**

#### **3.6.1. Communication between real robots and virtual robots**

During the performance, any real robot may communicate with any virtual robot. The communication mode is ZigBee. The communication can be initialised by either real robots or virtual robots.

#### **3.6.2. Interaction and Communication between virtual robots**

During the performance, virtual robots can communicate with each other via programming.

3.6.3. It is the teams' responsibility to make sure that their communication does not interfere with other teams' robots when practicing or performing. No team is permitted to use radio frequency (RF) signals like WLAN wireless communication.

## **4. ORIGINAL PERFORMANCE**

### **4.1. Kind of Performance**

4.1.1. CoSpace Performance allows teams to create a 1 to 2 minutes creative performance using autonomous real robots, virtual robots and 3D virtual environment that teams have designed, built and programmed. The performance, regardless whether it is drama or dance routine, must be delivered in real/virtual co-existence world (with real/virtual environment communication established).

4.1.2. In CoSpace Performance, teams are required to build real robots, design virtual environment including virtual robots and establish communications between the real and virtual objects wirelessly using Bluetooth or Zigbee. Virtual robots and items in the virtual environment should react accordingly once they receive a signal from real robots. The real robot or items in the real environment should react accordingly once they receive a signal from virtual environment. The effective interaction between real and virtual worlds is one of the judging criteria.

### **4.2. Duration**

4.2.1. The duration of a performance routine must be more than 1 minute and less than 2 minutes.

### **4.3. Music and Video**

4.3.1. Music and video must be embedded in the virtual environment if teams choose to have. You may have more than one piece of them for the entire routine to enhance the theme delivery.

### **4.4. Human Team Members**

4.4.1. Human team members are encouraged to perform with their robots. There is no penalty for humans not performing with their robots. However, it may affect the entertainment marks.

4.4.2. The only physical contact humans can have with their real robots are:

- to start the real robot(s) at the beginning of a performance.
- the physical contact is a part of the performance (This has to be discussed with and approved by the judges PRIOR to the performance).

### **4.5. Scenery**

4.5.1. Real scenery

Teams are encouraged to provide their own scenery in the performance area.

4.5.2. Virtual scenery (3D virtual environment)

Teams are required to design virtual scenery. The virtual scenery may include virtual 3D objects (buildings, trees, etc.), virtual video display, music, speeches, or animations, etc. that suit the theme of the performance. The virtual environment will be projected on the backdrop screen as an extension of the real world. Team can use any form of Digital Interactive Media to create objects and embed them into the virtual environment to enhance the theme.

- 4.5.3. Teams need to build the 3D virtual environment on their own PC/laptop. They need to connect their own PC/laptop to the AV console and play the virtual scenery during the competition. It is strongly recommended for teams to try the connection PRIOR to the actual performance.

#### **4.6. Performance Routine**

- 4.6.1. One of the team members needs to start-up and control the 3D virtual environment for the routine.
- 4.6.2. One human team member or several members, for a team with multiple real robots and props, can start each real robot, either by hand or remote control.
- 4.6.3. The performance routine begins when human/real robots starts performing or virtual environment presentation begins.

### **5. JUDGING CATEGORY AND SCORING**

Technical presentation cum demonstration and performance will be judged using the published score sheets. Teams are encouraged to study the score sheets in detail in order to understand how they will be judged.

#### **5.1. Technical Presentation cum Demonstration**

- 5.1.1. All teams will have a 20 minutes to give presentation and demonstration.
- 5.1.2. 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.
- 5.1.3. The 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.

#### **5.2. Performance**

Performances will be judged according to the following categories:

- 5.2.1. Real world setup including real robots, robot costumes, creative use of sensors, props and their arrangement.

5.2.2. The real robots should have solid construction, components should not fall off, and Robots movement should be smooth and controlled. Sensors should be used effectively (eg. to trigger different parts of the program, for detection of boundary line, etc). The motorized props, static display, back drops, lighting effect, or any special effect should enhance the performance. Costumes should be appropriate, innovative, well made and complement the performance.

5.2.3. Virtual world setup including virtual robots and 3D environment design

Virtual robots design should be fit into the theme well. 3D Virtual environment including various Interactive Digital Media activities enhances the overall performance.

5.2.4. Virtual/Real world communication

2 types of communication will be assessed.

- Communication between virtual robots and virtual objects.
- Communications between real robots and virtual robots/objects.

5.2.5. Choreography and Cinematography

Creative use of the virtual camera and creative theatre/dance performance presented.

5.2.6. Entertainment value

Human, real robots, virtual robots, and virtual environment contributed to communicate the theme and enrich the performance. The overall performance should be entertaining, exciting, and enjoyable and will successful convey the story or theme.

### **5.3. Scoring**

5.3.1. The overall score of each team is calculated as follows:

- Presentation cum Demonstration – 30%
- CoSpace performance – 70%

5.3.2. Each team will be 2 opportunities to perform. The highest performance score will be added to the technical presentation score to calculate an overall score.

## **6. PRIZE AND AWARD**

The awards are determined by combining the interview and their best performance score. Depending on the number of teams entering the competition, there will be awards for trophies and certificates.

## **7. CODE OF CONDUCT**

### **7.1. Spirit**

7.1.1. It is expected that all participants, students and mentors, will respect the RoboCupJunior mission. In addition, participants should keep in mind the values and goals of RoboCupJunior.

7.1.2. It is not whether you win or lose, but how much you learn that counts. You will really miss out on a lifelong learning experience if you don't take this opportunity to collaborate with students and mentors from all over the world. Remember this is a unique moment!

### **7.2. Fair Play**

7.2.1. It is expected that the aim of all teams is to participate in a fair and clean competition.

7.2.2. Humans that may cause deliberate interference with robots or damage to the venue will be disqualified.

7.2.3. The team is responsible for removing all debris left from their routine that may interfere with the performance of subsequent activities.

7.2.4. Remember: Helping those in need and demonstrating friendship and cooperation are the spirit of RoboCupJunior as well as for making a better world.

### **7.3. Sharing**

7.3.1. It is understood that RoboCupJunior International events with rich technological and curricular developments should be shared with other participants after the competition.

7.3.2. Any developments may be published on the RoboCupJunior Web site following the event.

7.3.3. Sharing information furthers the mission of RoboCupJunior as an educational initiative.

### **7.4. Behaviour**

7.4.1. All movement and behaviour is to be of a subdued nature within the event venue.

7.4.2. Competitors are not to enter set-up areas of other leagues or other teams, unless expressly invited to do so by other team members.

7.4.3. Participants who misbehave may be asked to leave the building and risk being disqualified from the event.



## **7.5. Mentors**

- 7.5.1. Mentors (teachers, parents, chaperones and other adult team-members) are not allowed in the student work area, except to assist carrying equipment in or out of the area as teams arrival or departure days.
- 7.5.2. If a problem is encountered with a computer or other device that is clearly beyond the reasonable ability level of a student to repair, a mentor may request permission from the organizers to enter the work area for the sole purpose of attending to that repair. They must leave the work area immediately after this is completed.
- 7.5.3. Mentors are not allowed to set up equipment for the performance, as this should be the responsibility of team members.
- 7.5.4. A mentor found in the student work area without an acceptable reason may lose his/her access to the venue and the team marks will be penalised.
- 7.5.5. A mentor found to be involved with mending, building or programming the robot(s) may lose his/her access to the venue and the team marks will be penalised.

## **7.6. Officials**

- 7.6.1. The referees and officials will act within the spirit of the event.
- 7.6.2. The officials shall not have close relationship with any of the teams participating in the CoSpace Performance.

## **7.7. Information about the event**

- 7.7.1. Teams will be responsible for checking the updated information during the event. The updated information will be provided on notice boards in the venue, and possibly on the event website. The latest information will be posted on the notice boards and will be announced at the daily team leader's meeting.

Please contact [Competition@CoSpaceRobot.org](mailto:Competition@CoSpaceRobot.org) should you have any questions.

## Presentation cum Demonstration Scoresheet

Team Name: \_\_\_\_\_ Institution: \_\_\_\_\_

### The aims of the presentation cum demonstration are to:

- Demonstrate the capabilities of the virtual/real robot(s)
- Explain the robot system and key capabilities
- Demonstrate fully working robot systems which work as described
- Focus on the key, innovative and original capabilities of the robot(s) developed
- Effectively communicates the technical capabilities of the robot to the audience with a high quality demonstration

### Examples of areas on which the demonstration and explanation could cover include:

- Demonstration and explanation of a working mechanism which is complex, effective, overcomes a particular challenge or addresses reliability and stability.
- Demonstration of successful robot-robot or robot-human interactions (e.g. through sensors or communication protocols)
- Successful implementation of a software algorithm
- Choice of sensors and what the sensors are used to detect or interact with and explanation of algorithms used for sensing
- Integration of entire system (electronics, software, electronics, mechanics)
- The biggest challenges/problem which have been overcome, e.g. sourcing enough power, reliability, interactivity

Category	Mark
Demonstration of robots' technical capabilities which are fully-working	/10
Explanation of robots' capabilities	/10
Clarity and quality of the demonstration	/10
<b>Total Score</b>	<b>/30</b>

Judge's Initial: \_\_\_\_\_

Date: \_\_\_\_\_

## Performance Scoresheet

Team Name: \_\_\_\_\_ Institution: \_\_\_\_\_

<b>1 - REAL WORLD SETUP (12 MARKS)</b>		<b>POINTS</b>
<b>1.1</b>	<b>Real Robots/Props Arrangement</b> <ul style="list-style-type: none"> <li>• The real robots/props setup is creative and enhances the performance.</li> <li>• Reward hand-built props, and additional technology (e.g. lights/moving parts/light effects)</li> <li>• Costumes are appropriate, innovative, well made and complement the performance. Reward handmade more heavily than commercial bought materials</li> </ul>	<b>/6</b>
<b>1.2</b>	<b>Use of Sensors</b> <ul style="list-style-type: none"> <li>• Is the robot programmed to respond to sensors?</li> <li>• Are sensors used to trigger next part of performance?</li> <li>• How is the robot programmed to keep within the stage boundaries?</li> <li>• How did the robot avoid obstacles or another robot</li> </ul>	<b>/6</b>
<b>Sub-Total</b>		<b>/12</b>
<b>2 - VIRTUAL WORLD SETUP (20 MARKS)</b>		<b>POINTS</b>
<b>2.1</b>	<b>Virtual Robot</b> <ul style="list-style-type: none"> <li>• A variety of robots, such as wheeled robots, humanoid robots.</li> <li>• The appearance of robots matches the theme of the performance and enhances the entertainment value.</li> <li>• The virtual robots' movement is varied, and interesting. Their movement fits the music and the performance of the real robots</li> </ul>	<b>/10</b>
<b>2.2</b>	<b>Virtual Environment</b> <ul style="list-style-type: none"> <li>• Innovative Cinematography</li> <li>• 3D Virtual environment enhances the overall performance</li> </ul>	<b>/10</b>
<b>Sub-Total</b>		<b>/20</b>

<b>3 - COMMUNICATION (16 MARKS)</b>		<b>POINTS</b>
<b>3.1</b>	<b>Virtual &lt; - &gt; Virtual Communication</b> <ul style="list-style-type: none"> <li>Communications between virtual robots/entities (1-2 very few/no communication, 3-5 significant amounts of communication)</li> </ul>	<b>/8</b>
<b>3.2</b>	<b>Virtual &lt; - &gt; Real Communication:</b> <ul style="list-style-type: none"> <li>Communications between real robot and virtual entities that adds to the performance (1-2 very few/no communication, 3-4 significant amounts of communication)</li> </ul>	<b>/8</b>
<b>Sub-Total</b>		<b>/16</b>
<b>4 – OVERALL PERFORMANCE (22 POINTS)</b>		<b>POINTS</b>
<b>4.1</b>	<b>Innovation &amp; Originality</b> <ul style="list-style-type: none"> <li>Robots are home-built, not kits</li> <li>Innovative ways of using technology, such as creative mechanical design system, sensing system or power system,</li> <li>Creative use of the performance area</li> <li>Virtual / real space communication</li> <li>Human-robot interaction</li> </ul>	<b>/6</b>
<b>4.2</b>	<b>Technical Complexity</b> <ul style="list-style-type: none"> <li>Real robot movement complex.</li> <li>Synchronization / communication between real/virtual robots.</li> <li>Human-robot interaction</li> </ul>	<b>/6</b>
<b>4.3</b>	<b>Entertainment Value</b> <ul style="list-style-type: none"> <li>Human, real robots, real props, virtual robots, and virtual environment contributed to communicate the theme and enriched the performance.</li> <li>Non-repetitive and entertaining movements, held interest of audience</li> <li>Overall theme and atmosphere was created, exciting, entertaining, enthralling, humorous, etc.</li> <li>Overall performance was entertaining/enjoyable which delivered the story successfully as described in the theme</li> </ul>	<b>/10</b>
<b>Sub-Total</b>		<b>/22</b>

**Total Score:            /70**

Judge's Initial: \_\_\_\_\_ Date: \_\_\_\_\_