



# RCAP CoSpace Grand Prix Rules 2018

## (CoSpace F1, FirsSteps)

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## CHAPTER 1: GENERAL RULES

### 1 Team

#### 1.1. Team Members

1.1.1 A CoSpace Grand Prix FisrtSteps team should consist of 2 to 4 members. Each participant can only register for one team. All team members must be under 12 year old.

- Age is as specified on 1st July in the year of the competition.

1.1.2 Every team member needs to carry out a technical role for the team (strategy planning, programming, etc.), which should be identified at registration. Each member will need to explain his/her technical role and should be prepared to answer questions regarding the technical aspects of their involvement during preparation for the CoSpace Grand Prix FisrtSteps Challenge.

1.1.3 Teams should be responsible for checking updated information (schedules, meetings, announcements, etc.) during the event.

#### 1.2. Team Captain

1.2.1 Each team must have a captain. The captain is responsible for communication with referees during the game.

1.2.2 As the space around the competition fields is limited (and crowds can often result in accidents that damage the robots), only the team captain is allowed to operate the real robot, based on the stated rules and as directed by the referee. Other team members (and any spectators) within the vicinity of the real world are to stand at least 150 cm away from the real world while their real robot is active, unless otherwise directed by the referee.

### 2 CoSpace Grand Prix FisrtSteps Description

In the CoSpace Grand Prix FisrtSteps Challenge, students need to make a robot, code a robot, and finally take part in the CoSpace Grand Prix FisrtSteps challenge.

#### 2.1 Make a Robot

2.1.1 Teams are required to assemble a real robot using the standard robot maker kit. Teams may need to design and make additional accessories to accomplish the mission.

#### 2.2 Code a Robot

2.2.1 There are two types of robots used in the CoSpace Grand Prix FisrtSteps challenge. A team must program the REAL\_ROBOT in the REAL\_WORLD and the VIRTUAL\_ROBOT in the VIRTUAL\_WORLD to complete the CoSpace Grand Prix FisrtSteps mission.

#### 2.3 Grand Challenge

2.3.1 The CoSpace Grand Prix FisrtSteps challenge consists of a race in REAL\_WORLD and VIRTUAL\_WORLD. The maximum duration for the CoSpace Grand Prix FisrtSteps challenge is 8 minutes.

2.3.2 A challenge begins with REAL\_ROBOT racing in REAL\_WORLD while VIRTUAL\_ROBOT is on standby in VIRTUAL\_WORLD. When REAL\_ROBOT passes the "REF\_TELE" gate of the referee

box (refer to section 3.2), VIRTUAL\_ROBOT will be activated (Teleportation) to race in VIRTUAL\_WORLD. REAL\_ROBOT stops until the end of the race.

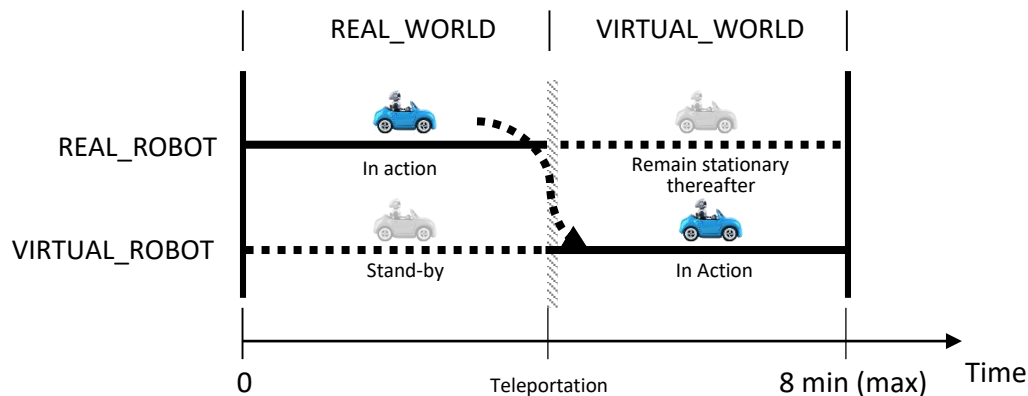


Figure 2: CoSpace Grand Prix FirstSteps

### 3 Referee

#### 3.1. Official

3.1.1 A referee is an official who manages the CoSpace Grand Prix FirstSteps and makes sure that the CoSpace Grand Prix FirstSteps rules are followed.

3.1.2 The referee receives and uploads the teams' virtual programs, as well as runs the race.

#### 3.2. The Referee Box

3.2.1 The organiser will provide a Referee Box that acts as the digital referee for races in REAL\_WORLD. It communicates with the CoSpace server throughout the whole competition. The referee box consists of the "REF\_STAT" gate and "REF\_TELE" gate.

3.2.2 Once the REAL\_ROBOT passes "REF\_STAT", the game clock begins. Once the REAL\_ROBOT passes "REF\_TELE", the team's VIRTUAL\_ROBOT will be activated and the virtual race will be started. It is the organiser's responsibility to ensure the referee box is in good working condition.

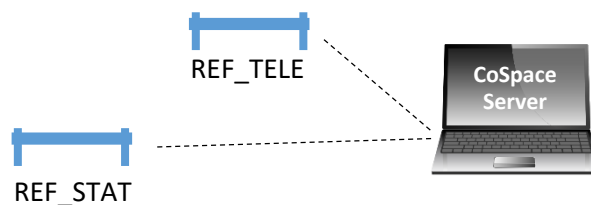


Figure 3: Referee Box

### 4 Human Interference

4.1.1 Except for resetting REAL\_ROBOT as permitted by the referee, human interference during the race is not allowed.

4.1.2 In any case, only the team captain is allowed to communicate with the referee.

## 5 Penalty

- 5.1.1 It is compulsory for teams to specify their team name in virtual race. Teams will be given a verbal warning if they fail to do so the first time. **The team will be disqualified for the current race if the team fails to add their team name for the second time.**

## 6 Interruption of a Race

- 6.1.1 In principle, a race will not be stopped during the challenge unless the referee needs to discuss an issue/problem with the OC/TC.

## 7 Conflict Resolution

### 7.1. Referee

- 7.1.1 During the CoSpace Grand Prix FisrtSteps, the referee's decisions are final.
- 7.1.2 At the conclusion of a race, the referee will ask the captain to sign the CoSpace Grand Prix FisrtSteps result sheet. Captains are given a maximum of 1 minute to review the result and sign. By signing it, the captain accepts the final result on behalf of the entire team. In case of further clarification, the team captain should write their comments on the result sheet and sign it.
- 7.1.3 A violation of the rules may result in disqualification from the tournament or the round at the discretion of the referee, officials, organizing committee and general chairs.

### 7.2. Rule Clarification

- 7.2.1 It is the team's responsibility to verify on the official website the latest version of the rules prior to the competition. If any rule clarification is needed, please contact the CoSpace Grand Prix FisrtSteps Technical Committee.
- 7.2.2 If necessary, a rule clarification may be made by members of the CoSpace Grand Prix FisrtSteps Technical Committee and Organizing Committee, even during a tournament.

### 7.3. Special Circumstances

- 7.3.1 Under special circumstances, such as the occurrence of unforeseen problems or malfunctions of the robot, rules may be modified by the Organizing Committee Chair in conjunction with available Technical Committee and Organizing Committee members, if necessary even during a tournament.
- 7.3.2 If any of the team captains/members/mentors do not show up to the team meetings to discuss the problems and the resulting rule modifications described in 7.3.1, it will be considered as an endorsement.

### 7.4. Complaint Procedure

- 7.4.1 Rule issues are not to be discussed during the race. Referee decisions are binding for the CoSpace Grand Prix FisrtSteps challenge. A team may protest by executing the following complaint procedure. The procedure is automatically invoked if a referee decides to abort the race for any reason (e.g. field damage, lighting failures, burning robots).
- 7.4.2 To initiate the complaint procedure, the team leader of the challenging team has to contact a member of the Technical Committee within 10 minutes of the end of the race in question. The

member of the Technical Committee will then invoke a team leader conference in consultation with the Organizing Committee. The following parties will participate in this conference: the referees of the race in question, Organising Committee members, and the Technical Committee (counselling). The situation shall be resolved by unanimous consent or by vote of the Organising Committee members.

- 7.4.3 All teams are reminded that while this is a competition, the league is also about cooperative research and evaluation, as such, complaints should be handled in a fair and forthcoming way.

## 8 Documentation

### 8.1. Poster

- 8.1.1 Teams will be given some public space to display their poster. The size of the poster should be no larger than A1 (60 x 84 cm). The poster should be brought along to the technical interview, after which, it should be displayed in the location indicated.

The aim of the poster is to explain the technology used in the robots. It should include:

- Team name;
- Team members' names and (perhaps) a picture of the team members;
- Team's country and location within country;
- **Team's track record;**
- **The innovative method used in programming the CoSpace Grand Prix FirstSteps racing robot ;**
- What the team hopes to achieve in robotics.

## 9 Code of Conduct

### 9.1 Fair Play

- 9.1.1 CoSpace Grand Prix FirstSteps Challenge is built upon the foundation of fairness, respect and friendship. Team members should be mindful of other people and their robots when moving around the tournament venue.
- 9.1.2 Mentors (teachers, parents, chaperones, translators, and other adult team members) are not allowed in the student work area. They are not allowed to be involved in the programming of students' robots.
- 9.1.3 It is expected that the aim of all teams is to participate fairly.

### 9.2 Behaviour

- 9.2.1 **Prior to the Challenge, team leaders and mentors are required to sign and acknowledge that they fully understand and are aware of the rules as well as Code of Conducts for the Challenge. All participants are responsible for their own actions.**
- 9.2.2 **During challenge, participants are to follow the directions of the referee. Failure to do so will result in a WARNING (Yellow Card). Subsequent infractions will result in an automatic DISQUALIFICATION (Red Card) of the round. Disqualification as a result of deliberately distract the competition is FINAL and appeals will not be entertained in any form. The status of Yellow/Red Cards will be recorded.**
- 9.2.3 **WARNING (Yellow Card) procedure**

- A WARNING can be issued at the sole discretion of the lead referee; however, assistant referee will be consulted. If no objection is raised, WARNING will be issued.
- A WARNING will be issued for the following disruptive behaviours and activities including but not limited to:
  - (a) Not following referee's instructions
  - (b) Disturbing other participants and/or competition staffs (including referees).
  - (c) Speaking loudly, shouting, using any kind of profanities or making sound that resembles profanity.
  - (d) Sabotaging other teams belongings or equipment
  - (e) Entering competition area when other teams are competing.
  - (f) Entering other teams' area without explicit permission.
  - (g) Engaging in disorderly conducts such as fighting, physical scuffles, running around competition and/or team area.
  - (h) Harassing referee
  - (i) Mentor interference with robots or referee decisions.

#### 9.2.4 DISQUALIFICATION (Red Card) procedure

- A DISQUALIFICATION can be issued at the sole discretion of the lead referee; however, assistant referee will be consulted. If no objection is raised, DISQUALIFICATION will be issued.
- An immediate DISQUALIFICATION can only be issued jointly by the lead and assistant referee. A DISQUALIFICATION will be issued for the following cases:
  - (a) Teams have collected two consecutive WARNINGS during competition period. A competition period is defined as the start to end of duration of competition.
  - (b) Teams that cause a deliberate interference with real robots or damage to the real-world setup.
  - (c) If one team copies a program from another team, both teams will be disqualified.

9.2.5 Once the RED CARD is issued, the team will be disqualified from the current race. If team receives 2 RED CARDS, it will be disqualified from the whole entire competition.

9.2.6 All immediate DISQUALIFICATION will be reviewed by the Chief Judge and the Organising Committee. Infractions that resulted in immediate DISQUALIFICATION will be reviewed and additional sanctions such as bans from future competitions will be considered.

### 9.3 Sharing

9.3.1 Teams are encouraged to share their programming and strategies with members from other teams.

9.3.2 Any developments may be published on the CoSpace Robot website after the event.

9.3.3 RCAP CoSpace Grand Prix FirstSteps sharing furthers the mission of RoboCup Asia Pacific as an educational initiative.

### 9.4 Spirit

9.4.1 It is expected that all participants (students and mentors alike) will respect the RoboCup Asia Pacific mission.

9.4.2 The referees and officials will act within the spirit of the event.

9.4.3 It is not whether you win or lose, but how much you learn that counts!

## CHAPTER 2: FIELDS

### 10 REAL\_WORLD

#### 10.1 REAL\_WORLD Dimension

10.1.1 The dimensions of the REAL\_WORLD are 180cm x 240cm.

10.1.2 The floor may be either smooth or textured and may have steps and/or gaps of up to 3 mm. It can also be printed on a canvas.

10.1.3 The REAL\_WORLD will be placed so that the floor is level.

#### 10.2 REAL\_WORLD Layout

10.2.1 The REAL\_WORLD may consist of any of the following:

- Black Guidelines
- Obstacles
- Mysterious Tasks

10.2.2 Black Guidelines

- The black guideline (1.8 -2 cm wide) may be made with standard electrical insulating tape, or printed onto other materials.
- The black guideline forms a path to guide REAL\_ROBOT during the race in REAL\_WORLD.
- Straight sections of the black guideline may have gaps with at least 5 cm of straight line before each gap. The length of a gap will be no more than 20 cm.



Figure 4: Sample of black

10.2.3 Obstacles

The size of obstacles should not be less than 10 cm x 5 cm x 15 cm (Length x width x height); there is no upper bound to the size.

10.2.4 Mysterious Tasks

In REAL\_WORLD, there may be mystery tasks that will only be released on the competition day.

10.2.5 Re-Start Markers

The re-start marker indicates the re-start position of the real robot when it is Lack of Progress (refer to 16.2.8). The re-start marker is orange in colour. It can be 5 mm to 10mm thick and up to 70 mm in diameter. The number of possible re-start markers will depend on the length of the course.

Typical REAL\_WORLD layout:



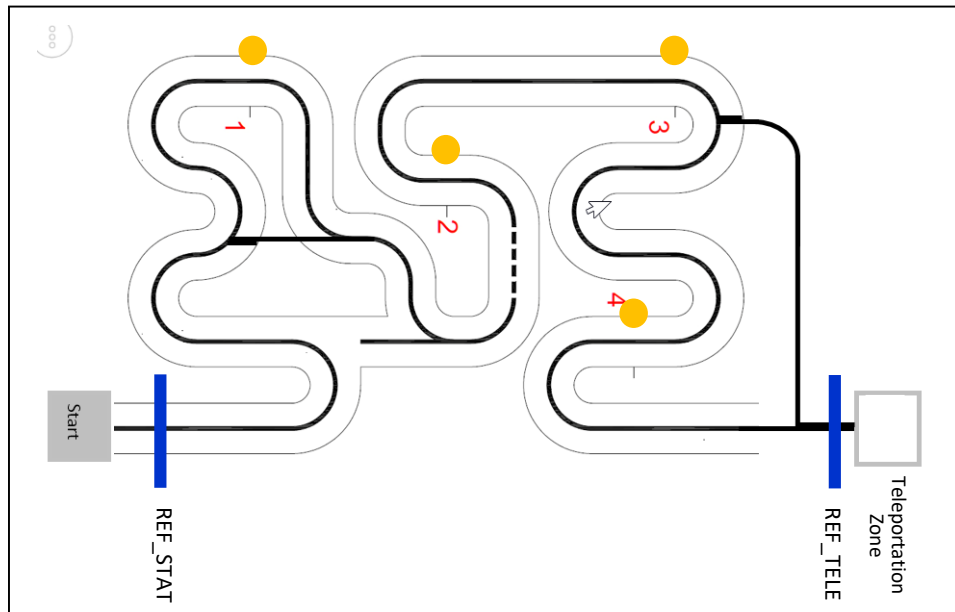


Figure 5: Real Field Layout

### 10.3 Environmental Conditions

- 10.3.1 The environmental conditions at a tournament will be different from the conditions at home. Teams must come prepared to adjust their robots to the conditions at the venue.
- 10.3.2 Lighting and magnetic conditions may vary in the CoSpace Grand Prix FirstSteps race field.
- 10.3.3 The field may be affected by unexpected lighting interference (e.g. camera flashes from spectators).

Though organizers and referees will do their best to minimize external lighting interferences, teams should also prepare their robots to handle such interferences.

## 11 VIRTUAL\_WORLD

### 11.1 VIRTUAL\_WORLD Dimension

- 11.1.1 The dimensions of VIRTUAL\_WORLD will be less than 300cm x 400cm.

- 11.1.2 Any surface colour that does not distract the robot's detection or movement is allowed.

### 11.2 VIRTUAL\_WORLD Layout

- 11.2.1 The VIRTUAL\_WORLD may consists any of the following:

- Black Guidelines
- Obstacles
- Pit Stops
- Mysterious Tasks

- 11.2.2 Black Guideline, Obstacles



The specifications of the black guidelines and obstacles are the same as in the real field. Please refer to section 10.2.2 - 10.2.3 for details.

### 11.2.3 Pit Stops

In motorsports, a pit stop is where a racing vehicle stops in the pits during a race for refuelling, new tyres, repairs, mechanical adjustments, a driver change, or as a penalty, or any combination of the above.

The size of pit stop is not fixed. It will change colour when the robot pass it..

### 11.2.4 Finish Lines

The mission is completed when VIRTUAL\_ROBOT passes the finish line.

## CHAPTER 3: ROBOT

### 12 REAL\_ROBOT

Teams are required to have their own Standard Robot Platform for the challenge.

#### 12.1 REAL\_ROBOT Construction

12.1.1 The basic design of the REAL\_ROBOT consists of a battery holder, a chassis, motors, electronics, controllers and sensors. Teams should follow the instruction manual to complete the necessary mechanical mounting and electrical connections. The REAL\_ROBOT has the following configuration:

- 6 IR sensors
- 1 Ultrasonic sensor
- 2 DC motors
- LED

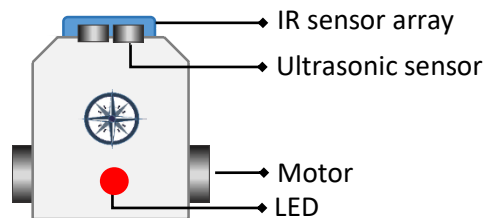


Figure 10: REAL\_ROBOT configuration

12.1.2 Teams may need to design and make additional accessories to accomplish the special tasks, if any. The width and length of the robot should remain unchanged.

12.1.3 Teams are not allowed to change the motors, controllers and sensors in this challenge.

12.1.4 There is no restriction on the weight of the robot, however it is important to note that the weight will affect the performance of the robot during the race.

12.1.5 It is encouraged to make the robot carry a small flag with a team name and team ID.

#### 12.2 REAL\_ROBOT Control

12.2.1 The robot must be controlled autonomously. The use of a remote control, manual control, or passing information (by sensors, cables, wirelessly, etc.) to the robot is not allowed.



12.2.2 REAL\_ROBOT must be started manually by the team captain.

## **13 VIRTUAL\_ROBOT**

### **13.1 VIRTUAL\_ROBOT Configuration**

13.1.1 In the CoSpace Grand Prix FirstSteps, the VIRTUAL\_ROBOT configuration is same with REAL\_ROBOT.

## **14 Robot Coding**

14.1.1 Teams are encouraged to use the CoSpace FirstSteps simulator to develop appropriate strategies for REAL\_ROBOT and VIRTUAL\_ROBOT.

14.1.2 Teams can develop two different programs, one for REAL\_ROBOT and one for VIRTUAL\_ROBOT, to improve their performances in the respective worlds.

14.1.3 Teams need to calibrate the sensors of the REAL\_ROBOT based on lighting conditions of the field for better performance.

## **CHAPTER 4: GAMEPLAY, JUDGING AND AWARD**

## **15 CoSpace Grand Prix FirstSteps Procedure**

### **15.1 Release of Task**

15.1.1 The tasks for both real and virtual challenges will be released to teams prior to the race.

### **15.2 Submission of AI**

15.2.1 The chief judge will announce the time for AI submission in the competition hall.

15.2.2 Each team must submit their first AI strategy which is created during the programming period (we'll call it AI\_1) to the chief judge.

### **15.3 Start of Each Round of Race**

15.3.1 5 minutes before each round of the race

- Team captains must get real robot ready and report to the referee at their respective race stations.
- Teams are allowed to submit a revised version of their AI to the referee if they wish make a change to their earlier AI. No modification of AI is allowed once the round of race begins. The referee will continue to use AI\_1 if there is no submission of revised AI.

## **16 CoSpace Grand Prix FirstSteps Challenge**

It is compulsory for every team to take part in the grand challenge.

### **16.1 Grand Prix FirstSteps Challenge Description**

16.1.1 In the grand challenge, teams will program both virtual and real robots to complete a run in the racecourse. The race begins with the real robot racing on the real racetrack. The real robot will be teleported to the virtual world once it passes REF\_TELE. The virtual robot will then



continue the race in the virtual racetrack. The team that reaches the finish line in the shortest possible time will be declared the winner.

16.1.2 The maximum duration for the CoSpace Grand Prix FirstSteps grand challenge is 8 minutes.

## **16.2 Real Race**

16.2.1 The team captain will upload the programs to the REAL\_ROBOT, place the REAL\_ROBOT in the initial station in REAL\_WORLD as instructed by the referee.

16.2.2 It is the team captain's responsibility to ensure that the correct program is uploaded.

16.2.3 Team captains must be present during the full length of the race.

16.2.4 Teams will be given 2 minutes for last-minute calibration and testing of the REAL\_ROBOT on the real field before the start of race.

16.2.5 The team captain will manually start the REAL\_ROBOT. The clock begins when the robot passes the "REF\_STAT" gate.

16.2.6 **REAL\_ROBOT is required to complete any mystery tasks between the "START" and "END" stations.**

16.2.7 A lack of progress occurs when:

- (a) the team captain declares a Lack of Progress
- (b) the robot loses the black line without regaining it back
- (c) a robot does not follow the indicated direction
- (d) a robot fails to complete the mysterious task.

16.2.8 **If a Lack of Progress occurs, the robot must be positioned on the previous re-start marker facing the path towards the teleportation zone and checked by the referee.**

16.2.9 After a Lack of Progress, the team may reset the power supply (turn the robot off and on) and subsequently restart the program. The team is not allowed to change the program, give any information about the field to the robot, or repair the robot.

16.2.10 There will be maximum of 3 re-starts allowed within a race. **The number of the re-starts will not be considered as further penalty in any form.**

16.2.11 When REAL\_ROBOT passes the REF\_TELE gate, it should stop and VIRTUAL\_ROBOT should be activated. The race clock continues. If the REAL\_ROBOT fails to move to the REF\_TELE gate, the VIRTUAL\_ROBOT will not be activated.

## **16.3 Virtual Race**

16.3.1 The referee will upload the programs onto the CoSpace server and place the VIRTUAL\_ROBOT in the initial station in the VIRTUAL\_WORLD.

16.3.2 It is the team captain's responsibility to ensure that the correct program is uploaded.

16.3.3 Team captains must be present during the full race.

16.3.4 The VIRTUAL\_ROBOT will be activated only when the REAL\_ROBOT passes the REF\_TELE gate.

16.3.5 The VIRTUAL\_ROBOT should avoid **all obstacles**.

16.3.6 Teams are encouraged to make use of Detour Markers to plan the best race route.



16.3.7 When VIRTUAL\_ROBOT reaches the “Finish” line, the race ends.

## 16.4 Ranking

The teams are ranked as follows:

	Situation	Rank
Tier 1	<ul style="list-style-type: none"><li>• REAL_ROBOT completes race in REAL_WORLD</li><li>• VIRTUAL_ROBOT passes all Pit Stops</li><li>• VIRTUAL_ROBOT reaches the Finish Line</li></ul>	<ul style="list-style-type: none"><li>• The team rank is determined by the race time at the Finish Line in the VIRTUAL_WORLD.</li></ul>
Tier 2	<ul style="list-style-type: none"><li>• REAL_ROBOT completes race in REAL_WORLD</li><li>• VIRTUAL_ROBOT is not able to passes all Pit Stops (regardless whether it reaches the Finish Line or not)</li></ul>	<ul style="list-style-type: none"><li>• The race time for VIRTUAL_ROBOT to reach the last Pit Stop will be recorded.</li><li>• The team rank will be determined based on the number of Pit Stops passed followed by the race time.</li></ul>
Tier 3	<ul style="list-style-type: none"><li>• REAL_ROBOT is not able to complete race in REAL_WORLD even after 3 re-starts.</li></ul>	<ul style="list-style-type: none"><li>• The team rank will be determined based on real zone it has passed. The team reached further real zone will be considered to have better ranking.</li><li>• In any case, teams will be given a chance to race in VIRTUAL_WORLD.</li><li>• If two teams have passed the same zone in the REAL_WORLD, then the team having better performance in VIRTUAL_WORLD is considered to have better ranking.</li></ul>

## 17 Awards

Depending on the number of teams entering the competition, there will be awards (trophies and certificates). The Organizing Committee can adjust the award type (trophy or certificate) if needed.

Rule clarification: [RCAP\\_Challenge@CoSpaceRobot.org](mailto:RCAP_Challenge@CoSpaceRobot.org)

Technical support: [support@CoSpaceRobot.org](mailto:support@CoSpaceRobot.org)