RCAP CoSpace Rescue Challenge Rules 2026

(CoSpace Rescue, U19 Category)

These are the official rules for the RoboCup Asia Pacific (RCAP) 2026 CoSpace Rescue Challenge. They are released by the RoboCup Asia Pacific CoSpace Rescue Technical Committee. The English rules have priority over any translations. Changes from the 2025 rules are highlighted in red.

PREFACE

In RCAP CoSpace Rescue Challenge, teams have to develop and program appropriate strategies for both real and virtual autonomous robots to navigate through the real and virtual worlds to collect objects while competing with another team's robot that is searching and collecting objects in the same real and virtual worlds.

In the RCAP CoSpace Rescue Challenge, students need to make their own robot, code the robot, and finally take part in the CoSpace Rescue Challenge.

The RCAP CoSpace Rescue Simulator is the only official platform for the sub-league. This simulator allows programs to be developed using a graphical programming interface, Python language, or C language. Participation teams can contact support@cospacerobot.org for RCAP CoSpace Rescue Simulator download, help and assistance.

In the CoSpace Rescue, U19 category, students will compete in both REAL_WORLD and VIRTUAL_WORLD.

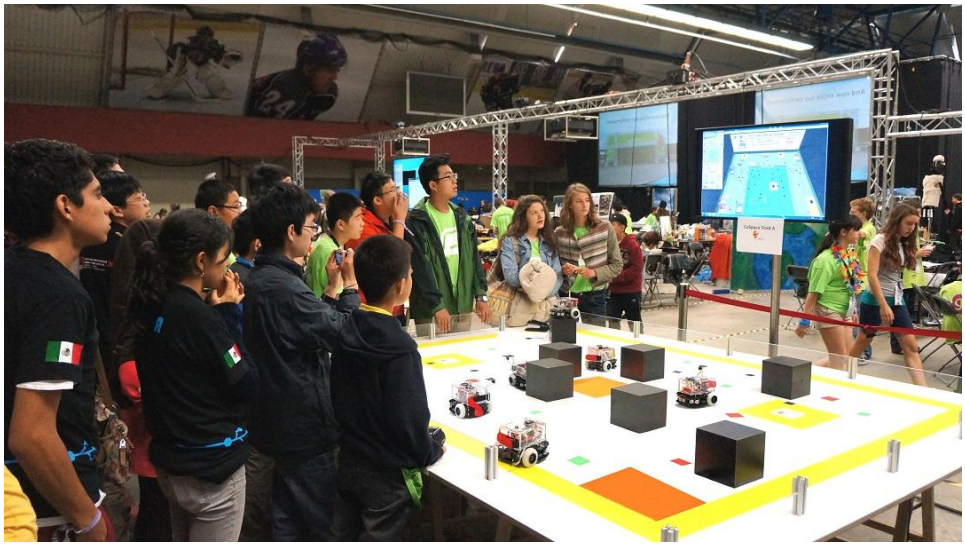

Figure 1: CoSpace Rescue U19 Challenge

OVERVIEW

Technical Interview (Optional):

- Judges are interested in determining students' understanding of the robotics AI and coding skills. Each team member must be prepared to answer questions about the technical aspects of their involvement in preparing the CoSpace Rescue Challenge. The duration is about 10 – 15 minutes. Teams may be asked to have second interview if judges consider it is necessary. Teams must show authenticity and originality with regards to the AI and code.
- Teams may take the “interview key points” for reference while preparing their interview. Refer to Appendix D.

Individual Team challenge (Compulsory):

Each team will take part in the individual team challenge.

SuperTeam Challenge (Compulsory):

At the RoboCup Asia-Pacific Competition, teams will also take part in a SuperTeam Competition.

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 leverage on individual teams’ strength and work together to create a new AI to solve a new task. SuperTeams are encouraged to express their friendship and cooperation and to demonstrate what they have learnt from each other.

The SuperTeam Challenge is a special program for the RCAP Finals and is not obligatory for regional events.

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.

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CHAPTER 1: GENERAL RULES

1 Team

1.1. Team Members

1.1.1 A CoSpace Rescue team should consist of 2 to 4 members. Each participant can only register for one team. Each participant can only register for one team.

1.1.2 All team members must be at the right age for the respective age group.

- U12 group: Teams with all students aged 7 to 12 year old can participate in this category.
- U19 group: Teams with all student members aged 13 to 19 year old can participate in this category. If a team has mixed ages (with both U12 and U19 members), they will be allowed to compete in U19 category.

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

1.1.3 Every team member need to carry out a technical role for the team (strategy planning, programming, etc.), which should be identified at the registration. Each member will need to explain his/her technical role and should be prepared to answer questions on the technical aspects of their involvement in preparing the CoSpace Rescue Challenge.

1.2 Responsibility

1.2.1 The team members are responsible for

- verifying the latest version of the rules prior to the competition. If any rule clarification is needed, please contact the CoSpace Technical Committee.
- checking updated information (schedules, meetings, announcements, etc.) during the event.
- coding for both real and virtual robots in both real and virtual worlds.
- uploading the correct code to both REAL_ROBOT and VIRTUAL_ROBOT.
- communication with CoSpace Technical Committee and Organising Committee for all CoSpace Rescue Challenge related matters.

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 Referees

2.1 Official

2.1.1 A referee is an official who manages the CoSpace Rescue games and makes sure that the CoSpace Rescue rules are followed.

2.1.2 The referee receives and uploads the teams' virtual programs, as well as running the game.

3 Interruption of a Game

3.1.1 Human interference during the game is not allowed.

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

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

4 Conflict Resolution

4.1 Referee

4.1.1 During a gameplay, the referee's decisions are final.

4.1.2 At conclusion of game play, the referee will ask the captain to sign the score sheet. Captain should be given maximum 1 minute to review the score sheet and sign it. By signing it, the captain accepts the final score on behalf of the entire team; in case of further clarification, the team captain should write their comments in the score sheet and sign it.

4.1.3 In case the team refuses to sign the scoresheet after the game, they should be advised to file a complaint following the procedure in section 4.4. This should not interrupt the following games. The referee should follow the instruction given by the chief judge.

4.2 Rule Clarification

4.2.1 It is team's responsibility to verify at the RoboCup Asia Pacific Official website on the latest version of the rules prior to the competition. If any rule clarification is needed, please contact the RCAP CoSpace Rescue Technical Committee.

4.2.2 If necessary even during a tournament, a rule clarification may be made by members of the RCAP CoSpace Rescue Technical Committee and Organizing Committee.

4.3 Special Circumstances

4.3.1 In special circumstances, such as the occurrence of unforeseen problems or malfunction of a robot, rules may be modified by the RCAP CoSpace Rescue Organizing Committee Chair in conjunction with available Technical Committee and Organizing Committee members, even during a tournament if necessary.

4.3.2 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 at 4.3.1, it will be considered as an endorsement.

4.4 Complaint Procedure

4.4.1 Rule issues are not to be discussed during the run. Referee decisions are binding for the CoSpace Rescue challenge. A team may protest by executing the following complaint procedure. The procedure is automatically invoked if a referee decides to abort the run for any reason (e.g. field damage, lighting failures, burning robots).

4.4.2 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 run. 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 run, Organising Committee members, and the Technical Committee (counselling). The situation shall be resolved by unanimous consent or by vote of the Organising Committee members.

4.4.3 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.

5 Documentation

5.1 Team Description Paper (TDP)

5.1.1 Teams are required to submit the Team description Paper (TDP) prior to the event.

5.2 Team Presentation Video

5.2.1 Each team is required to submit a team presentation video as required before the competition. The highlighted videos will be showcased in RCAP Academy YouTube Official Channel (youtube.com/rcapacademy). Template & guidelines will be given by the Technical Committee.

6 Code of Conduct

6.1 Fair Play

6.1.1 CoSpace Rescue 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.

6.1.2 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.

6.2 Behaviour

6.2.1 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.

6.2.2 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.

6.2.3 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.

6.2.4 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.

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

6.2.6 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.

6.3 Penalty

6.3.1 The following are strictly prohibited.

(a) During the game, using third-party software, self-written code, or any other tools to retrieve additional system information is strictly prohibited.

(b) Any other behaviours that affect the normal operation of the RCAP CoSpace Rescue Simulator, and direct or indirect control of the behaviours of the RCAP CoSpace Rescue Simulator, such as the scaling of the simulation window is strictly prohibited.

6.3.2 A DISQUALIFICATION from the current match can be issued at the sole discretion of the CoSpace Chief Judge and CoSpace Technical Committee if teams offend the rules 6.3.1 for the first time.

6.3.3 A DISQUALIFICATION from the entire competition can be issued at the sole discretion of the CoSpace Chief Judge and CoSpace Technical Committee for repeat offenders.

6.4 Sharing

6.4.1 Teams are encouraged to share their codes and strategies with members after the competition.

6.4.2 Any developments may be published on the RCAP Academy Channel or CoSpaceRobot.org after the event.

6.4.3 RCAP CoSpace Rescue sharing furthers the mission of RoboCup Asia Pacific as an educational initiative.

6.5 Spirit

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

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

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

CHAPTER 2: FIELDS

7 Arena

7.1 Dimensions

7.1.1 The dimensions of REAL_WORLD are 180cm x 240cm. The dimensions of VIRTUAL_WORLD are 270cm x 360cm.

7.2 Floor

7.2.1 REAL_WORLD

- The floor of REAL_WORLD is generally white. The floor may be either smooth or textured.
- The REAL_WORLD will be placed so that the floor is level.

7.2.2 VIRTUAL_WORLD

- The VIRTUAL_WORLD is a 3D simulated environment. The floor is not restricted to white or light colour. However, the colour objects, collection box, special zones, etc., can still be distinguished.

7.3 Boundary

7.3.1 REAL_WORLD

- REAL_WORLD will be enclosed by a wall of height 20 cm.

7.3.2 VIRTUAL_WORLD

- U19 group: There will be no boundary for VIRTUAL_WORLD. Teams are required to keep the robot within the virtual arena based on the dimensions given. There will be an indication of the boundary for audience.

Appendix A shows the sample layout of REAL_WORLD and VIRTUAL_WORLD. Appendix B shows the real field building instruction.

8 REAL_WORLD and VIRTUAL_WORLD Layout

Both REAL_ WORLD and VIRTUAL_WORLD contains various elements as follows:

8.1 Markers

8.1.1 There may be some markers in the virtual/real worlds. The makers can be used to help the virtual/real robot for its localization, guidance, etc. The minimum size of the marker is 2cm x 2cm. The colour and shape of the marker is not fixed.

8.2 Special Zones

8.2.1 Certain areas in the virtual/real world are designated as special zones. RED, CYAN and BLACK objects collected in these areas are worth double points. The special zone is blue in colour as shown in figure 2. The special zones have a minimum size of 30cm x 30cm. The shape of the special zone is not fixed.

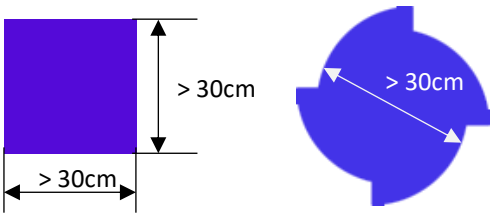


Figure 2: Sample of Special Zones

8.3 Obstacles

8.3.1 Obstacles found in real and virtual worlds can be of any size, any shape with the minimum dimensions of 10cm x 5cm.

8.4 Traps

8.4.1 Traps are surrounded by a yellow boundary as shown in figure 3. The minimum size of the trap is 8cm x 8cm. The traps can be any colour. The shape of traps is not fixed. If a robot goes over a trap it will lose any objects it is currently carrying.

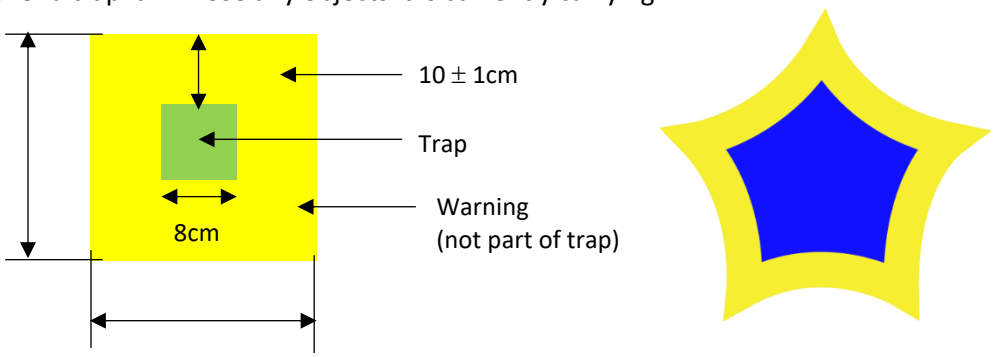


Figure 3: Sample of Traps

8.5 Object Collection Boxes

8.5.1 Figure 4 shows the object collection box. The collection box is ORANGE in colour. The dimensions can be (20 ± 3) cm x (20 ± 3) cm. The collection box can be any shape.

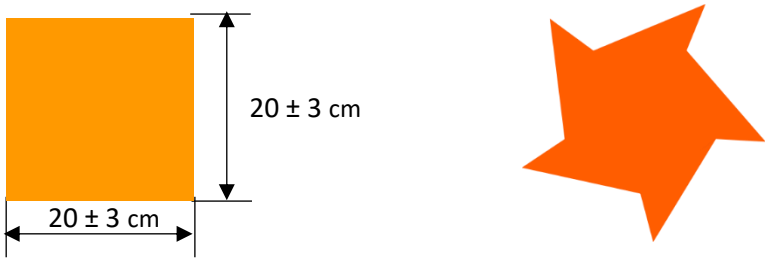


Figure 4: Sample of object collection boxes

8.6 Robot Coordinates (U19 Group – VIRTUAL_WORLD Only)

8.6.1 For the U19 group, the CoSpace Server will send the robot its own coordinates while the robot is searching in the VIRTUAL_WORLD. Figure 5 shows the virtual robot is at position (180cm, 197cm).

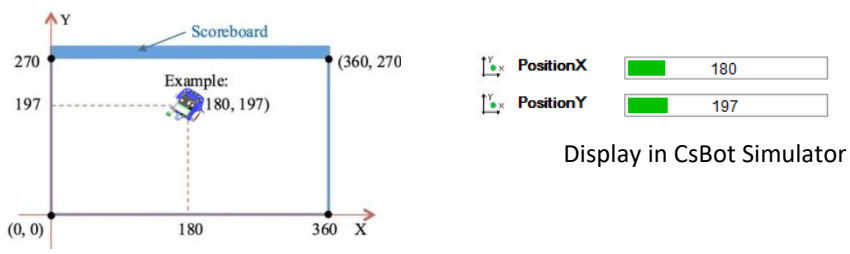


Figure 5: X & Y coordinate system for robot in VIRTUAL_WORLD

8.7 Swamplands (U19 Group – VIRTUAL_WORLD Only)

8.7.1 Certain areas in the VIRTUAL_WORLD are designated as swamplands. The swampland is grey color as shown in figure 6. The swampland can be any size bigger than 10cm x 10cm. The shape of the swamplands is not fixed.

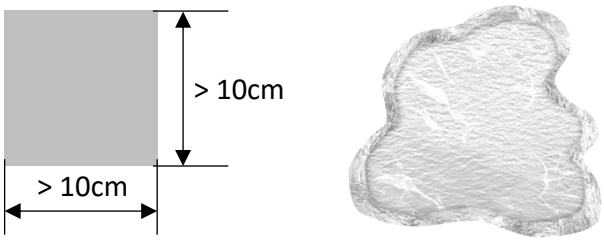


Figure 6: Sample of Swamplands

8.8 Signal Block Zone (U19 Group – VIRTUAL_WORLD Only)

8.8.1 In the VIRTUAL_WORLD for U19 group, there are Signal Block Zones. When a robot enters the signal block zone, its coordinates information will be blocked, meaning the robot will receive PositionX = 0 and PositionY = 0.

8.8.2 The Signal Block Zones are randomly created by the CoSpace server. They will be generated once the field is launched. The location of the Signal Block Zones will not be changed throughout the entire game period.

8.8.3 There are 3 Signal Block Zones in the VIRTUAL_WORLD.

8.9 Objects

8.9.1 Basic Objects

8.9.1.1 There are THREE types of objects, RED, CYAN, and BLACK located randomly throughout the course. The thickness of each object is less than 2mm. Each type of objects worth different value.

8.9.1.2 Colour, size and shape of the objects

Colour, size and shape of the objects will be different for FirstSteps, U12 and U19 groups. Appendix C shows the details.

8.9.2 SUPER and SUPER+ Objects (U19 Groups – VIRTUAL_WORLD Only)

8.9.2.1 Creation of SUPER and SUPER+ objects

(a) ONE SUPER Object will be generated for every ONE set of RED, CYAN and BLACK objects collected and deposited successfully (refer to section 11.4.3) in the VIRTUAL_WORLD.

(b) ONE SUPER+ Object will be generated for every TWO sets of RED, CYAN and BLACK objects collected and deposited successfully (refer to section 11.4.3) in the VIRTUAL_WORLD.

(c) The SUPER or SUPER+ objects generated by BLUE team can only be collected by the BLUE team itself. The SUPER or SUPER+ objects generated by RED team can only be collected by the RED team itself.

8.9.2.2 Size, colour and shape of SUPER and SUPER+ objects

The SUPER and SUPER+ objects are about 5cm in diameter. They are circular in shape and purple in colour.

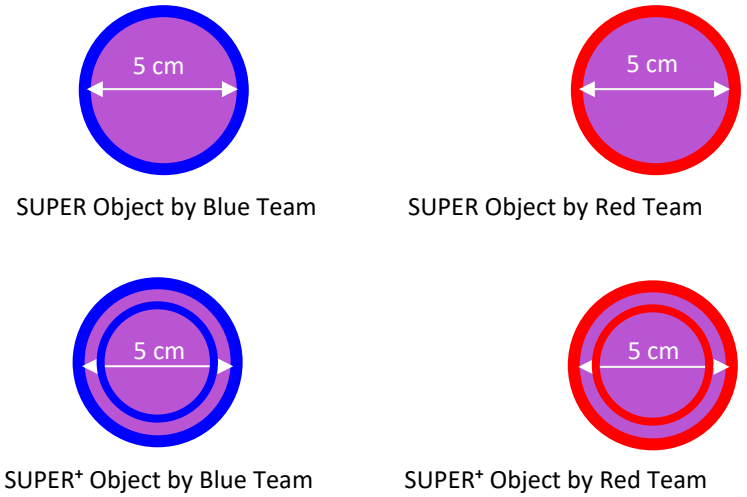


Figure 7: SUPER and SUPER+ objects

Placement of SUPER and SUPER+ objects (U19 Groups):

- The CoSpace server will send the coordinates (X, Y) of the SUPER or SUPER+ objects to the respective team upon SUPER or SUPER+ objects' creation.
- The details, such as SUPER and SUPER+ objects notification and the coordinates, are described in the CoSpace Rescue Simulator user guide.

CHAPTER 3: ROBOT

9 Robot

9.1 REAL_ROBOT Configuration

9.1.1 The RCAP CoSpace Rescue Challenge uses a Standard Platform. The basic design of the REAL_ROBOT consists of a battery holder, a chassis, motors, electronics, controllers and sensors. The REAL_ROBOT has the following configuration:

- 3 ultrasonic sensors
- 1 gyro sensor
- 2 RGB sensors
- 2 DC motors
- 1 LED for status indication

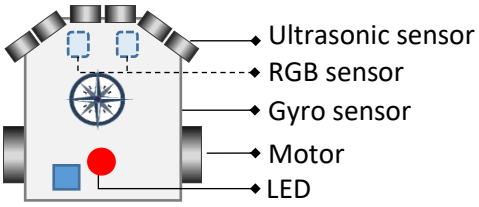


Figure 8: REAL_ROBOT configuration

9.1.2 It is team's responsibility to ensure the real robot is in good working condition to avoid any issues caused by the real robot during the real game.

9.1.3 Teams should have sufficient batteries and tools for the games. Organiser will NOT provide batteries.

9.1.4 Teams are not allowed to change the motors, controllers, sensors, layout, and structures of the assembled real robot in this challenge.

9.1.5 Teams are required to bring their own Robot. It is encouraged to make the robot carry a small flag with a team name and team ID.

9.2 VIRTUAL_ROBOT Configuration

9.2.1 The Configuration of VIRTUAL_ROBOT is the same as REAL_ROBOT.

9.3 ROBOT Control

9.3.1 REAL_ROBOT and VIRTUAL_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.
9.3.2 REAL_ROBOT must be started manually by the team captain.
9.3.3 REAL_ROBOT must not damage any part of the field in any way.
9.3.4 If the location of the treasure is fixed, any pre-mapped type of dead reckoning strategy (the precise predefined movements designed based on the known positions of treasures/objects within the field) is prohibited.

9.4 Real/Virtual Communication

9.4.1 A game begins with REAL_ROBOT navigating in REAL_WORLD.
9.4.2 When the Game timer reaches 3 minutes, the competition system will automatically activate the virtual robot, and the team does not need to set up and operate this part.

9.5 Lighting

9.5.1 The lighting condition for the virtual/real worlds could be varied. Teams must be able to perform calibration in order to complete the mission.
9.5.2 For teams using real robot, please note that picture taking by spectators might create IR and visible light into the real-world setup and to the real robots. Whilst efforts will be made to limit this, it is very difficult for organizers to strictly control factors outside of the real world. Teams are strongly encouraged to program their real robots so that sudden changes (e.g. camera flash) do not cause major problems.
9.5.3 Every effort will be made by the organizers to locate the real world away from sources of magnetic fields such as under-floor wiring and metallic objects, however, sometimes this cannot be avoided.

CHAPTER 4: GAMEPLAY, JUDGING AND AWARD

10 Competition content

10.1 Competition format

10.1.1 For RCAP CoSpace Rescue U19 category(Onsite Competition). A game lasts 9 minutes, with two teams competing in one game. A game consists of a real world (REAL_WORLD) and a virtual world (VIRTUAL_WORLD). A team has one robot in each WORLD as shown in figure 8.
(a) The real robot (REAL_ROBOT) can spend between 3 minutes in REAL_WORLD.
(b) The virtual robot (VIRTUAL_ROBOT) will spend 6 minutes in VIRTUAL_WORLD.
10.1.2 For RCAP CoSpace Rescue U19 category(Onsite Competition). A team must program REAL_ROBOT and VIRTUAL_ROBOT to navigate and collect objects in REAL_WORLD and VIRTUAL_WORLD.

10.2 REAL_WORLD

10.2.1 A game begins with REAL_ROBOT navigating in REAL_WORLD.

10.2.2 In the real world, REAL_ROBOT searches for 3 types of objects, RED, CYAN, and BLACK objects. REAL_ROBOT has to collect the objects and then deposit them in the collection box to receive points. It cannot collect more than 6 objects at any one time without depositing them in the collection box.

10.2.3 Bonus points will be awarded for every set of RED, CYAN and BLACK objects collected and deposited successfully in one single trip to the collection box.

10.3 VIRTUAL_WORLD

10.3.1 In VIRTUAL_WORLD, VIRTUAL_ROBOT searches for 5 types of objects, RED, CYAN, BLACK, SUPER and SUPER+ objects. VIRTUAL_ROBOT has to collect the objects and deposit them in the collection box to receive points. It cannot collect more than 6 objects at any one time without depositing them in the collection box.

10.3.2 SUPER or SUPER+ objects will be created upon every set of RED, CYAN and BLACK objects collected and deposited successfully in one single trip to the collection box in World 2.

10.4 Competition Setup

10.4.1 A Team must be able to program both REAL_ROBOT and VIRTUAL_ROBOT.

10.4.2 Virtual/real robots must be controlled autonomously.

10.4.3 The use of a remote control to manually control virtual/real robots is not allowed.

11 Gameplay

11.1 Pre-setup

11.1.1 The layout of both REAL_WORLD and VIRTUAL_WORLD will be released to teams prior to the tournament.

11.2 Pre-round Practice

11.2.1 Wherever necessary, the organizing committee will provide the teams with a timetable for entering the practice field for calibration.

11.3 Game Procedure

11.3.1 A referee is an official who receives and uploads teams' programs as well as runs the games.

11.3.2 The team captain is responsible for ensuring that the correct program is uploaded to the real robot, and the correct program of world 2 is submitted to the designated referees on time. The team leader can submit two programs for world 2, one for the red robot and one for the blue robot.

11.3.3 At the end of each programming period

(a) The chief judge will announce the time for program submission in the competition hall.

(b) 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.

11.3.4 Start of Each Round of Game

(a) 5 minutes before each run, team captains must report to the referee at their respective game stations.

(b) The 1st run will use the AI_1 submitted at the end of the coding session. No re-submission of AI_1 is allowed.

(c) Starting from the 2nd run onwards, teams are allowed to submit a revised version of their AI to the referee if they wish to make a change to the previous AI. This has to be done 5 minutes before each run.

(d) The referee will continue to use the AI_1 or the previous version of AI if there is no submission of revised AI received 5 minutes before the run. The referee must confirm the correct AI to use with the team captain.

(e) Once an AI is submitted for a run, no further modifications can be made to it for that specific run.

11.3.5 3 minutes after the scheduled game time

(a) If a team has not arrived at the game station 3 minutes after the scheduled game time, the team will forfeit the game. The opponent will gain 500 points and be declared as the winner. Kindly note that the scheduled game time might be delayed.

11.3.6 Pre-match Meeting

(a) Each team will be assigned a team colour (BLUE or RED). At the start of the game, the referee will toss a coin. The result determines the teams' colour.

11.3.7 Start of Play

(a) Real game

- Teams should program and download the code to the real robot before the real game. It is team's responsibility to ensure that the correct program is downloaded to the correct robot.

(b) Virtual game

- The referee will upload the programs to the CoSpace server, place the team's robot in the starting point in the virtual world and start the virtual game.
- It is the team captain's responsibility to ensure that the correct program is uploaded.
- Team captains must be present during the full length of the game.

11.4 Scoring

11.4.1 A team will be given 100 points at the beginning of each game.

11.4.2 Collecting objects

A team will gain points by collecting the objects.

To indicate that a robot has collected an object, it must stop and flash the LED for 3 seconds when any one of the color sensors has detected the object. The robot must move away from its stopping position autonomously at the end of 3 seconds.

Object Type	Points in Real World		Points in Virtual World	
	Regular Zone	Special Zone	Regular Zone	Special Zone
RED	20	40	10	20
CYAN	30	60	15	30
BLACK	40	80	20	40
SUPER	NA	NA	90	90
SUPER$^+$	NA	NA	180	180

(a) A real/virtual robot cannot collect more than 6 objects at any one time without unloading or depository them in the collection box.

(b) Objects in the real world will NOT disappear after they are collected. It is team's responsibility to program their robot such that it moves away from the same real object and search for others. Collecting the same objects consecutively will not be counted.

(c) Objects in the virtual world will disappear after they are collected.

11.4.3 Depositing objects

When a robot deposits objects successfully, the points of the objects deposited will be doubled.

"Robot deposits objects successful" means:

- A robot must stop inside the collection box with the LED steady ON for 3 seconds to indicate the depositing process;

  A robot is only considered to be in the collection box when the colour sensor detects the collection box (the colour sensor is in the collection box).

- The robot will exit the collection box autonomously after deposition (the colour sensor is out of the collection box).

11.4.4 Bonus points (only for REAL_WORLD)

(a) For every ONE set of RED, CYAN and BLACK objects collected and deposited successfully (in one single trip to the collection box) in REAL_WORLD, 90 bonus points will be rewarded. There will be no SUPER objects generated in REAL_WORLD.

(b) For every TWO sets of RED, CYAN and BLACK objects collected and deposited successfully (in one single trip to the collection box) in REAL_WORLD, 180 bonus points will be rewarded. There will be no SUPER+ objects generated in REAL_WORLD.

11.4.5 Falling into a Trap

If a virtual/real robot falls into a trap (refer to section 8.4), all objects that have been collected but not yet placed in the object collection box (refer to section 8.5) will disappear. Therefore, the points awarded for those objects collected will be deducted.

A virtual/real robot is considered to be in the trap if any one of the robot's color sensor has detected the trap.

11.4.6 Falling into a Swampland (U19 Group – VIRTUAL_WORLD Only)

If a robot falls into a swampland (refer to section 8.7), the robot's speed will be reduced by 80% by the CoSpace server.

A virtual/real robot is considered to be in a swampland if any one of the color sensor has detected the swampland.

11.4.7 Falling into a Signal Block Zone (U19 Group – VIRTUAL_WORLD Only)

If a robot falls into a signal block zone, no points will be deducted. However, the robot's position info (refer to 8.8) will be lost.

A virtual robot is considered to be in a signal block zone if the centre of the robot is within the zone. The centre coordinates is provided to teams by the CoSpace server.

11.4.8 Out of Boundary (U19 Group – VIRTUAL_WORLD Only)

If a robot is out of the boundary, it will be placed inside VIRTUAL_WORLD by the CoSpace server automatically. No points will be deducted. However, it will be frozen for 10 seconds.

A virtual robot is considered out of boundary if the centre of the robot is outside the VIRTUAL_WORLD.

11.4.9 Game Points

After each match, following GAME POINTS will be given accordingly.

Game	GAME POINTS
Win	3
Tie	1
Loss	0

11.5 Human Interference

11.5.1 Except for a lack of progress, human interference (e.g. re-locate a real/virtual robot to any reset point) during the game is not allowed unless permitted by the referee. A violation of the rules may be penalized by disqualification from the tournament, the round or may result in loss of points at the discretion of the referee, officials, organizing committee or general chairs.

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

11.6 Relocation

11.6.1 In real game, the team captain can request for relocation for the following case:

(a) REAL_ROBOT is stuck

(b) REAL_ROBOT is looping

(c) REAL_ROBOT is not performing well.

Upon team's request, the referee will call "RELOCATE" and relocate REAL_ROBOT to a different location but close to where it was with different orientation. The REAL_ROBOT will NOT be frozen after relocation. Each team can call relocation up to 3 times in the REAL_WORLD in each game.

11.6.2 In virtual game, the team captain can request to relocate the VIRTUAL_ROBOT to a different location for the following case:

(a) VIRTUAL_ROBOT is looping

(b) VIRTUAL_ROBOT is not performing well.

Upon team's request, the referee will call "RELOCATE" and relocate the VIRTUAL_ROBOT to a different location but close to where it was with different orientation. However, the robot will be frozen for 10 seconds after relocation. Each team can only call relocation up to 3 times in VIRTUAL_WORLD in each game. The referee will keep track of the number of relocations requested.

11.6.3 In virtual game, when a virtual robot is stuck for 10 seconds, the robot will be relocated to a different location but close to where it was with different orientation by the CoSpace server automatically. After relocation, the VIRTUAL_ROBOT will not be frozen for another 10 seconds. The relocation by CoSpace server will NOT be recorded as in section 11.6.2.

11.6.4 The match may be terminated early if both teams agree and if the lack of progress cannot be resolved within the first 4 minutes. In this case, the team captain must inform the referee of the decision to terminate the game, and the teams will retain all points they have earned.

11.7 Penalty

11.7.1 It is compulsory for teams to specify the team name in virtual games. Teams will be given a verbal warning if they failed to do so for the first time. The team will be disqualified for the current game if the team fails to add the team name for the second time in a virtual game.

11.7.2 Attacking Robot is defined as the robot has sensed another robot and hit it deliberately.

11.7.3 If a virtual/real robot is hit/attacked by another virtual/real robot, the attacking robot will be separated from the attacked robot and repositioned at the same location with different orientation (if there is collision) and be frozen for 10 seconds. There will be no point deduction.

11.7.4 If two virtual/real robots bump into each other, both robots will be separated from each other and repositioned at the same location with different orientation (if there is collision). Both robots will be frozen for 10 seconds. There will be no point deduction.

11.7.5 The team needs to make an estimate of the situations caused by the robot being punished and prepare its own response plan.

11.7.6 In the submitted program, please do not use functions such as Print() that need to generate output in the console.

11.8 Interruption of Game

11.8.1 In principle, a game will not be stopped during gameplay.

11.8.2 The referee can end a game when all objects have been collected by the robots.

11.8.3 The referee can pause a game when the game coordinator/referee needs to discuss an issue/problem with the OC/TC. The game will be called “time-out” in this case.

11.8.4 Teams are not allowed to quit a game 4 minutes after the game started.

11.9 Online Challenges

11.9.1 The organizing committee may need to adopt an online challenge mode in specific competitions. Guidelines will be given by the Technical Committee.

11.9.2 For RCAP CoSpace Rescue U19 category (online challenges), students are only required code a virtual robot, and finally take part in the CoSpace Rescue Challenge. The game will last for 6 minutes, and it will only take place in virtual world 2. It will be a singles game or counteract game.

11.9.3 In the online challenge, Teams are only required to program the virtual robot in virtual world. Teams must submit code to the CoSpace online server at the end of coding session. Multiple submission is allowed but only the last submission will be used in the game.

11.9.4 It is the participant’s responsibility to ensure that the correct program is uploaded.

11.9.5 The official will download the program submitted, upload the programs onto the VIRTUAL_ROBOT on the referee station, place the VIRTUAL_ROBOT in the initial position in the starting point in the virtual world and start the virtual game.

11.9.6 The game could be a singles game or counteract game. The team should fully consider these factors.

12 Judging and Award

12.1 Technical Interview (Optional):

12.1.1 Judges are interested in determining students' understanding of the robotics AI and coding skills. Each team member must be prepared to answer questions about the technical aspects of their involvement in preparing the CoSpace Rescue Challenge. The duration is about 10 – 15 minutes. Teams may be asked to have second interview if judges consider it is necessary. Teams must show authenticity and originality with regards to the AI and code.

12.1.2 Teams may take the “interview key points” for reference while preparing their interview. Refer to Appendix D.

12.2 Friendship Tournament

12.2.1 A friendship tournament will be setup for teams that could not reach the quarter-finals. The minimum number of teams participating in the friendship tournament is 4.

12.2.2 Teams will draw lots to determine the team to play with. At the end of a match, the winning team must continue on to the next match. The losing team can modify the program and play again, or withdraw its participation. The challenge will be carried out during the specific duration announced by the RCAP CoSpace Rescue Organizing Committee onsite. The last survivor will be the winner.

12.3 SuperTeam Challenge

12.3.1 At the RoboCup Asia Pacific Competition, teams may also take part in a SuperTeam Competition.

12.3.2 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 leverage on individual teams’ strength and work together to create a new AI to solve a new task. SuperTeams are encouraged to express their friendship and cooperation and to demonstrate what they have learnt from each other.

12.3.3 The SuperTeam Challenge is a special program for the RCAP Finals and is not obligatory for regional events.

12.4 Winner

12.4.1 Round Robin

- The ranking of the Robbin is determined by the Game Points for each team.
- If two teams have the same game points, the winner of the meeting between the two will be winner.
- If the result of the two meeting teams is still tie, the team with the higher total scores in round robin will be the winner.

12.4.2 Quarter-Finals, Semi-finals and Final

- The winner of the quarter-finals, semi-finals and final will be decided solely based on the quarter- /semi- /final game result.
- If match tie, the team with the higher points in VIRTUAL_WORLD will be the winner.
- If the points in VIRTUAL_WORLD tie, the teams will move to go re-match.

12.4.3 Friendship Tournament

- The winner will be the last survivor of the Friendship Tournament.

12.4.4 SuperTeam Challenge

- The first place in SuperTeam Challenge will be the winner.

12.5 Awards

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

RCAP CoSpace Technical Committee

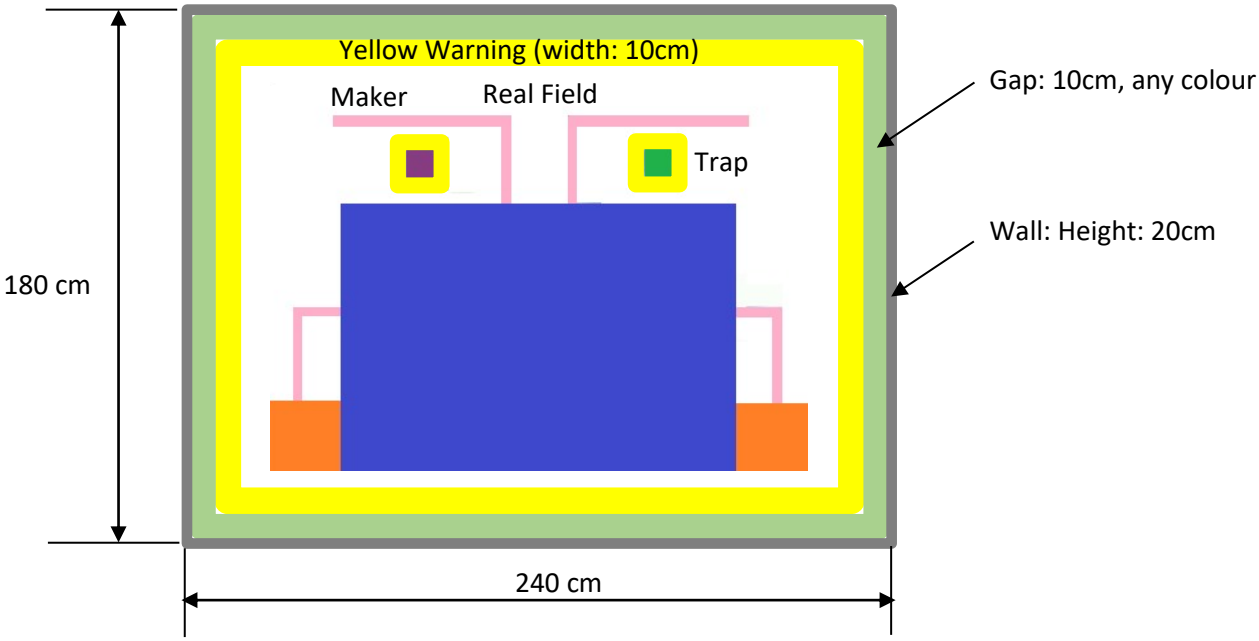
Contact us:

Rule clarification: cospace@robocupap.org

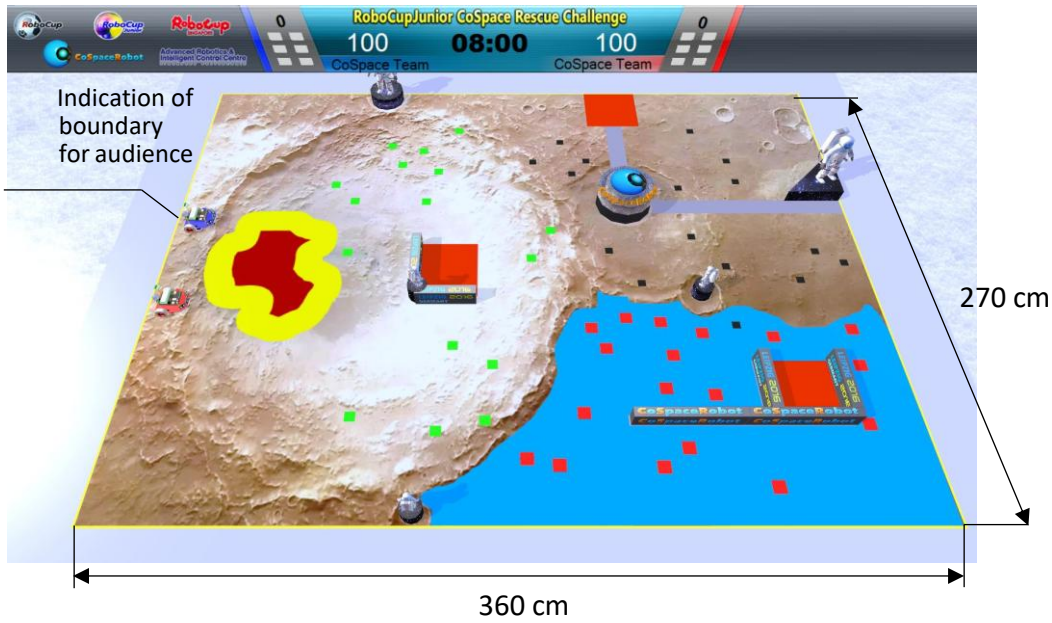
Technical support: support@CoSpaceRobot.org

13 APPENDIX A: Competition Setup

REAL_WORLD



VIRTUAL_WORLD (U19 Group)



- The coordinates of virtual robots, special zones, collection boxes, traps, signal block zones will be provided to teams.
- The coordinates of SUPER and SUPER+ objects will be sent to team that generates the objects.

14 APPENDIX B: Real Arena Suggested Building Instructions

The inner dimensions of the real arena are 180cm x 240cm which is about the same as the RCJ soccer field. The following is the suggested instruction for building the real arena. These instructions are applicable only for the World Championship organizers.

(a) Cut a piece of 243 cm x 183 cm plywood or fiberboard (about 1.5cm thickness is adequate). The surface of the board may be either smooth or textured. You may also join a few small ones together. Please make sure the joint is smooth. It should not affect the real robot movement.

(b) Lay the board on the floor. The floor should be level.

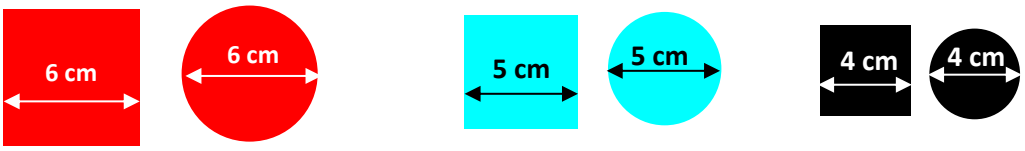
(c) Paint the surface to white colour.

(d) A simple frame should be added at the edge to prevent the robot from falling if the arena is not placed on floor.

15 APPENDIX C: List of Objects

U12 & FirstSteps Group

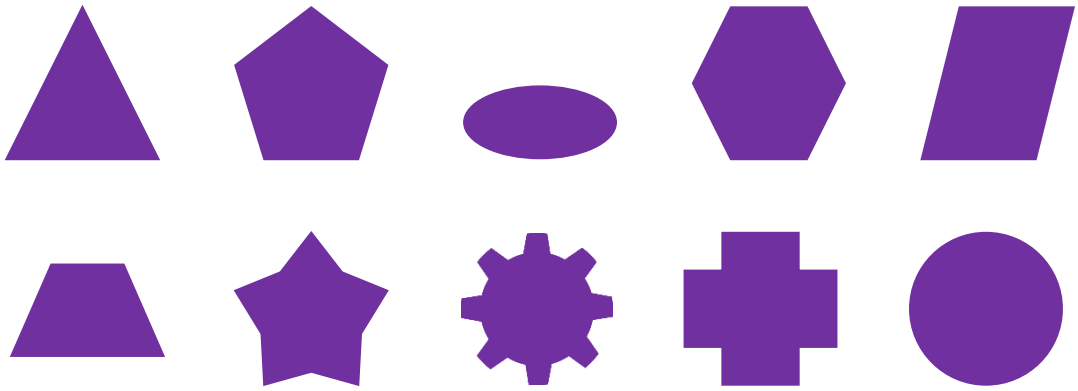
The colour, shape, and size of objects is fixed. They are square or round shape in general.



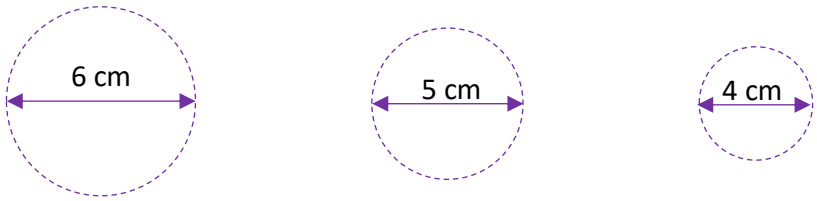
RED CYAN BLACK

U19 Group

- Shape: The shape of the objects will be any one of the following. There might be different shapes of objects in a map.



- Size: the inscribed circle for the 3 types object are:



- Colour: the colour of the objects will be in the RED/ CYAN categories or BLACK.

RED CYAN BLACK

16 APPENDIX D: Interview Key Points

For FirstSteps and U12 Categories

1. What was the strategy to solve certain task in your program? Was there any other way to do it? What was the advantage of your method over the others?
2. How would you modify your program if……? (e.g. collection box in a different location, swampland here, lots of black objects in the special zone)
3. Are you able to program a robot to complete a certain task?
4. What have you learnt through the CoSpace Rescue Challenge?
5. The explanation should be clear and logical.

For U19 Category

1. What kind of strategy / methodology / AI algorithm was used to program the search and rescue robot?
2. How did you use the above mentioned method to solve the problem? Please explain in details.
3. What was the major issue you need to consider during the implementation?
4. Can the algorithm be able to adapt to other search and rescue scenarios?
5. What was the most innovative idea in your program?
6. Have you considered other algorithms? If yes, why did you select the current method instead of others? What was your evaluation criteria?