

RCAP CoSpace Rescue Challenge Rules 2023

RCAP CoSpace Rescue Challenge, University (Advanced)

These are the official rules for the RoboCup Asia Pacific (RCAP) 2023 CoSpace Rescue Challenge, University (Advanced). They are released by the RoboCup Asia Pacific CoSpace Rescue Technical Committee. The English rules have priority over any translations.

In the RCAP CoSpace Rescue Challenge University category, the following 2 challenges will be organized in 2023.

- Preliminary Challenge: CoSpace Rescue U19 simulator and competition rules will be adopted.
- Advanced Challenge: CoSpace Rescue (Vision) simulator and this competition rules will be adopted.

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 or C language. Participation teams can contact support@cospacerobot.org for RCAP CoSpace Rescue Simulator download, help and assistance.

In the CoSpace Rescue University (Advanced) category, students will only compete in **VIRTUAL_WORLD**.



Figure 1.1: RCAP CoSpace Rescue Challenge, University (Advanced), World 2



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 C.

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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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 RCAP CoSpace Rescue University group challenge is exclusive to currently enrolled college and university students at the graduate and undergraduate levels.
- 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.
- 1.1.4 Teams should be responsible for checking updated information (schedules, meetings, announcements, etc.) during the event.

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 VIRTUAL_ROBOT in VIRTUAL_WORLD.
 - uploading the correct code to VIRTUAL_ROBOT.
 - communication with CoSpace Technical Committee and Organising Committee for all CoSpace Auto-Driving Challenge related matters.

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 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. (https://2023.robocupap.org/download/RCAP2023_TDP_Template.pdf)

5.2 Team Presentation Video

- 5.1.2 Each team is required to submit a team presentation video 3 weeks 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!

7 Arena

7.1 Dimensions

7.1.1 The dimensions of VIRTUAL_WORLD are 270cm x 360cm.

7.2 Floor

7.2.1 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 VIRTUAL_WORLD

- 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 the VIRTUAL_WORLD.

8 VIRTUAL_WORLD Layout

The Virtual_World 2 contains various elements as follows:

8.1 Markers

8.1.1 There may be some markers in the virtual worlds. The makers can be used to help the virtual 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 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 3. The special zones have a minimum size of 30cm x 30cm. The shape of the special zone is not fixed.

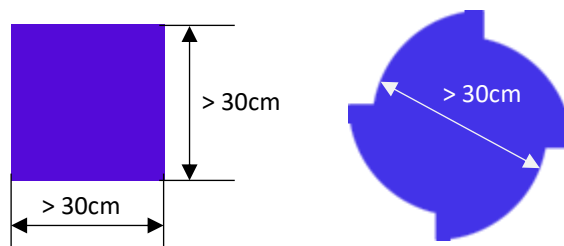


Figure 2: Sample of Special Zones

8.3 Obstacles

8.3.1 Obstacles found in virtual worlds can be of any size, any shape with the minimum dimensions of 10cm x10cm.

8.4 Traps

8.4.1 Traps in WORLD_2 are surrounded by a yellow boundary as shown in figure 3. The minimum size of the trap is 10cm x 10cm. There is an AprilTags inside the trap.

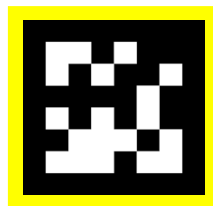


Figure 3 : Sample of Traps in WORLD_2

8.5 Object Collection Boxes

8.5.1 Figure 4 shows the object collection box in WORLD_2. Each collection box is pasted with an AprilTag, and the AprilTag is pasted on the side of the 3D object in the field. The robot can identify the AprilTag's attributes through its camera and confirm whether the collection box belongs to itself.

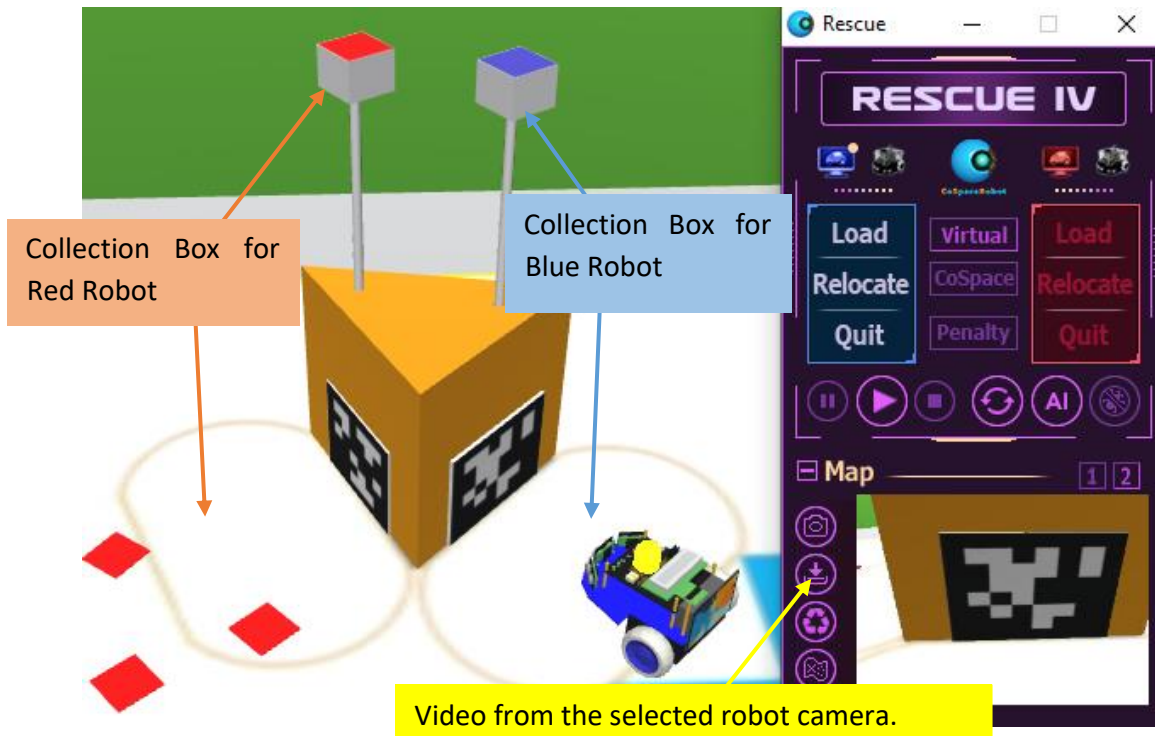


Figure 4: Sample of object collection boxes in WORLD_2

8.6 Robot Coordinates

8.6.1 Robot coordinates are not available in the CoSpace Rescue University Category Advanced challenge.

8.7 Swamplands (University Group – WORLD_2 Only)

8.7.1 Certain areas in the WORLD_2 are designated as swamplands. The swampland is grey color as shown in figure 5. The swampland can be any size bigger than 30cm x 30cm. The shape of the swamplands is not fixed.

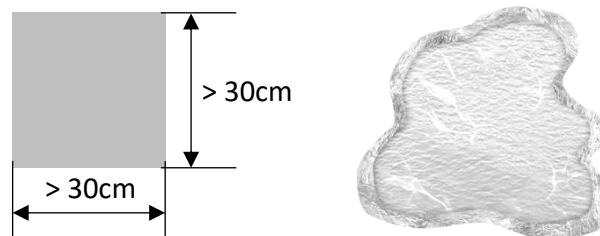


Figure 5: Sample of Swamplands

8.8 Objects

8.8.1 Basic Objects

8.8.1.1 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 (refer to section 11.4.2).

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

8.8.2 SUPER and SUPER+ Objects (University Group –WORLD_2 Only)

8.8.2.1 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 11.4.2) 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 11.4.2) 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.

8.8.2.2 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.

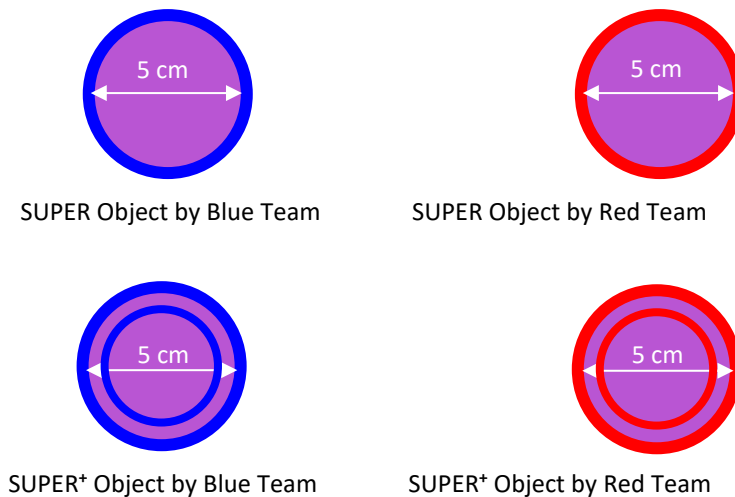


Figure 6: SUPER and SUPER+ objects

8.8.2.3 Placement of SUPER and SUPER+ objects

The CoSpace server will randomly generate SUPER or SUPER+ objects onto the field.

9 Robot

9.1 VIRTUAL_ROBOT Configuration

9.1.1 The ROBOT has the following configuration:

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

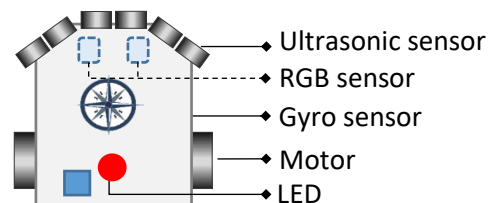


Figure 7: ROBOT configuration

9.2 Camera Configuration

9.2.1 The virtual robot in the CoSpace Rescue (Vision) simulator adds a front simulated camera to the above configuration.

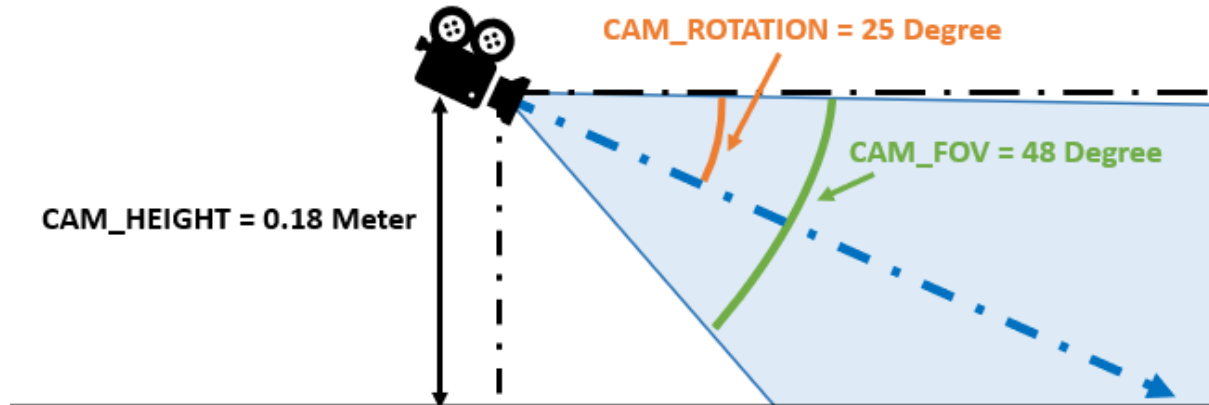


Figure 8: Camera configuration

9.2.2 Simulated camera parameters.

```
//Simulated Camera Parameters
```

```
#define CAM_HEIGHT 0.18 // Camera height, in meters.
```

```
#define CAM_FOV 48 // Camera view angle in vertical axis, in degrees.
```

```
#define CAM_ROTATION 25 // Camera rotation in vertical axis, in degrees.
```

```
//Image Dimension
```

```
#define IMG_WIDTH 320
```

```
#define IMG_HEIGHT 240
```

9.3 ROBOT Control

9.3.1 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 Any pre-mapped type of dead reckoning strategy (movements predefined based on known locations or placement of features in the field) is prohibited.

9.4 Lighting

9.4.1 The lighting condition for the virtual worlds could be varied. Teams must be able to perform calibration in order to complete the mission.



10 Competition content

10.1 Competition format

10.1.1 For RCAP CoSpace Rescue Challenge University category, 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.

10.2 VIRTUAL_WORLD

10.2.1 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.

10.2.2 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 (refer to section 8.5.1).

10.3 Competition Setup

10.3.1 A Team must be able to program VIRTUAL_ROBOT.

10.3.2 Virtual robots must be controlled autonomously.

10.3.3 The use of a remote control to manually control robots is not allowed.

11 Gameplay

11.1 Pre-setup

11.1.1 The layout of the VIRTUAL_WORLD will be released to teams prior to the tournament. The organiser will announce the details.

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 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) No modification of AI is allowed once the run begins.

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

- 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 Virtual World	
	Regular Zone	Special Zone
RED	10	20
CYAN	15	30
BLACK	20	40
SUPER	90	90
SUPER*	180	180

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

(b) 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 Falling into a Trap

If a 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 robot is considered to be in the trap if any one of the robot's color sensor has detected the trap.

11.4.5 Falling into a Swampland (University 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 robot is considered to be in a swampland if any one of the color sensor has detected the swampland.

11.4.6 Out of Boundary (RCAP CoSpace Rescue Challenge, University – 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.

11.4.7 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 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.

11.6 Relocation

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

- VIRTUAL_ROBOT is looping
- 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.



- 11.6.2 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.
- 11.6.3 A team may decide to stop a round early if the lack of progress cannot be resolved within the first 5 minutes. In this case, the team captain must indicate to the referee the team's desire to terminate the game. The team will be awarded all points achieved.

11.7 Penalty

- 11.7.1 The following are strictly prohibited. Offenders will be disqualified from the RCAP 2023.
- During the game, using third-party software, self-written code, or any other tools to retrieve additional system information is strictly prohibited.
 - 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.
- 11.7.2 In the challenge program, please do not use functions such as Print() that need to generate output in the console.
- 11.7.3 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.
- 11.7.4 If a 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.
- 11.7.5 If two 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.

11.8 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 5 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 University 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 C.

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 Round Robin 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

VIRTUAL_WORLD (University (Advanced))

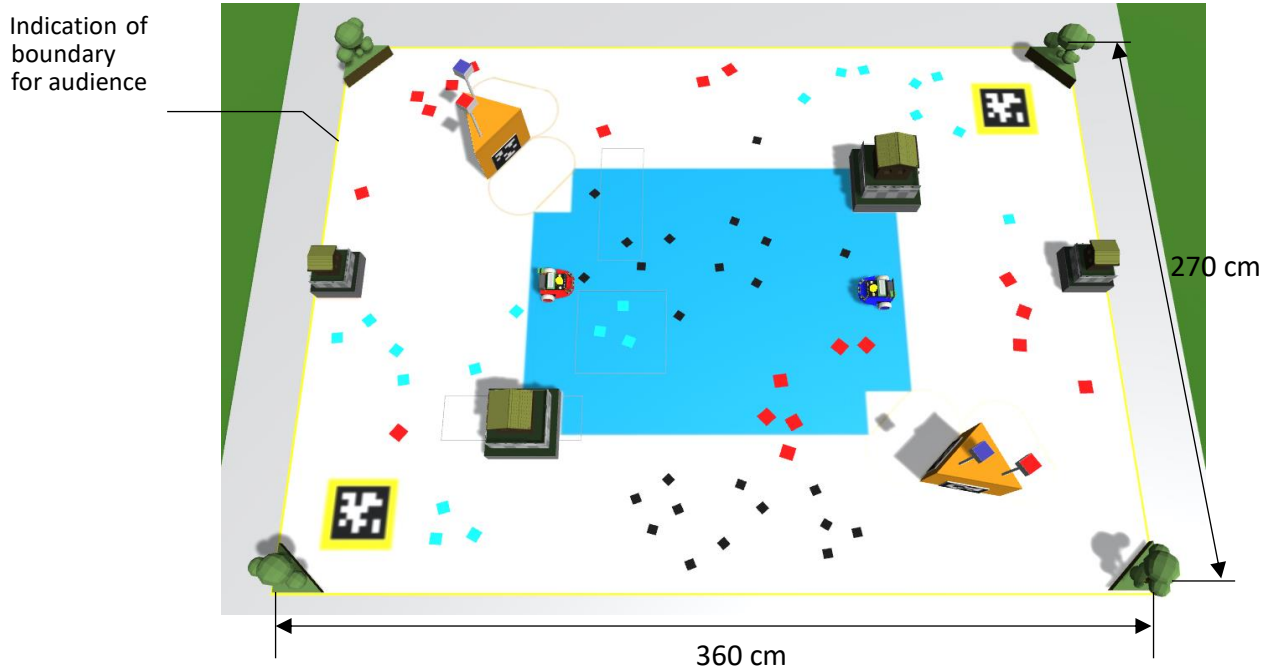


Figure 13.4: RCAP CoSpace Rescue Challenge, University (Advanced), VIRTUAL_World

- Robot coordinates are not available in the RCAP CoSpace Rescue Challenge, University (Advanced).

14 APPENDIX B: List of Objects

U12 & FirstSteps Group

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

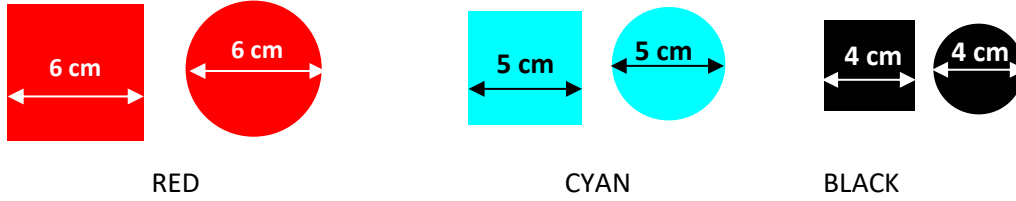


Figure 14.1: List of Objects, U12 & FirstSteps Group

U19 & University Group

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

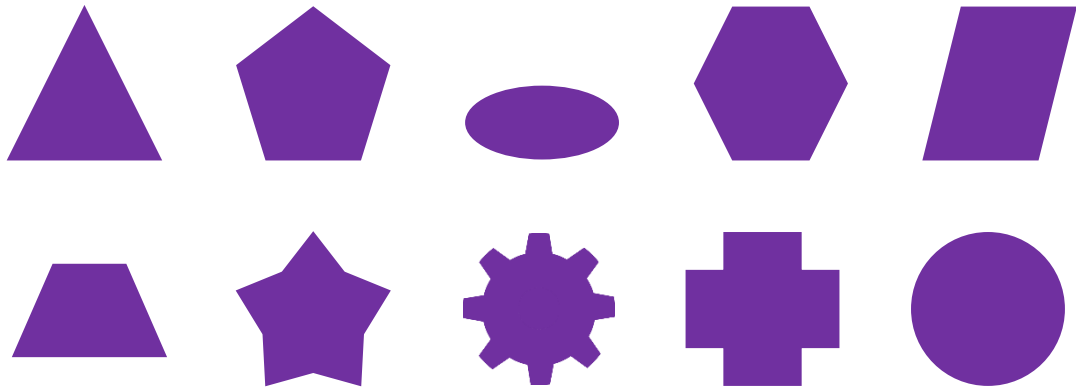
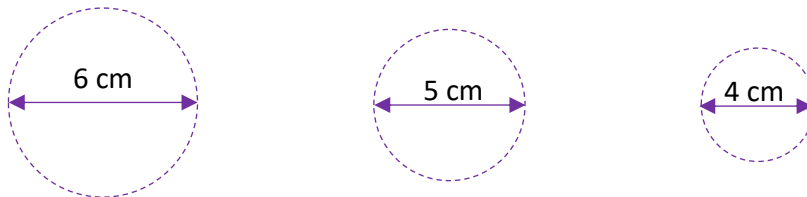
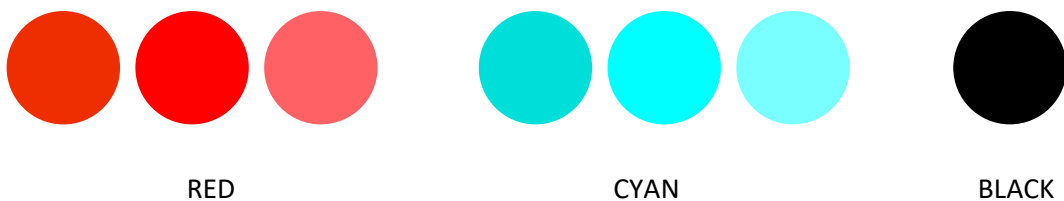


Figure 14.2: List of Objects, U19 & University Group

- 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.





15 APPENDIX C: 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?