

RoboCupJunior **Rescue CoSpace** – Rules 2017

RoboCupJunior Rescue CoSpace Technical Committee

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Fernando Ribeiro (Portugal)

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These are the official rules for RoboCupJunior **Rescue CoSpace 2017**. They are released by the RoboCupJunior **Rescue CoSpace** Technical Committee. **The English rules** have priority over any translations. **Changes from the 2016 rules are highlighted in red.** **Changes are made to clarify some statements (highlighted in yellow).**

Preface

In **Rescue CoSpace**, 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.

The **Rescue CoSpace** Simulator is the only official platform for the sub-league. It can be downloaded at <http://www.cospacerobot.org>. This simulator allows programs to be developed using a graphical programming interface or C language. Please refer to **Rescue CoSpace** Simulator help or CoSpaceRobot.org for details. You can also contact support@cospacerobot.org for assistance.



Official RoboCupJunior site: <http://rcj.robocup.org/rescue.html>

Official RoboCupJunior forum: <https://junior.forum.robocup.org/>

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Overview

Teams are judged in three areas: Technical Interview, Technical Challenge, and Tournament.

- **Technical Interview:** 10 to 15 minutes' face-to-face interview between the team and the judges in which all team members are required to present the learning journal, solution to a specific task, and Team Description Paper (Secondary age group). 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 Rescue CoSpace Challenge.

Teams may be asked to have second interview after the Technical Challenge, Round Robin or Finals, if judges consider it is necessary. Teams must show authenticity and originality with regards to the AI and code. Teams can take the Rescue CoSpace Interview Score Sheet as reference while preparing for the technical interview.

- **Technical Challenge:** The Technical Challenge is compulsory for all teams. It is to evaluate individual team's capability in AI planning and coding. Technical Challenge task will be announced on site. Its format may be completely different from the traditional Rescue CoSpace mission. Teams are required to submit the solution within 2 hours. The Technical Challenge result will be counted as the evaluation criteria for the "winner of the round robin" and the "Best Strategy Award".
- **Tournament:** The tournament begins with Round Robin games. The winner of the round robin is determined based on Technical Challenge results (30%) and total GAME POINTS from Round Robin games (70%). The top 8 teams will advance to the Quarter-Finals, Semi-finals and Final. The winner of the Finals will be decided solely based on the quarter- /semi- /final game result. Teams that could not enter the finals will join the Friendship Tournament (refer to section 8.4).

Best Strategy Challenge:

In order to encourage students into a Robotics and AI related field, the Best Strategy Challenge is setup for individual team members who have passion and talent in Robotics AI and coding. The Best Strategy Challenge is not compulsory for every team member. The task will be announced onsite. Students will have two and half-hours to complete the task.

SuperTeam Challenge:

At the international RoboCupJunior Rescue CoSpace Challenge, 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 demonstrating what they have learnt from each other.

The SuperTeam Challenge is a special program for the international event and is not obligatory for regional events. The rules of the SuperTeam challenge are provided in a separate document, teams who participate in the international event are strongly encouraged to carefully read the SuperTeam 2017 rules in advance of the international finals.



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1 Team

1.1 Team Members

- 1.1.1 A team should have 2 or more members to form a RoboCupJunior team to participate in the International event. Maximum team size is 5 members for RoboCupJunior 2017. Each participant can only be registered in one team in RoboCupJunior.
- 1.1.2 All team members must be the correct age for the primary and secondary categories as stated on the RCJ website <http://rcj.robocup.org/about.html> under "Ages".
- 1.1.3 Every team member need to carry out a technical role for the team (strategy planning, programming, etc.), this should be identified at the registration. Each member will need to explain his/her technical role and should be prepared to answer questions about the technical aspects of their involvement preparing the Rescue CoSpace Challenge.
- 1.1.4 Teams should be responsible for checking update information (schedules, meetings, announcements, etc.) during the event.

1.2 Team Captain

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

2 Game description

2.1 Game process

- 2.1.1 A game lasts 8 minutes, with two teams competing in one game. A game consists of WORLD_1 and WORLD_2. A team has one robot in each WORLD as shown in figure 1.
 - a) ROBOT_1 can spend between 3-5 minutes in WORLD_1
 - b) ROBOT_2 will spend the remaining time in WORLD_2.
- 2.1.2 A team must program ROBOT_1 and ROBOT_2 to navigate and collect objects in WORLD_1 and WORLD_2. A team must end ROBOT_1 and activate the ROBOT_2 when transferring from WORLD_1 to WORLD_2 (refer section 2.3).
- 2.1.3 Only one robot can move at any one time. When ROBOT_1 moves in WORLD_1, ROBOT_2 must be in standby mode. When the ROBOT_2 is activated, ROBOT_1 stops until the end of the game.

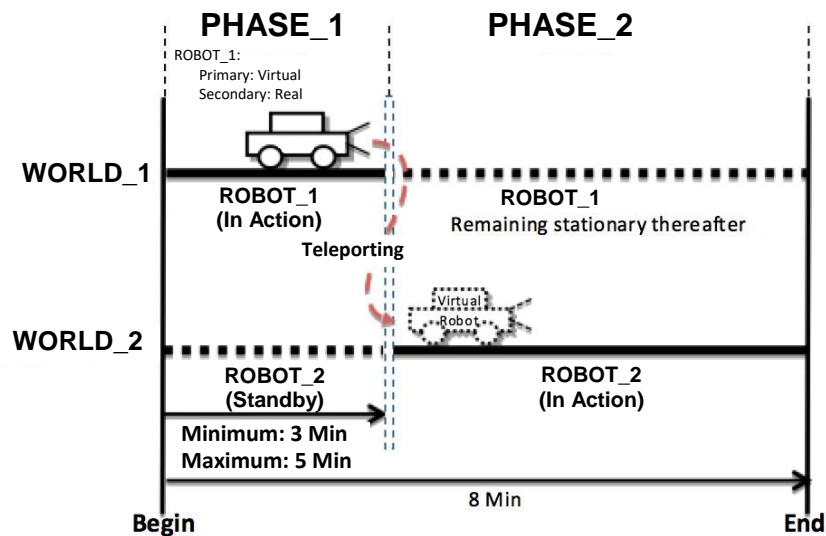


Figure 1: Rescue CoSpace Game Process

2.2 Phase_1

- 2.2.1 A game begins with ROBOT_1 navigating in WORLD_1.
- 2.2.2 In the WORLD_1, ROBOT_1 searches for 3 types of objects, RED, **CYAN**, and BLACK objects. ROBOT_1 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.
- 2.2.3 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 (refer to section 5.5.4).

2.3 Teleportation

Teleportation means ending ROBOT_1's movement in WORLD_1 and activating the team's ROBOT_2 in WORLD_2.

- 2.3.1 A team needs to teleport their ROBOT_1 at any time after 3 minutes but before the first 5 minutes passed whilst ending the ROBOT_1's movement.
- 2.3.2 Teleportation within the first 3 minutes is invalid.
- 2.3.3 If a team fails to teleport by the end of the first 5 minutes, ROBOT_2 will be activated by the CoSpace server automatically (refer to section 5.5.5).

2.4 Phase_2

- 2.4.1 In WORLD_2, ROBOT_2 searches for 5 types of objects, RED, **CYAN**, BLACK, SUPER and SUPER+ objects. ROBOT_2 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.

- 2.4.2 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 3.13.1).

2.5 Competition Setup

- 2.5.1 Primary Category, the ROBOT_1 and ROBOT_2 are virtual robots. Both WORLD_1 and WORLD_2 are virtual worlds.

- 2.5.2 Secondary Category, the ROBOT_1 is real and ROBOT_2 is virtual. WORLD_1 is a real and WORLD_2 is a virtual.

A team must be able to program both real and virtual robots and establish communication between them in order to teleport from WORLD_1 (real) to WORLD_2 (virtual). The use of real robots is not compulsory for regional competitions. Each local organizing committee will decide the competition format.

3 Arena

3.1 Layout

- 3.1.1 Primary Category: Both WORLD_1 and WORLD_2 contain objects, obstacles, traps, markers, object collection boxes and special zones.

Appendix A shows the sample layout of WORLD_1 and WORLD_2 for the primary category.

- 3.1.2 Secondary Category: Both WORLD_1 (real) and WORLD_2 (virtual) contain objects, obstacles, traps, markers, object collection boxes and special zones. The WORLD_2 also contains swamplands and signal block zones.

Appendix B shows the sample layout of WORLD_1 and WORLD_2 for the secondary category.

3.2 Dimensions

- 3.2.1 The dimensions of WORLD_1 are 180cm x 240cm. The dimensions of WORLD_2 are 270cm x 360cm.

3.3 Floor

- 3.3.1 Primary Category:

The floor of both WORLD_1 and WORLD_2 is generally white.

- 3.3.2 Secondary Category:

- a) WORLD_1 (Real World):

- The floor of WORLD_1 is generally white. The floor may be either smooth or textured. Appendix D shows the building instructions.
 - The real world will be placed so that the floor is level.
- b) WORLD_2 (Virtual World):
- The virtual world is a 3D simulated environment (Refer to Appendix B). The floor is not restricted to white or light color. However, the color objects, collection box, special zones, etc., can still be distinguished.

3.4 Boundary

3.4.1 Primary Category

WORLD_1 and WORLD_2 will be enclosed by a wall of height 15 cm.

3.4.2 Secondary Category

- a) WORLD_1 will be enclosed by a wall of height 15 cm.
- b) There will be no wall around the boundary for WORLD_2. 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.

3.5 Markers

- 3.5.1 There may be some markers in the virtual/real worlds. The markers 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 color and shape of the marker is not fixed.

3.6 Obstacles

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

3.7 Special zones

- 3.7.1 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 color 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.

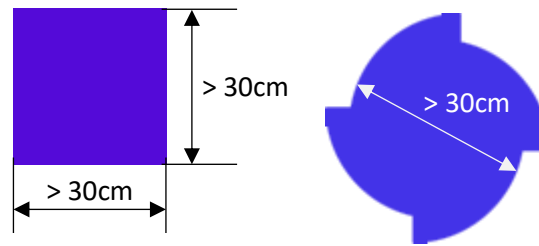


Figure 2: Sample of Special Zones

3.8 Traps

3.8.1 Traps are surrounded by a yellow boundary as shown in figure 3. The minimum size of the trap is 10cm x 10cm. The traps can be any color. The shape of traps is not fixed. If a robot goes over a trap it will lose any objects it is currently carrying.

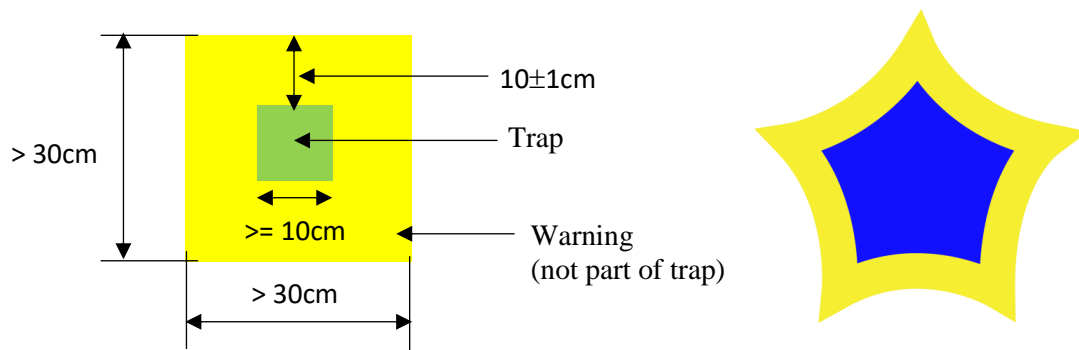


Figure 3: Sample of Traps

3.9 Swamplands (Secondary Category – WORLD_2 Only)

3.9.1 Certain areas in the WORLD_2 are designated as swamplands. The swampland is grey color as shown in figure 4. The swampland can be any size bigger than 30cm x 30cm. The shape of the swamplands is not fixed.

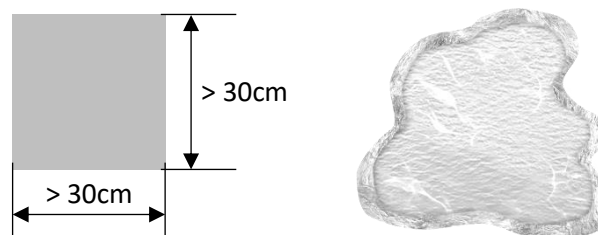


Figure 4: Sample of Swamplands

3.10 Robot Coordinates (Secondary Category – WORLD_2 Only)

3.10.1 For the Secondary Category, the CoSpace Server will send the robot its own coordinates while the robot is searching in the WORLD_2. Figure 5 shows the virtual robot is at position (180cm, 197cm)

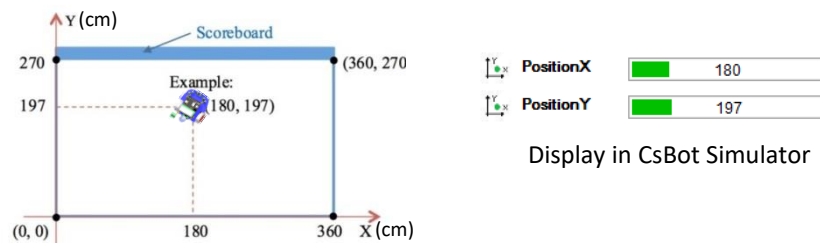


Figure 5: X & Y coordinate system for robot in WORLD_2

3.11 Signal Block Zone (Secondary Category – WORLD_2 Only)

3.11.1 In the WORLD_2 for secondary category, 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.

3.11.2 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.

3.11.3 There are 3 Signal Block Zones in the WORLD_2.

3.12 Basic Objects

3.12.1 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 5.5.2).

3.12.2 Color, size and shape of the objects

Color, size and shape of the objects will be different for the primary and secondary age groups. Appendix C shows the details.

3.13 SUPER and SUPER+ Objects (Both Primary and Secondary Categories - WORLD_2 Only)

3.13.1 Creation of SUPER and SUPER+ objects

- ONE SUPER Object will be generated for every ONE set of RED, **CYAN** and BLACK objects collected and deposited successfully (in one single trip to the Collection Box, refer to section 3.14) in the WORLD_2.
- ONE SUPER+ Object will be generated for every TWO sets of RED, CYAN and BLACK objects collected and deposited successfully (in one single trip to the Collection Box) in the WORLD_2.

- 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.

3.13.2 Size, color 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 color.

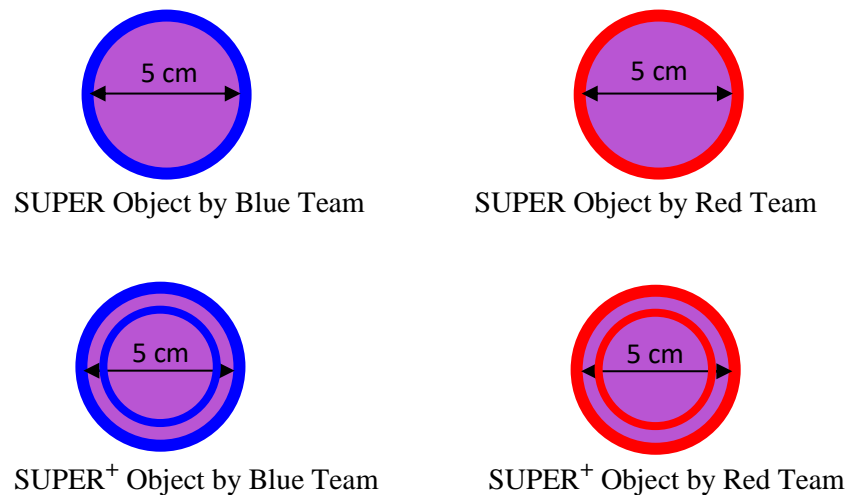


Figure 6: SUPER and SUPER+ objects

3.13.3 Placement of SUPER and SUPER+ objects

- a) Primary Category

The SUPER and SUPER+ objects will be placed on the lines 15 cm away from the wall (Refer to Appendix A). The line reference number (Line 1, 2, 3, or 4) will be sent to the respective team upon the SUPER and SUPER+ objects' creation.

- b) Secondary Category

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 [Rescue CoSpace Simulator user guide](#).

3.14 Object Collection Boxes

- 3.14.1 Figure 7 shows the object collection box. The collection box is ORANGE in color. **The dimensions can be (30 ± 3) cm x (30 ± 3) cm.** The collection box can be any shape.

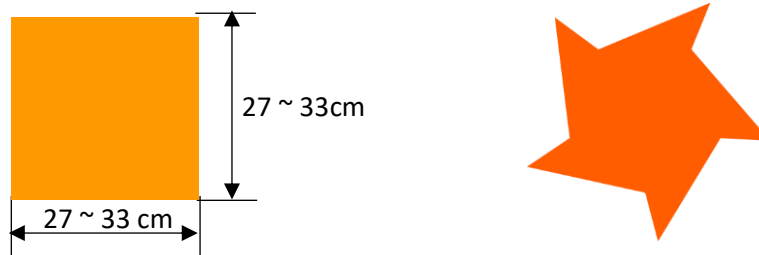


Figure 7: Sample of object collection boxes

3.15 Lighting

- 3.15.1 The lighting condition for the virtual/real worlds could be varied. Teams must be able to perform calibration in order to complete the mission.
- 3.15.2 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.
- 3.15.3 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.

4 Real Robots (Secondary Category Only)

In **RoboCupJunior International Competition** the organizer will provide the real robots (standard platform) for secondary teams during the international competition. ZigBee communication protocol is used in the Rescue CoSpace robot platform for establishing the real/virtual robot communication. Self-built robots are not allowed.

4.1 Control

- 4.1.1 Virtual/real robots must be controlled autonomously.
- 4.1.2 The use of a remote control to manually control virtual/real robots is not allowed.

4.2 Communication

- 4.2.1 Both ROBOT_1 and ROBOT_2 must be fully autonomous. The minimum duration of ROBOT_1 movement is 3 minutes and maximum duration is 5 minutes.
- 4.2.2 Teams need to setup the communication between ROBOT_1 and CoSpace server so that the team can teleport their robots from WORLD_1 to WORLD_2.
- 4.2.3 Teleportation within the first 3 minutes is invalid.



- 4.2.4 If a team fails to teleport within the first 5 minutes, the CoSpace server will stop ROBOT_1 and activate ROBOT_2 automatically (refer to section 5.5.5).
-

5 Gameplay

5.1 Pre-setup

- 5.1.1 The layout of both WORLD_1 and WORLD_2 will be released to teams prior to the tournament.

5.2 Pre-round Practice (Secondary Category Only)

- 5.2.1 Wherever possible, teams will have an access to a practice field for calibration. Teams can calibrate their sensors ONLY before a game at the real field. Calibration is defined as the taking of sensor readings and modifying of the real robot's program to accommodate such sensor readings. Calibration can be done in as many locations as desired.

5.3 Humans

- 5.3.1 As the space around the competition fields is limited (and crowds can result in accidents to robots), only team captain is allowed to move the real robot, based on the stated rules and as directed by the referee.
- 5.3.3 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.

5.4 Game Procedure

- 5.4.1 A referee is an official who receives and uploads teams' programs as well as runs the games.
- 5.4.2 At the end of each programming period
- The chief judge will announce the time for program submission in the competition hall.
 - 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.
- 5.4.3 5 minutes before each game
- Team captains must report to the referee at the respective game stations.
 - Teams are allowed to change the AI before each game (ONLY ONCE) and submit the revised version to the referee. The referee will continue to use AI_1 if there is no revised AI submitted.
- 5.4.4 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.

5.4.5 Pre-match Meeting

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

5.4.6 Start of Play

- a) Real game (Secondary Category Only)
- 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 the correct program is uploaded.
 - Team captains must be present during the full length of the game.

5.5 Scoring

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

5.5.2 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 sensor has detected the object.

Object Type	Points in Real World (Secondary only)		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 placing them in the collection box.
- b) Objects in **WORLD_1 of the secondary category** 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.

5.5.3 Depositing objects

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

- a) Robot in the collection box: A robot is only considered to be in the collection box when both color sensors detect the collection box (both color sensors are in the collection box).
- b) Robot successful object deposit: A robot must
 - stop inside the collection box;
 - turn on the LED for 3 seconds (with a steady light) to indicate the depositing process;
 - exit the collection box autonomously after deposition (both color sensors are out of the collection box).

5.5.4 Bonus points (only for WORLD_1)

- a) For every ONE set of RED, **CYAN** and BLACK objects collected and deposited successfully (in one single trip to the collection box) in WORLD_1, 90 bonus points will be rewarded. There will be no SUPER objects generated in WORLD_1.
- b) For every TWO sets of RED, **CYAN** and BLACK objects collected and deposited successfully (in one single trip to the collection box) in WORLD_1, 180 bonus points will be rewarded. There will be no SUPER+ objects generated in WORLD_1.

5.5.5 Communication and Teleportation

- a) For successful teleportation, teams will be given 100 bonus points. Teams can choose a location in WORLD_2 that the robot will be teleported to.
- b) For unsuccessful teleportation, the robot will be placed in WORLD_2 by the CoSpace server. No bonus will be given. Teams cannot choose the location in WORLD_2 that the robot will be teleported to.

5.5.6 Falling into a Trap

If a virtual/real robot falls into a trap (refer to section 3.8), all objects that have been collected but not yet placed in the object collection box (refer to section 3.14) 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.

5.5.7 Falling into a Swampland (Secondary Category - WORLD_2 Only)

If a robot falls into a swampland (refer to section 3.9), 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.

5.5.8 Falling into a Signal Block Zone (Secondary Category - WORLD_2 Only)

If a robot falls into a signal block zone, no points will be deducted. (Refer to section 3.11.1) However, the robot's position info (refer to section 3.10.1) will be lost.

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

5.5.9 Out of Boundary (Secondary Category - WORLD_2 Only)

If a robot is out of the boundary, it will be placed inside WORLD_2 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 center of the robot is outside the WORLD_2.

5.5.10 Game Points

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

Game	GAME POINTS
Win	3
Tie	1
Loss	0

5.6 Human Interference

- 5.6.1 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 as the discretion of the referee, officials, organizing committee or general chairs.**
- 5.6.2 In any case, only the team captain is allowed to communicate with the referee.

5.7 Lack of Progress

- 5.7.1 Lack of progress occurs when there is no progress in a game play for 10 seconds and the situation is not likely to change. A typical lack of progress situation is when a real/virtual robot is stuck **or a robot is looping.**
- When a real/virtual robot is stuck for 10 second:** The referee will call “**STUCK**” and the robot will be relocated to a different location but close to where it was with different orientation. The robot will be in action immediately after relocation.
- When a robot is looping (robot repeats the same movement) for 10 seconds:** The team captain can request to relocate the robot to a different location. Upon team’s request, the referee will call “**RELOCATE**” and the robot will be relocated to a different location but close to where it was with different orientation. However, the robot will be frozen for 10 seconds after relocation. The team can only call relocation up to 3 times in each game. The referee will keep track of the number of relocations requested.
- 5.7.2 A team may decide to stop a round early if the lack of progress cannot be resolved **and 5 minutes have passed.** 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.

5.8 Penalty

- 5.8.1 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.
- 5.8.2 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.

- 5.8.3 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.

5.9 Interruption of Game

- 5.9.1 In principle, a game will not be stopped during gameplay.
- 5.9.2 The referee can end a game when all objects have been collected by the robots.
- 5.9.3 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.
- 5.9.4 Teams are not allowed to quit a game 5 minutes after the game started.

6 Conflict Resolution

6.1 Referee

- 6.1.1 During a gameplay, the referee’s decisions are final.
- 6.1.2 **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.**

6.2 Rule Clarification

- 6.2.1 **It is team’s responsibility to verify at the RoboCupJunior Official website about the latest version of the rules prior to the competition.** If any rule clarification is needed, please contact the International RoboCupJunior **Rescue CoSpace** Technical Committee.
- 6.2.2 **If necessary even during a tournament, a rule clarification may be made by members of the RoboCupJunior Rescue CoSpace Technical Committee and Organizing Committee.**

6.3 Special Circumstances

- 6.3.1 If special circumstances, such as unforeseen problems or capabilities of a robot occur, rules may be modified **by the RoboCupJunior Rescue CoSpace Organizing Committee Chair in conjunction with available Technical Committee and Organizing Committee members, if necessary even during a tournament.**
- 6.3.2 **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 6.3.1, it will be considered as an agreement.**



7 Documentation

7.1 Learning Journal

The learning journal submission is for

- RoboCupJunior regional competition – both primary and secondary age group.
- RoboCupJunior world championship – primary age group only.

Each team must bring a learning journal or any form of documentation describing the information about the team, their preparation efforts in programming and how they prepared for RoboCupJunior. The learning journal must be presented during the interview, and may be called upon to help establish the authenticity of a team's performance.

7.2 Team Description Paper

The Team Description Paper (TDP) submission is for

- RoboCupJunior world championship – secondary age group only.

Each team is required to submit a TDP (2 - 4 pages) two weeks before the official starting date of the RoboCupJunior competition. The TDP should include the team description, strategy, discussion and conclusion. The TDP format can be downloaded from <http://rcj.robocup.org/rescue.html>. Teams need to send the TDP to the Rescue CoSpace Technical Committee for review. Teams are required to present the TDP during the interview. Teams may be called upon to help establish the authenticity of a team's performance.

7.3 Poster

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 the interview the poster 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 school and district;
- Development of the searching and placement strategies;
- Any interesting or unusual features of their programs;
- What the team hopes to achieve in robotics.

8 Judging and Award

8.1 Technical Interview

- 8.1.1 It is compulsory for all teams to attend the technical interview. Teams may take the interview score sheet for reference while preparing their interview.
- 8.1.2 During the interview, students will be asked about their preparation efforts. The interview format for Primary age group and Secondary age group are different.
 - a) Primary age group teams are required to present the learning journal and poster for the interview. Teams may be asked to present the solution to a specific scenario during the interview.
 - b) Secondary age group teams are required to give a technical presentation based on the TDP (refer to section 7.2) and present their poster during the interview.
- 8.1.3 Interviews will take place in English, if teams require a translator they should inform the local organizing committee by e-mail prior to the event to allow translators to be organized.
- 8.1.5 Teams may be asked to have second interview after the Technical Challenge, Round Robin or Finals, if judges consider it is necessary. Teams may be asked to submit their source code for the round. The source code will not be shared with other teams without the team's permission.
- 8.1.6 Team members have to indicate whether he/she will take part in the Technical Challenge (refer to section 8.2) and Best Strategy Challenge (refer to section 8.3).

8.2 Technical Challenge (Note: Apply specifically for the World Championship)

- 8.2.1 The Technical Challenge is to evaluate individual team's capability in AI planning and coding capability. The Technical Challenge task will be announced on site. Its format may be completely different from the traditional Rescue CoSpace mission. Teams are required to submit the solution within 2 hours.
- 8.2.2 It is compulsory for teams to take part in the Technical Challenge. During the programming period, students are not allowed to leave the team area.
- 8.2.2 Primary age group: All team members are required to work as a team to take part in the Technical Challenge. Discussion can be carried out among team members, but they are not allowed to consult mentors or other members who are not participating in the technical challenge.
- 8.2.3 Secondary age group: 50% or more of team members are required to attend the Technical Challenge. i.e. minimum 2 members are required for a team of 4. Minimum 3 members are required for a team of 5. Each member will work on the task independently. Members are not allowed to consult mentors. Members from the same team are not allowed to discuss or share code among themselves. The average score will be considered as the team result.



8.2.4 The Technical Challenge result will be used as the evaluation criteria for the “winner of the round robin” (refer to section 8.5.1) and the “Best Strategy Award” (refer to section 8.5.3).

8.3 Best Strategy Challenge (Note: Apply specifically for the World Championship)

- 8.3.1 The Best Strategy Challenge is not compulsory for every member. Only students aiming for the Best Strategy Award are required to sit in the Challenge.
- 8.3.2 Team members can only take part in the challenge as individual candidates. **Each candidate has to work on the task independently. No discussion or sharing code with any member is allowed.**
- 8.3.3 **The task will be announced onsite. Candidates will have two and half-hours to complete the task. During the programming period, candidates are not allowed to leave the team area.**

8.4 Friendship Tournament

- 8.4.1 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.
- 8.4.2 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 RCJ Rescue CoSpace Organizing Committee onsite. The last survivor will be the winner.

8.5 Winner

8.5.1 Round Robin

- The winner of the round robin is determined based on Technical Challenge results (30%) and total GAME POINTS (refer to section 5.5.10) from round robin games (70%).
- If two teams gained the same result, the winner will be decided based on the technical challenge result. If the technical challenge results are still the same, the winner will be decided based on the total round robin points. If the total round robin points are still the same, the team with the higher points in WORLD_2 will be the winner.

8.5.2 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, teams will be going for re-match.

8.5.3 Best Strategy

- Primary Category: The winner will solely depend on the Best Strategy Challenge Result
- Secondary Category: The winner will be determined based on the combination of 30% of Technical Challenge Result (individual score) and 70% of the Best Strategy Challenge result.



8.5.4 Best Novice Team

- The winning team must consist of all new members from a new team and a new school.
- The team must be one of the top 4 teams in its age group.

8.5.5 Friendship Tournament

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

8.6 Awards

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

8.6.1 Trophy

- RoboCupJunior **Rescue CoSpace** Individual winning teams.
- RoboCupJunior **Rescue CoSpace SuperTeam World Champion**.

8.6.2 Certificate

- **Best Presentation (primary age group).**
- **Best Technical Presentation.**
- **Best Technical Challenge.**
- Best Novice Team Award.

9 Code of Conduct

9.1 Fair Play

- 9.1.1 Humans that cause a deliberate interference with real robots or damage to the real-world setup will be disqualified.
- 9.1.2 It is expected that the aim of all teams is to participate fairly.

9.2 Behavior

- 9.2.1 If one team copies a program from another team, both teams will be disqualified.
- 9.2.2 Teams will be disqualified for deliberately trying to lose the game or tie with the opponent team.
- 9.2.3 Team members should be mindful of other people and their robots when moving around the tournament venue.
- 9.2.4 Team members are not to enter setup areas of other leagues or other teams, unless expressly invited to do so by team members.
- 9.2.5 Team members who misbehave may be asked to leave the building and risk being disqualified from the tournament.



- 9.2.6 These rules will be enforced at the discretion of the referees, officials, tournament organizers and local law enforcement authorities.
- 9.2.7 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 programming of students' robots. Mentor interference with robots or referee decisions will result in a warning in the first instance. If this reoccurs, the team will risk being disqualified.

9.3 Sharing

- 9.3.1 Teams are encouraged to share their programming and strategies to the **members from other teams.**
- 9.3.2 Any developments may be published on the RoboCupJunior website after the event.
- 9.3.3 This furthers the mission of RoboCupJunior as an educational initiative.

9.4 Spirit

- 9.4.1 It is expected that all participants (students and mentors alike) will respect the RoboCupJunior 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!

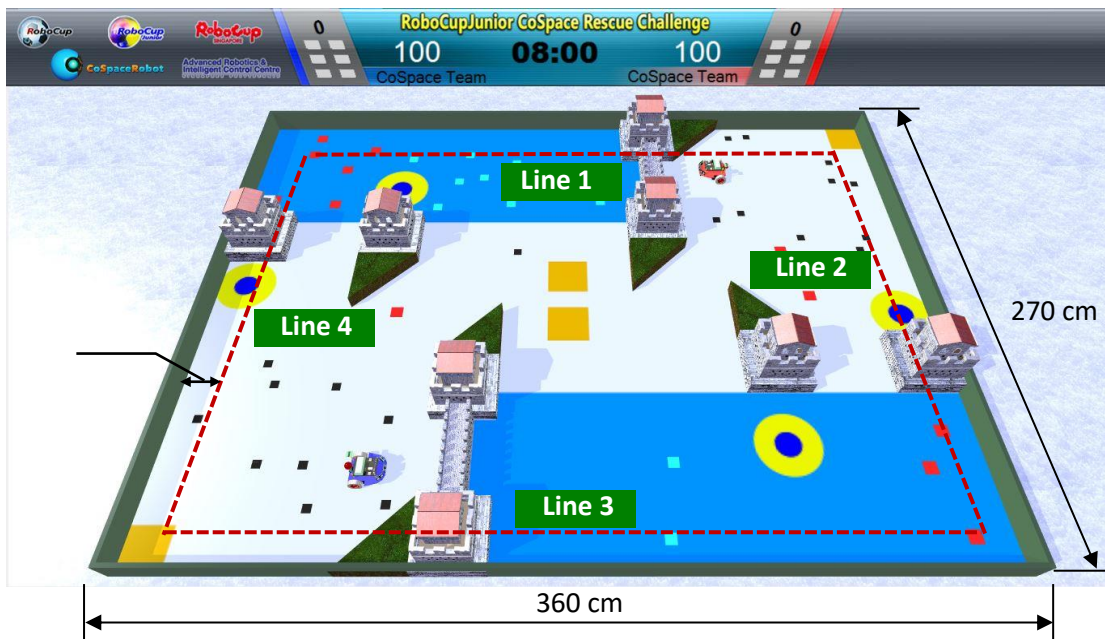
About **Rescue CoSpace** Simulator: www.CoSpaceRobot.org

10 APPENDIX A: Primary Category Competition Setup

10.1 WORLD_1 (Virtual):



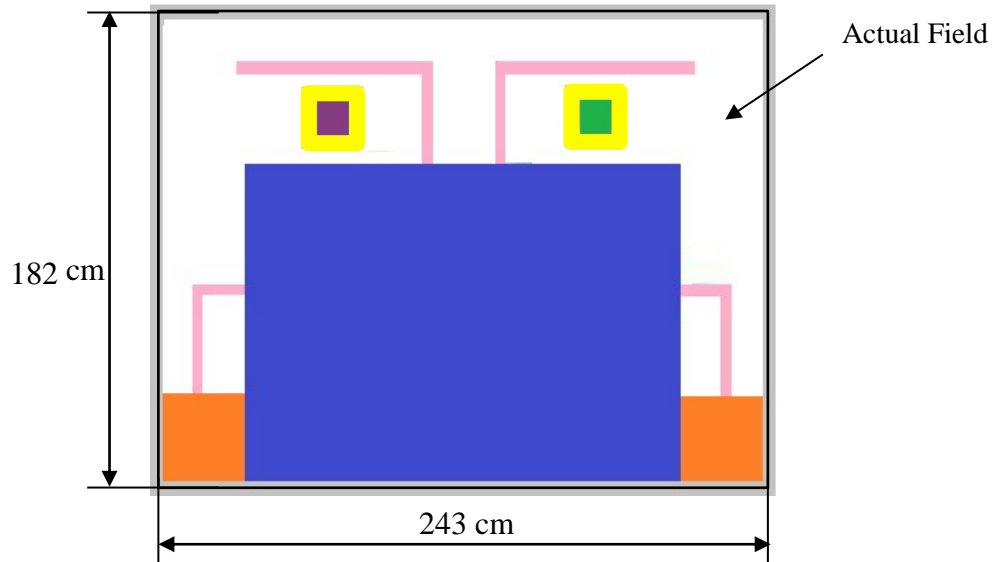
10.2 WORLD_2 (Virtual):



- The SUPER and SUPER+ objects will be placed 15cm away from the wall (indicated by the dash-lines in the diagram; however, the dash-line will not be shown in the WORLD_2) upon generation.

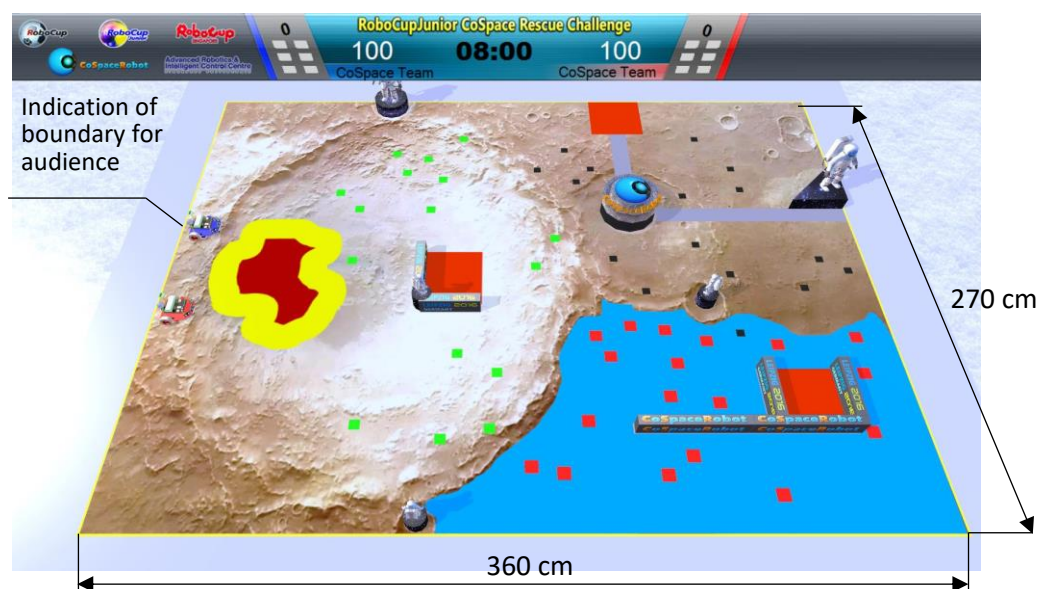
11 APPENDIX B: Secondary Category Competition Setup

11.1 WORLD_1 (Real):



- The location (X & Y coordinates) of any objects including real robot, real objects, special zones, traps, marker, collection boxes, and obstacles will not be disclosed to teams.

11.2 WORLD_2 (Virtual):

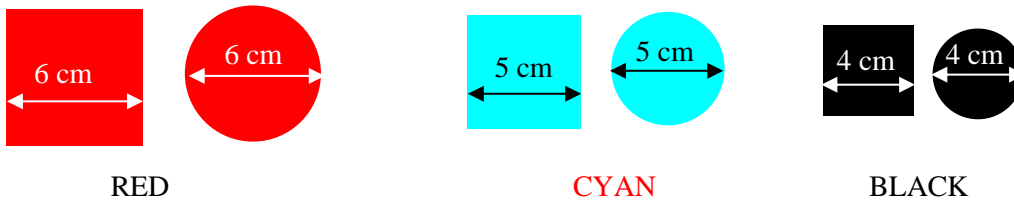


- The coordinates of virtual robots, special zones, collection boxes, traps, signal block zones will be provided to teams.
- The coordinates of SUPER and SUPER+ objects will be sent to team that generates the objects.

12 APPENDIX C: List of Objects

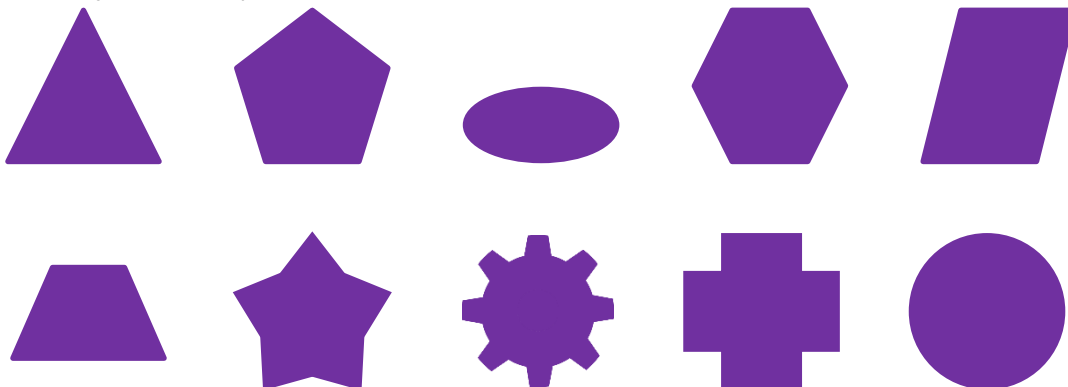
12.1 Primary Category

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

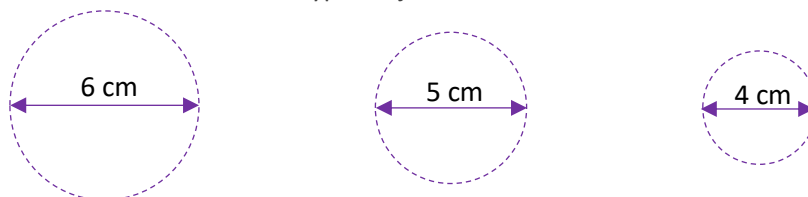


12.2 Secondary Category

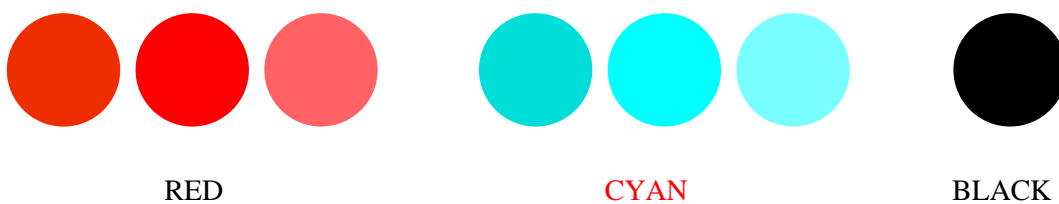
- Shape: The shape of the objects will be any one of the following. There might be different shapes of objects in a map.



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



- Color: the color of the objects will be in the RED/ CYAN categories or BLACK.



13 APPENDIX D: Real Arena Suggested Building Instructions

The size of the real arena is the same as the RCJ soccer field. The following is the suggested instruction for building the real arena for **Rescue CoSpace** Secondary category. These instructions are applicable only for the World Championship organizers.

- 1) Cut a piece of 243 cm x 182 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.
- 2) Lay the board on the floor. The floor should be level.
- 3) Paint the surface to white color.
- 4) A simple frame should be added at the edge to prevent the robot from falling if the arena is not placed on floor.

