RoboCupJunior Rescue B Rules 2013

RoboCupJunior Rescue - Technical Committee 2013
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Changes from 2012 rules are in **red**.

Preface

Rescue B scenario: An earthquake has struck a city, and the houses became unstable. Rescue personnel needs to go inside of these houses but can spend as little time inside the houses as possible. The condition has become too dangerous for the rescuers to conduct rescue mission themselves. Instead, a robot has been dispatched to find victims inside of the houses and signal their positions to the rescuers.

There are also areas treacherous for the robot (e.g. cracks, ditches, etc., which are symbolized by the black squares in the rescue arena). When the robot has searched through the whole building and found all victims, it should get out of the houses as fast as possible.

Differences from Rescue A
There is no line on the floors of Rescue B arena. Instead, the robot must search inside of a labyrinth on its own. The paths in the labyrinth may vary between competition rounds (the walls inside will be repositioned each round). Also, there are more than one victim inside of Rescue B arena. The robot needs to signal where they are, but does not have to rescue the victims.

1. Arena

1.1 Description:
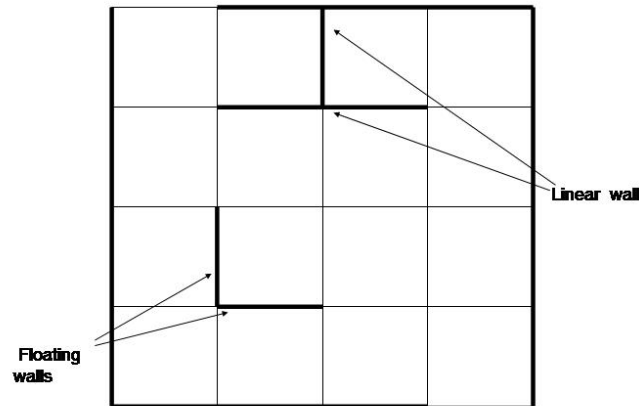1.1.1 The arena is modular. Each room can be thought of as a "room" in a building.
1.1.2 Rooms may be placed adjacent to each other (side by side) or stacked vertically (above/below).
1.1.3 Adjacent rooms will be placed so that the floors are level to each other and the horizontal (plane of the earth).
1.1.4 Stacked rooms will be connected by a ramp (sloping hallway) with an incline of approximately 25 degrees from the horizontal.
1.1.5 Rooms and ramps will have walls **at least 15 cm** high. Walls will be a light color (white, or close to white).
1.1.6 Walls may or may not lead to the entrance/exit. Walls that lead to the entrance/exit are called linear walls. The walls that do NOT lead to the entrance/exit are called "Floating Walls".

Linear wall

Floating walls

1.2 Dimensions:

1.2.1 Each room is approximately **120 cm by 120 cm [could be 120 cm by 90 cm],** with walls that are **at least 15 cm** high.

1.2.2 Doorways and ramps are at least 30 cm wide.

1.3 Floor:

1.3.1 Floors are a light color (white, or close to white). Floors may be either smooth or textured (like linoleum or carpet), and may have steps of up to 3 mm in height at joints between rooms. There may be holes in the floor (about 5 mm diameter), for fastening walls.

1.3.2 Through the arena**,** there may exist black tiles that represent "no go" spaces. Black tiles will be placed randomly at the start of each round (see 3.3.7). **Black tiles may not be completely fixed.**

1.3.3 Rooms are placed in a way that the floors are level.

1.4 Path:

1.4.1 Rooms will be subdivided into paths defined by walls (walls should meet the guidelines as set forth in 1.1.5).

1.4.2 Paths will be approximately **30 cm** wide but may open into foyers wider than the path. Foyers may be any size up to the full size of a room.

1.4.3 A single tile indicates both the entrance to and exit from the arena. This tile is one of the outermost tiles **in the first room**.

1.4.4 There is only one opening between adjacent rooms.

1.5 Debris and Obstacles:

1.5.1 Debris and Obstacles may be located anywhere in the arena (except on the ramp).

1.5.2 Debris may consist of speed bumps (made from 10 mm plastic pipe or wooden dowel painted white) or wooden sticks less than 3 mm in diameter (e.g. cocktail sticks or kebab skewers). Robots may drive over or push aside debris as needed.

1.5.3 Debris may also be attached **to** or next to walls.

1.5.4 Obstacles may consist of bricks, blocks, weights and other large, heavy items. Robots are expected to navigate around Obstacles. Obstacles that are moved/knocked over will remain where they fall and will be reset only once the robot has completed its scoring run.

1.5.5 Obstacles, when used, will never prevent the robot from discovering routes in the maze.

1.5.6 The obstacles will have a maximum height of 40 cm and a width of 20 cm. Their shape can be everything from rectangular to cylindrical.

1.5.7 The obstacles can only be placed in foyers with at least 20 cm to the nearest walls.

1.6 Victims:

1.6.1 Victims are heated sources located near the floor of the arena (centered approximately 7 cm above the floor).

1.6.2 Each victim has a surface area greater than 25 sq cm.

1.6.3 The organizers will try to keep enough difference (minimum of 10 degrees) between victims' temperatures and the indoor temperature. The temperature of victim simulates human body temperature between 28C to 40C.

1.6.**4** There will be a minimum of five (5) active victims in any round.

1.6.**5** There may be objects that resemble victims in appearance, but are not heated. Such objects are not to be identified as victims by robots.

1.6.6 Victims will never be located on black tiles or on tiles with obstacles.

1.7 Environmental Conditions:

1.7.1 Teams should expect the environmental conditions at a tournament to be different from the conditions of at their home practice field.

1.7.2 Teams must come prepared to adjust their robots to the lighting conditions at the venue.

1.7.3 Lighting and magnetic conditions may vary along the course in the rescue arena.

1.7.4 The arena may be affected by magnetic fields (e.g. generated by under floor wiring and metallic objects).

1.7.5 Teams should prepare their robots to handle unexpected lightning interference. While the organizers and referees will try their best to minimize external lighting interference, it is not possible for them to foresee all unexpected interferences such as camera flash from spectators.

1.7.6 The OC will try their best to fasten the walls onto the field floor so that the impact from regular robot's contact should not affect it. (Refer to 6.1)

2. Robot

2.1 Control:

2.1.1 Robots must be controlled autonomously (use of a remote control to manually control the robot is not allowed).

2.1.2 Robots must be started manually by **the team captain**.

2.1.3 Robots may utilize various maze navigation algorithm. Pre-mapped type of dead-reckoning is prohibited.

2.1.4 The robot must not damage any part of the arena in any way.

2.1.5 Robots should include a stop/pause button so they may be easily stopped/paused by humans to avert any potentially damaging or illegal robot actions.

2.2 Construction:

2.2.1 The height of a robot must not exceed 30 cm.

2.2.2 Robots may not have any sensor or other device that enables it to 'see' over the walls.

2.2.3 Robots may be constructed of any robot kit or building blocks (either commercially available or custom built from raw hardware) as long as the robot complies with the above constraints, and its design and construction are primarily and substantially the original work of the students (see section 2.5. below).

2.2.4 Any commercially produced robot kit that is specifically marketed as a 'maze solver' or 'rescue robot' is likely to be disqualified unless significant modifications have been made to both its mechanical design and software. If there is any doubt as to the acceptability of a particular commercial product, participants must obtain approval from the International RoboCupJunior Rescue Technical Committee several months prior to any competition. Organizers will treat all inquiries with the utmost privacy, and will not release details to any third parties.

2.2.5 **Bluetooth Class 2 and Class 3 communications, and ZigBee (See RoboCupJunior General Rules) are** the only radio type allowed in RoboCupJunior. Teams with robots that have other types of radio communication on board have to remove these radio communication devices or disable them as other types of radio communication can interfere with other leagues competing in RoboCup. **If a robot has a device(s) for other forms of radio communication, the team must prove that device have been disabled.** Robots that do not comply may face immediate disqualification from the tournament.

2.2.6 For safety reasons, no lasers are allowed on any robot.

2.3 Team:

2.3.1 A team is only allowed one robot in the arena.

2.3.2 Also refer to 3.2 Humans rules.

2.4 Inspection:

2.4.1 The robots will be examined by a panel of referees before the start of the tournament and at other times during the competition to ensure they comply with all of the constraints described above.

2.4.2 It is the responsibility of teams to have their robots re-inspected if modifications are made to the robot at any time during the tournament.

2.4.3 Students will be asked to explain the operation of their robot, in order to verify that the construction and programming of the robot is their own work.

2.4.4 Students will be asked questions about their preparation efforts, and may be requested to answer surveys and participate in video-recorded interviews for research purposes.

2.5 Violations:

2.5.1 Any violations per the inspection rules will prevent that robot **from** competing until modifications are **made**.

2.5.2 Modifications must be made within the time schedule of the tournament, and teams must not delay tournament play while making modifications.

2.5.3 If a robot fails to comply with all constraints (even with modification), it will be disqualified from that round but not from the tournament.

2.5.4 If there is excessive mentor assistance, or the work on the robots is not substantially comprised of original work by the students, the team will be disqualified from the tournament.

3. Play

3.1 Pre-round Practice:

3.1.1 Where possible, competitors will have access to practice arenas for calibration, testing and tuning throughout the competition.

3.1.2 Where there are dedicated 'competition' and 'practice' arenas it will be at the organizer's discretion if testing is allowed on the competition arenas.

3.2 Humans:

3.2.1 Teams should designate one **of its own team members** as 'captain' and **another one** as 'co-captain'**.** Only these two team members will be allowed an access to the practice/competition arenas**, unless otherwise directed by the referee.**

3.2.**2** All other team members (and any spectators) must stand at least 150 cm away from the arena while their robot is active, unless otherwise directed by the referee.

3.2.**3** As movement of robots by humans is not acceptable during scoring runs except as instructed to do so by the referee, only the 'captain' will be allowed to interact with the robot during a scoring run.

3.3 Start of Play:

3.3.1 The round begins at the scheduled starting time whether or not the team is present/ready. Start times will be posted prominently around the venue.

3.3.2 Once the round has begun, robots are not permitted to leave the competition area for any reason. Each round will last a maximum of 8 minutes.

3.3.3 Calibration is defined as the taking of sensor readings and modifying robot program to accommodate such sensor readings. Once the clock has started, teams may calibrate their robot in as many locations as desired on the arena, but the clock will continue to count down. Robots are not permitted to move under power while calibrating.

3.3.4 **Calibration time is not for pre-mapping the arena and/or victim location. Pre-mapping activities will result in immediate disqualification of the robot for the round.**

3.3.5 Before a scoring run is started, a dice will be rolled to determine the location of the black tiles. The position of the black tiles will **NOT** be revealed to the team until after they are ready to start a scoring run (see 3.3.6). Referees will ensure the combination of black tile placement result in a maze that is 'solvable' before a robot begins a scoring run.

3.3.6 Once the robot is **started**, the referee will place the black tiles (determined by roll of dice as per 3.3.5).

3.3.7 Once a scoring run has begun, no more calibration is permitted (this includes changing of code/code selection).

3.4 Scoring:

3.4.1**Robots are rewarded points for each "victim" they identify in the arena: 25 points per "victim" on floating wall, 10 points per "victim" on linear wall.** A victim on a tile where there is a linear wall on one side of the tile is rewarded 10 points even when the victim is placed on a floating wall. To identify a victim, a robot must stop within 10 cm of the victim, then flash a lamp on and off for two seconds before continuing.

3.4.2 Robots are penalized 10 points for making a false victim identification.

3.4.3 Each robot is awarded a Reliability Bonus. This is calculated as follows:

Reliability Bonus Score = The number of victims successfully identified x 10, minus the number of Lack of Progress x 10.

3.4.4 Reliability Bonus score can only be reduced down to a minimum of 0 points.

eg: 7 victims correctly identified, 2 lack of progress: Reliability Bonus Score = (7 x 10) - (2 x 10) = 50 points

5 victims correctly identified, 6 lack of progress: Reliability Bonus Score = (5 x 10) - (6 x 10) = 0 Points (cannot go less than 0)

3.4.5 **A successful exit** bonus will be awarded if the robot successfully finishes the round by **being stationary for at least 5 seconds** on the **start** tile. (This is to simulate the retrieval of the robot from the disaster zone.**) The points awarded will be 10 per victim successfully identified.**

3.4.6 Ties in scoring will be resolved on the basis of the time taken by each robot to complete the course.

3.4.7 A score sheet template is provided on the official RoboCupJunior website.

3.5 Lack of Progress:

3.5.1 A Lack of Progress occurs if

A) The team captain declares a Lack of Progress.

B) The robot passes through the black tile and leaves it in another direction.

C) The robot or a team member injures or breaks the arena.

D) A team member touches the arena or their robot without permission from the referee.

3.5.2 If a Lack of Progress **occurs,** the robot must be returned to the entry tile **(the first visited square in the current room)** of the room or ramp where the Lack of Progress occurred. **Note that the entry tile is different when going backwards in the maze.**

3.5.3 After a Lack of Progress the team captain may reset (turn on and off) the power supply and program. **He is not allowed to change the program or give any information about the maze to the robot. The only exception is information about its re-start coordinate/state, nothing else.**

3.5.**4 The team captain may declare an "end of round" if the team wants to stop the round early.** The team will be awarded all points achieved up to the call for end of round.

3.6 End of Play:

3.6.1 The round ends when:

A) The time expires.

B) The team captain calls end of round.

C) The robot returns to the start tile and gets the exit bonus.

4. Conflict Resolution

4.1 Referee:
4.1.1 During game play, the referees' decisions are final.

4.2 Rule Clarifications:
4.2.1 Rule clarification**s** may be made by members of the International RoboCupJunior Rescue Technical Committee.

4.3 Special Circumstances:
4.3.1 Specific modifications to the rules to allow for special circumstances, such as unforeseen problems and/or capabilities of a team's robot, may be agreed **upon** at the time of the tournament, provided a majority of the contestants agree.

5. Documentation

5.1 Presentation:
5.1.1 Each team must bring an electronic presentation (e.g. in PowerPoint or Flash format) and/or a poster documenting the design, construction and programming of their robot. (For the details of the presentation contents, refer to 5.1.3.)

5.1.2 Presentations and/or posters are to be shown to the judges during the scheduled interview session before being put up for viewing by the judges, other teams and the visiting members of the public.

5.1.3 The presentation should provide information about the team and how they prepared for RoboCupJunior. The information could include:
  - Team name;
  - League and Division (primary or secondary);
  - Team members' names and (perhaps) their pictures;
  - Country and city/town where the team members are from;
  - Team's school and district;
  - Pictures of the robot prototypes;
  - Information about the robot, including schematics, mechanical drawings and samples of code (programs);
  - Any interesting or unusual features of the robot;
  - What the team hopes to achieve in robotics.

(Additional guidelines may be provided at the International RCJ Community Forum.)

5.1.**4** Judges will review the presentation and discuss the contents with team members.

5.1.**5** Competitors are requested to provide a digital version of their presentation and poster.

5.1.**6** Prizes may be awarded to teams with outstanding presentations.

5.2 Sharing:
5.2.1 Teams are encouraged to view one another's posters and presentations.

6. Code of Conduct

6.1 Fair Play:

6.1.1 Robots that cause deliberate or repeated damage to the arena will be disqualified.

6.1.2 Humans that cause deliberate interference with robots or damage to the arena will be disqualified.

6.1.3 It is expected that the aim of all teams is to participate fairly.

6.2 Behaviour:

6.2.1 Participants should be mindful of other people and their robots when moving around the tournament venue.

6.2.2 Participants are not to enter setup areas of other leagues or other teams, unless expressly invited to do so by team members.

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

6.2.4 These rules will be enforced at the discretion of the referees, officials, tournament organizers and local law enforcement authorities.

6.3 Mentors:

6.3.1 Mentors (teachers, parents, chaperones, **translators** and other adult team members) are not allowed in the student work area.

6.3.2 The organizers will try to provide sufficient seating for mentors to remain in a supervisory capacity close to the student work area.

6.3.3 **Mentors are not permitted to repair robots or be involved in programming of students' robots.**

6.3.4 Mentor interference with robots or referee decisions will result in a warning in the first instance. If this recurs, the team will risk being disqualified.

6.4 Sharing:

6.4.1 The understanding that any technological and curricular developments should be shared among the RoboCup and RoboCupJunior participants after the tournament has been a part of world RoboCup competitions.

6.4.2 Any developments may be published on the RoboCupJunior website after the event.

6.4.3 This furthers the mission of RoboCupJunior as an educational initiative.

6.5 Spirit:

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