RoboCupJunior Rescue B Rules 2012

RoboCupJunior Rescue - Technical Committee 2012
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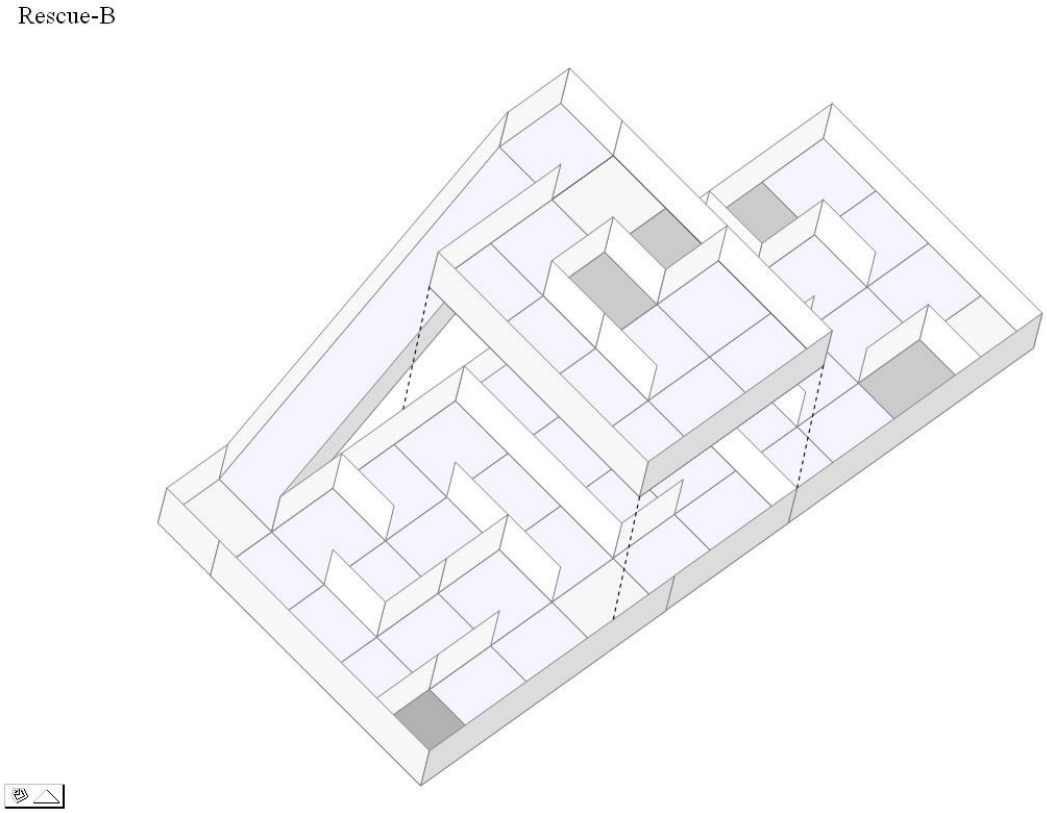
1 Arena



Sample of possible RescueB setup

1.1 Description:

1.1.1 The arena is modular. Each module can be thought of as a "room" in a building.
1.1.2 Modules may be placed adjacent to each other (side by side) or stacked vertically (above/below).
1.1.3 Adjacent modules will be placed so that the floors are level to each other and the horizontal (plane of the earth).
1.1.4 Stacked modules will be connected by a ramp (sloping hallway) with an incline of approximately 25 degrees from the horizontal.
1.1.5 Modules and ramps will have walls approximately 300 mm high. Walls will be a light color (white, or close to white).

1.2 Dimensions:

1.2.1 Each module is approximately 1200 mm by 1200 mm (47 inches by 47 inches) [could be 1200 mm by 900 mm (47 inches by 36 inches)], with walls that are approximately 300 mm (12 inches) high.
1.2.2 Doorways and ramps should be at least 300 mm wide.

1.3 Floor:

1.3.1 Floors should be 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 modules. There may be holes in the floor (about 5 mm diameter), for fastening walls.
1.3.2 Throughout 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).
1.3.3 Modules should be placed so that the floors are level.

1.4 Path:

1.4.1 Modules 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 300 mm wide but may open into foyers wider than the path. Foyers may be any size up to and including the full size of a module.
1.4.3 A single tile will indicate both the entrance and exit to the arena. This tile will be one of the outermost tiles on the lower floor.

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 on 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 only be located on tiles that do not have walls directly on either side. This will give robots the space necessary to navigate around them.

1.6 Victims:

1.6.1 Victims will be electrically heated sources of thermal infrared (TIR) radiation (wavelengths greater than about 3 microns) located near the floor of the arena (centered approximately 7 cm above the floor).
1.6.2 Each victim will have a surface area greater than 25 sq cm.
1.6.3 Victims may be coated with paint or fabric to ensure a high thermal emissivity.
1.6.4 The surface temperature of victims should be as close to human body temperature as possible (37ºC/310K).
1.6.5 There will be a minimum of five (5) active victims in any round.
1.6.6 There may be objects that resemble victims in appearance, but are not heated. Such objects are not to be identified as victims by robots.

1.7 Environmental Conditions:

1.7.1 Teams should expect environmental conditions at a tournament to be different than at their home practice field.
1.7.2 Lighting conditions will certainly vary both in general and along the path in the rescue arena.
1.7.3 Magnetic fields (e.g. generated by underfloor wiring and metallic objects) may be present and effect robot behaviour (every effort will be made by the organizers to locate the rescue arenas away from magnetic fields but this cannot always be avoided).
1.7.4 Spectators take pictures, and cameras will introduce IR and Visible light into the arena and to the robots. Whilst efforts will be made to limit this, it is not possible for organizers to strictly control factors outside of the competition arena. Teams are strongly encouraged to build and program their robots so that sudden changes (eg. camera flash) do not cause major problems. This is good practice in all robotics, both in competitions and in real life situations.
1.7.5 Teams should design their robots to cope with variations in environmental conditions and come prepared to calibrate their robots to contend with the alternate environmental conditions found at the venue.

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 humans.
2.1.3 Robots may utilize many different methods to navigate the arena (wall touching, wall sensing, randomizing, etc.) but all navigation functions must be accomplished by the robot "searching" and not by the robot following any pre-loaded maps of the arena.
2.1.4 At no time can a robot displace walls (push them out of place) or cause damage to any arena element.
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 300 mm.
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 Blue Tooth Class 2 communication and ZigBee modules are the only radio type allowed in RoboCupJunior. Robots that have other types of radio communications on board will either need to remove these or disable them as other types of radio communication can interfere with other leagues competing in RoboCup. 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 In certain competitions (check the bylaws for the competition) this rule can be modified such that two or more robots may be deployed and cooperate in fulfilling the task (see rule 2.2.5 for radio restrictions between cooperating robots).

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 competing until modifications are effected.
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, then 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 Because space around the practice and competition arenas is limited (and crowds can result in accidents to robots) teams should designate one human who will act as 'captain' and one human who will act as 'co-captain', and only these two team members will be allowed access to the practice/competition arenas.
3.2.2 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.
3.2.3 All other team members (and any spectators) must stand at least 150 cm (approximately 60 inches or 5 ft.) away from the arena while their robot is active, unless otherwise directed by the referee.

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 and no points are scored while a team is calibrating.
3.3.4 Calibration time is to be used for the purposes outlined in 3.3.3 and not for pre-mapping of the arena and/or victim location. Any and all 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 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 teams are ready to perform a scoring run, they must notify the referee who will indicate to the team captain to start the robot. Once the robot is underway, the referee will place the black tiles (also 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 20 points for each “victim” they identify in the arena. To identify a victim, a robot must stop within 100 mm 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 For each "Lack of Progress" incurred, the Reliability Bonus score is reduced by 10 points 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 of 20 points will be awarded if the robot successfully finishes the round by stopping on the entry tile. (This is to simulate the retrieval of the robot from the disaster zone).
3.4.6 Ties in scoring will be resolved on the basis of the time taken by each robot to complete the course.

3.5 Lack of Progress:

3.5.1 Lack of Progress is defined as

A) Any instance where the robot is lost or stuck, or cannot identify victims (essentially, the robot is no longer progressing through the arena and scoring points).

B) Any time a robot completely crosses a black tile. ie. travels onto the black tile and leaves a black tile via a different direction.

C) When a team captain declares.

3.5.2 As referees will not know the programming protocols written into the robot's code that may allow the robot to recognize and self-correct for any Lack of Progress it is the team captain's responsibility to identify and call Lack of Progress (except in the case of black tiles).

3.5.3 If the team captain (or referee in the case of crossing black tiles) calls Lack of Progress the robot must be returned to the closest entry/exit tile of the module or ramp where the Lack of Progress occurred. Team captains can choose the direction their robot begins to either re-enter the module or start to explore an additional module.

3.5.4 A team may elect to stop the round early at any time. In this case, the team captain must indicate to the referee the team's desire to terminate. The team will be awarded all points achieved up to the call for end of round. There is no additional penalty for picking up the robot once end of round is called.

3.6 End of Play:

3.6.1 The round ends when time expires, the team captain calls end of round, or all modules have been successfully negotiated and all victims successfully identified.

4 Conflict Resolution

4.1 Referee:

4.1.1 During game play, the referee's decisions are final.

4.2 Rule Clarification:

4.2.1 Rule clarification 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 to at the time of the tournament, provided a majority of the contestants agree.

5 Documentation

5.1 Reporting:

5.1.1 Each team will participate in a technical presentation at the competition. The presentation should include a poster (approximately A3 size) documenting the design, construction and programming of their robot.

5.1.2 Presentations and posters will be shown to the judges during the scheduled interview, before being put up for viewing by 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. Areas that could be covered include:

5.1.3.1 Team name;

5.1.3.2 Division (primary or secondary);

5.1.3.3 Team members' names and (perhaps) a picture of the team members;

5.1.3.4 Team's country and location within country;

5.1.3.5 Team's school and district;

5.1.3.6 Pictures of the robot under development;

5.1.3.7 Information about the robot, including schematics, mechanical drawings and samples of code;

5.1.3.8 Any interesting or unusual features of the robot;

5.1.3.9 What the team hopes to achieve in robotics.

5.1.4 Judges will review the presentation and discuss the contents with team members.

5.1.5 Competitors must provide digital versions (e.g. PowerPoint, PDF or Flash format) of their presentation and poster to the judges at the scheduled interview.
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 and other adult team members) are not allowed in the student work area.
6.3.2 Sufficient seating will be supplied for mentors to remain in a supervisory capacity around the student work area.
6.3.3 Mentors are not 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 An understanding that has been a part of world RoboCup competitions is that any technological and curricular developments should be shared with other participants after the tournament.
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!

7 SuperTeam Challenge

This competition is for the robots that perform best in the individual competition. The challenge will make use of the existing arenas and focus on team cooperation
A superteam will be made up of 2 individual teams and the pairings will be decided by a draw once the results of the individual competition are known.
The details of the challenge will be released in Mexico 24 hours before the Superteam competition starts.