

Rescue Rules (2009)

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Changes from 2008 rules are highlighted in red.

1. Arena.

1.1. Description:

1.1.1. The arena is modular. Each module can be thought of as a "room" in a building. Modules may be placed adjacent to each other (on the same level horizontally) or may be stacked vertically. Modules on the same level are connected by level hallways. Modules on different levels are connected by a sloping hallway or ramp. A ramp will not exceed an incline of 25 degrees from the horizontal, and must have walls at least 10 cm high.

Building plans are linked on this site (see sidebar).

1.2. Dimensions:

1.2.1. Each module is approximately 122 cm by 91 cm (48 inches by 36 inches), with walls that are approximately 28 cm (11 inches) high.

1.2.2. Each room will have two doorways in standard locations (see building plans). Robots will enter through one doorway and exit through the other.

1.3. Floor:

1.3.1. The floor of each room will be a light colour (white, or close to white). The floor may be either smooth or textured (like linoleum or carpet), and may have steps of up to 3 mm in height at joins between modules.

1.3.2. The arena should be placed so that the floors are level.

1.4. Line:

1.4.1. On the floor, there will be a black line for the robots to follow. The black line will be made with standard electrical (insulating) tape, 1–2 cm wide. The black line traces a maze on the floor. It may have 90 degree turns in it, turns of greater than 90 degrees, or curves. The line will never cross itself. The line will never come closer than 10 cm to a wall or another line.

1.4.2. Where the black line is used, it will enter and exit each room through the standard doorways. Any straight section of the black line running alongside a wall (in a room or on a ramp) may have gaps of up to 30 cm in it. A gap in the line may contain a victim.

1.5. Debris:

1.5.1. Debris may be located anywhere in the Orange and Red Zones (but NOT in hallways or on the ramp). Debris may take the form of obstacles to be avoided, speed bumps that should be driven over, or smaller objects that could be driven over or pushed aside.

1.5.2. Debris may consist of bricks, blocks, weights, speed bumps (made from 10 mm plastic pipe or wooden dowel painted white, cut in half lengthways), or wooden sticks less than 3 mm in diameter (e.g., cocktail sticks or kebab skewers).

1.6. Graded difficulty:

1.6.1. It is recommended that the first room (the "Yellow Zone") in the course should NOT contain any gaps or sharp turns in the black line and should be free of debris.

1.6.2. It is recommended that subsequent rooms (the "Orange Zone" and "Red Zone") in the course should be progressively more difficult. (Note that the rooms themselves are NOT coloured. "Yellow", "Orange" and "Red" signify easy, intermediate and hard.)

1.6.3. The black line may end at the entrance to the last room (the "Red Zone") or the bottom of the ramp, so that robots are required to utilize some form of search strategy to locate victims and the exit and finishing line in the last room. Victims may be located anywhere on the floor of that room, but must each be at least 10 cm from the nearest wall.

1.7. Victims:

1.7.1. "Victims" will be located in random positions throughout the course.

1.7.2. Two types of victim may be present:

1.7.2.1. Victims constructed out of green tape;

1.7.2.2. Victims constructed out of aluminized tape or aluminium foil or other reflective material.

1.7.3. The victims will be adhered flat across the black line, or flat on the floor when located in a gap or in the "Red Zone".

1.7.4. The reflectances (for green light at normal incidence) of the silver bodies, white (or close to white) floor, green bodies and black line will be well separated, with the following gradation: silver bodies (lightest) > floor > green bodies > black line (darkest).

1.8. Lighting and magnetic conditions:

1.8.1. Teams must come prepared to calibrate their robots based on the lighting conditions at the venue.

1.8.2. Lighting conditions may vary along the course in the rescue arena.

1.8.3. Every effort will be made by the organizers to locate the rescue arena away from magnetic fields such as underfloor wiring and metallic objects. However, sometimes this cannot be avoided.

Hint: It is recommended that teams design their robots to cope with variations in lighting and magnetic conditions, as these vary from venue to venue. Teams should come prepared to calibrate their robots based on the conditions at the venue.

2. Robots.

2.1. Size:

2.1.1. The upright robot must fit inside an upright 22 cm diameter cylinder.

2.1.2. The robot height must not exceed 22 cm.

2.1.3. Robots will be measured with all parts fully extended.

2.2. Control:

2.2.1. Robots must be controlled autonomously.

2.2.2. Robots must be started manually by humans.

2.2.3. The use of a remote control to control the robot manually is not allowed.

2.2.4. **BlueTooth Class 2 communication between robots is permitted. No other form of radio communication is allowed. Communication between robots and computers is not allowed.**

2.3. Construction:

2.3.1. Any robot kit or building blocks, either available on the market or built from raw hardware, may be used, as long as the robot fits the above specifications and as long as the design and construction are primarily and substantially the original work of the students (see section 2.5. below).

2.4. Team:

2.4.1. In each round, a single robot is deployed which must perform its tasks autonomously. (At certain international events, this rule can be modified such that two or more robots are deployed together and have to cooperate in fulfilling the task. Check the bylaws for the event.)

2.5. Inspection:

2.5.1. The robots will be examined by a panel of referees before the start of the tournament to ensure that they meet the constraints described above.

2.5.2. It is the responsibility of teams to have their robots re-inspected if their robots are modified at any time during the tournament.

2.5.3. While being inspected, each robot must be upright and at its maximum size; i.e., anything that protrudes from the robot must be fully extended.

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

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

2.6. Violations:

2.6.1. Any violations of the inspection rules will prevent that robot competing until modifications are effected.

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

2.6.3. If a robot fails to meet all specifications (even with modification), the robot will be disqualified from that round (but not from the tournament).

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

3. Play.

3.1. Pre-round setup:

3.1.1. **Participants will have access to practice arenas** for calibration, testing and tuning **throughout** the competition.

3.1.2. Organizers will make every effort to allow **2 minutes** of setup time **on the competition arenas for each team** before each of **their rounds**.

Hint: Participants should be aware, however, that situations may arise where these conditions cannot be met; and so participants should arrive prepared to cope with conditions that are less than ideal.

3.2. Length of round:

3.2.1. Robots will be given a maximum time of **8 minutes** to complete the course. The time for each round will be kept by the referee.

3.3. Start of play:

3.3.1. To begin, the robot is placed at its starting location in the doorway at the beginning of the black line.

3.3.2. Teams that are late for their starting time will forfeit the round. **Start times will be posted prominently around the venue.**

3.4. Humans:

3.4.1. In general, movement of robots by humans is not acceptable.

3.4.2. Humans can move robots only when told to do so by the referee.

3.4.3. Before the start of each round, teams should designate one human who will act as "captain", and be allowed to **move** the robot, based on the stated rules and as directed by the referee.

3.4.4. Other team members within the vicinity of the rescue arena are to stand at least 150 cm (approximately 60 inches) away from the arena while their robot is active, unless otherwise directed by the referee.

3.5. Scoring:

- 3.5.1. The robots must attempt to follow the black line where it is present.
- 3.5.2. Robots are rewarded 10 points for locating each "victim" on the course. A robot must indicate that it has found a victim by stopping and flashing a lamp for at least two (2) seconds.
- 3.5.3. Robots are rewarded 10 points for successfully negotiating each gap in the black line.
- 3.5.4. Robots are rewarded 10 points for successfully avoiding each large item of debris blocking the black line.
- 3.5.5. Robots are rewarded 5 points for successfully driving over each speed bump on the black line.
- 3.5.6. Robots are rewarded 10 points for successfully entering a room through one doorway and exiting through the other doorway.
- 3.5.7. Robots are rewarded 20 points for successfully negotiating a ramp without any assistance.
- 3.5.8. Robots are penalized 2 points for making a false victim identification (i.e. indicating that they have found a victim at a location where there isn't one).
- 3.5.9. Robots are penalized 5 points for each lack of progress (see section 3.6 below).
- 3.5.10. Points are awarded only once for each item (e.g. if a robot finds a victim and then has to be returned to the entrance to that room, extra points are NOT awarded for identifying the same victim again).
- 3.5.11. Ties in scoring will be resolved on the basis of the time taken by each robot (or team of robots) to complete the course.

3.6. Lack of progress:

- 3.6.1. Lack of progress occurs if the robot is stuck in the same place or loses the black line for more than 20 seconds.
- 3.6.2. If a robot fails to negotiate a particular part of the course (e.g., gap, victim, item of debris, etc.), then it must be returned to the entrance to the room in which it is located, or Starting Point, by the designated team "captain".
- 3.6.3. If a robot fails to negotiate a particular part of the course two (2) times in succession, then the designated team "captain" may move the robot to a point just past that part of the course. This point is now considered the new Starting Point after any subsequent problems in that room.
- 3.6.4. A team may elect to stop the round early if the lack of progress is caused by a faulty robot. 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 thus far.

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 RoboCupJunior International 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 must bring an electronic presentation (e.g., in PowerPoint, PDF or Flash format) and a poster (approximately A3 size) documenting the design, construction and programming of their robot.

5.1.2. Presentations and posters should be suitable 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. 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 and team, 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 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. All movement and behaviour are to be of a subdued nature within 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 competition.

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!**

Appendix.

Bylaws for RoboCupJunior 2009 in Graz, Austria:

A1. Teams will be paired together to form "superteams" of two (2) robots, for each round. These combinations will change every round.

A2. Both robots must start from the same location, at the entrance to the first room (the "Yellow Zone") in the course. Superteams will need to decide as a group which robot goes first and how long to wait before the second robot is started. The second robot must be started within 60 seconds of the first robot being started. The time recorded for each superteam starts from when their first robot begins moving, and finishes when both robots exit the Red Zone.

A3. The score for each robot in the individual competition will be calculated as follows:

A3.1. Each victim identified by either or both of the robots scores 10 points for both robots.

A3.2. The points scored under rules 3.5.3–3.5.7 by both robots are totalled and given to each robot.

A3.3. The penalty points accumulated under rules 3.5.8. and 3.5.9. are applied only to the robot that incurred them.

A3.4. A robot's score for a round is made up by adding the points from A3.1., A3.2. and A3.3.

A3.5. The robot's tournament score is the total of its round scores, minus the score of its worst round.

A4. In both the Primary and Secondary competitions, the twelve individual teams that achieve the highest tournament scores in the rounds will proceed to the superteam competition on the last day.

A5. The score for each superteam in the superteam competition will be calculated as follows:

A5.1. Each victim identified by either or both of the robots scores 10 points for the team.

A5.2. The points scored under rules 3.5.3–3.5.9 by each robot are totalled and given to the team.

A5.3. The team's score is obtained by adding the points from A5.1 and A5.2.

A6. In both the Primary and Secondary competitions, prizes will be awarded to the three individual teams that achieve the highest cumulative scores in the rounds, and to the three super teams that achieve the highest scores in the finals.

A7. In both the Primary and Secondary competitions, a prize will be awarded to the team with the best presentation.