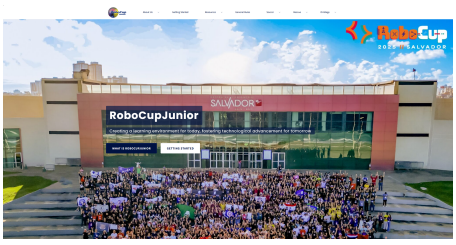
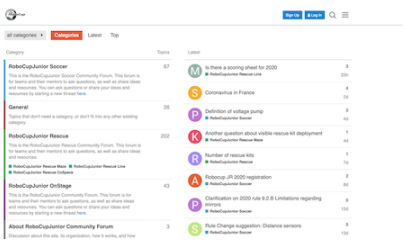
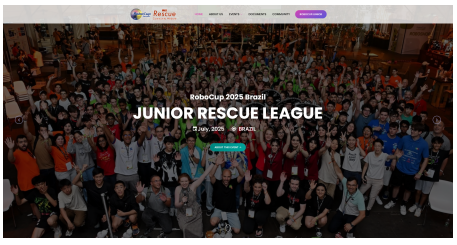
RoboCupJunior Rescue Line Rules 2027

RoboCupJunior Rescue Committee 2027		
Chair	Alexander Jeddeloh	Germany
Co-Chair	Stefan Zauper	Austria
	Gonzalo Zabala	Argentina
	Rebeca Graff	Brazil
	Kelen Cristiane Teixeira	Brazil
	Tomas Lugo	USA
	Wiktor Liew	Sweden
	Mahmoud Madi	UAE

RoboCupJunior Exec 2027		Trustees representing RoboCupJunior	
Marek Šuppa	Slovakia	Julia Maurer	USA
Christian Häußler	Germany	Roberto Bonilla	USA
Margaux Edwards	Australia		
Tatiana Pazelli	Brazil		
Tom Linnemann	Germany		
William Plummer	Australia		

Official Resources

RoboCupJunior Official Website	RoboCupJunior Official Forum	RCJ Rescue Community Website
		
https://junior.robocup.org	https://junior.forum.robocup.org	https://rescue.rcj.cloud

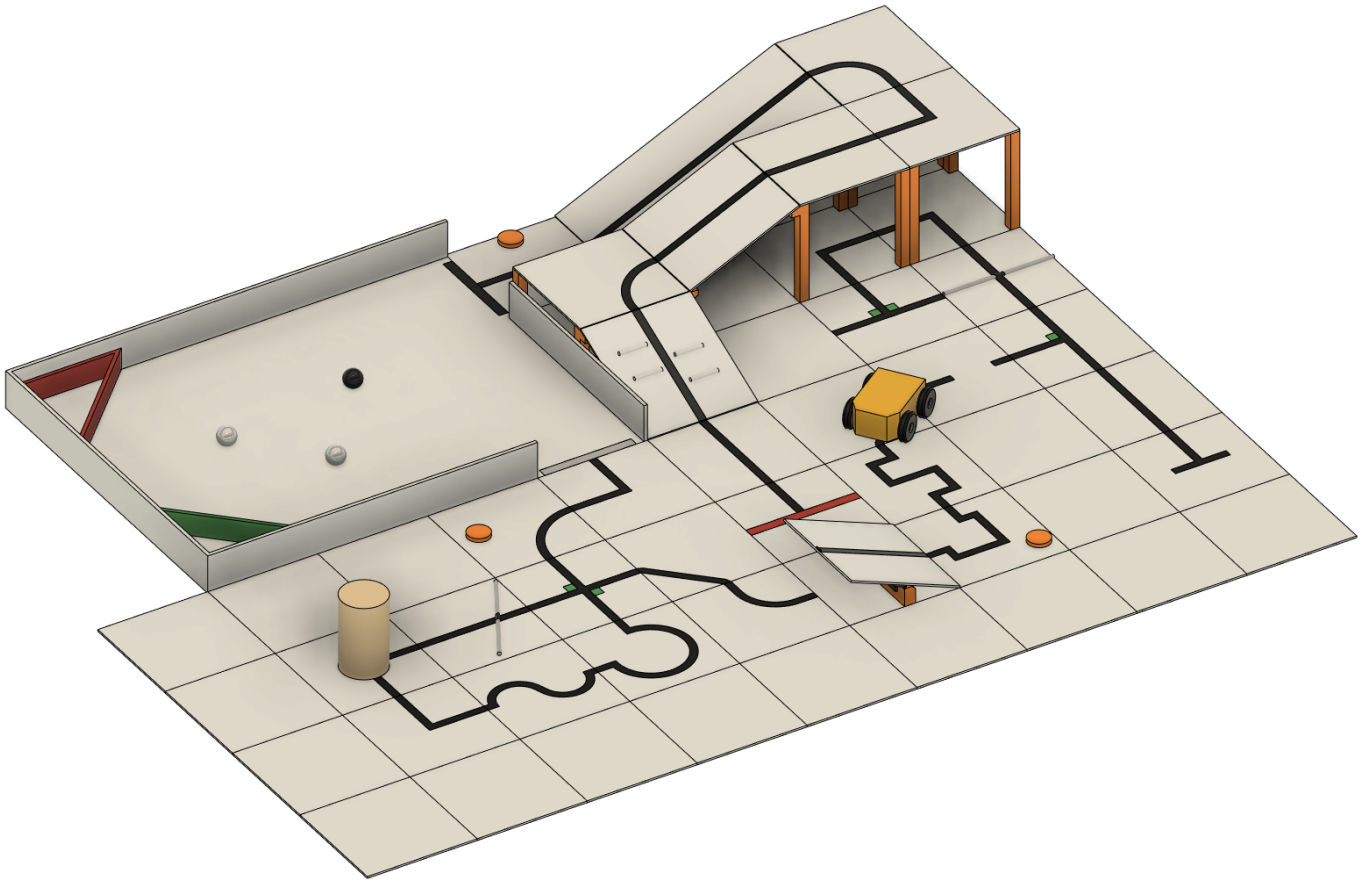
Corrections and clarifications to the rules may be posted on the forum before updating this rule file. It is the responsibility of the teams to review the forum to have a complete vision of these rules.

Before you read the rules

Please read through the RoboCupJunior General Rules before proceeding with these rules, as they are the premise for all rules. The English rules published by the RoboCupJunior Rescue Committee are the only official rules for RoboCupJunior Rescue Line 2027. The translated versions each regional committee can publish are only referenced information for non-English speakers to understand the rules better. It is the responsibility of the teams to read and understand the official rules.

Scenario

The land is too dangerous for humans to reach the victims. Your team has been given a difficult task. The robot must be able to carry out a rescue mission in a fully autonomous mode with no human assistance. The robot must be durable and intelligent enough to navigate treacherous terrain with hills, uneven land, and rubble without getting stuck. When the robot reaches the victims, it has to gently and carefully transport each one to the safe evacuation point where humans can take over the rescue. The robot should exit the evacuation zone after a successful rescue to continue its mission throughout the disaster scene until it leaves the site. Time and technical skills are essential! Come prepared to be the most successful rescue team.



Summary

An autonomous robot should follow a black line while overcoming problems in a modular field formed by tiles with different patterns. The floor is white, and the tiles are on different levels connected with ramps.

Teams are not allowed to give their robot any information in advance about the field as the robot is supposed to recognize the area by itself. The robot earns points as follows:

- 10 points for following the correct path on a tile at an intersection or a dead end.
- 20 points for navigating through a seesaw tile.
- 20 points for overcoming each obstacle (bricks, blocks, weights, and other large, heavy items). A robot is expected to navigate various obstacles.
- 10 points for reacquiring the line after a tile with one or more gaps.
- 10 points for each successfully navigated ramp tile.
- 10 points for negotiating a tile with one or more speed bumps.
- **30 points for successfully exiting the evacuation zone.**

If the robot gets stuck in the field, it can be restarted at the last visited checkpoint. The robot will earn points when it reaches new checkpoints. Somewhere on the path, there will be a rectangular zone with walls (the evacuation zone). The evacuation zone is delimited **at the entrance by** [1] a reflective silver tape strip attached to the floor and **at the exit by** [2] a strip of black tape.

Once in the evacuation zone, the robot should locate and transport the victims to the designated evacuation points. The victims are represented by **spheres of 4 to 5 cm in diameter with an off-center center of mass** [3]. The live victims are **reflective silver and** [4] electrically conductive, and the dead victims are **black and not** [5] electrically conductive.

The team can earn multipliers for victim evacuations depending on the rescue order. Be prepared to face obstacles, speed bumps, and debris in the evacuation zone. Still, the robot will not score points by negotiating these difficulties here. The robot should then exit the evacuation zone and follow the line until the goal tile of the course is reached.

Changes from the 2026 RoboCupJunior Rescue Line Rules

- Added "30 points for successfully exiting the evacuation zone."
- Changed "in the entrance with" to "at the entrance by"
- Changed "the exit with" to "at the exit by"
- Changed "spheres with an off-center center of mass of 4 to 5 cm in diameter" to "spheres of 4 to 5 cm in diameter with an off-center center of mass"
- Changed "reflective silver which is" to "reflective silver and"
- Changed "black, which is not" to "black and not"
- Added "(including on elevated sections)"
- Changed "checkpoint markers" to "checkpoints"
- Deleted "In the evacuation zone, obstacles may be placed anywhere with a minimum of 10 cm clearance from the wall. Obstacles in the evacuation zone are not scored."
- Changed "green marks" to "green markers"
- Changed "inside the evacuation zone. In the evacuation zone, organizers may put the obstacle anywhere" to "anywhere inside the evacuation zone"
- Changed "perpendicular to the wall" to "on the wall (light can point into the evacuation zone)"
- Changed "that resemble real victims in the evacuation zone" to "in the evacuation zone. A fake victim may resemble a real victim but will not satisfy all the characteristics of a real victim defined above in Rule (3.10.2 and 3.10.3) (size, shape, color, reflectivity, or conductivity)"
- Changed "videotaped" to "recorded"
- Changed "the difficulty of the field will be kept" to "that the difficulty of the field is kept"
- Changed "out of" to "exit"
- Changed "round" to "game"
- Deleted "The team captain may make further attempts at the course to earn additional points from scoring elements that have not already been earned before reaching the next checkpoint."
- Changed "ramp," to "ramp tile,"
- Changed "dead victim if both living victims have already been successfully evacuated." to "dead victim. A dead victim placed in the red evacuation point before both living victims have been successfully evacuated is not a successful rescue and earns no multiplier."
- Changed "-0.05" to "0.05"
- Added "Multipliers earned for successful victim rescues will never be lower than 1.25."
- Deleted "Multipliers earned for successful victim rescues will never be lower than 1.25."
- Changed "((SLVR)+(EZLP))_1" to "MAX(1.25, (SLVR)-(EZLP))_1"
- Changed "((SLVR)+(EZLP))_2" to "MAX(1.25, (SLVR)-(EZLP))_2"
- Changed "((SDVR)+(EZLP))" to "MAX(1.25, (SDVR)-(EZLP))"

- Added "Note: The calculation was updated to reflect the wording and reality better."
- Added "A robot is awarded 30 points for successfully exiting the evacuation zone. The points are awarded when more than half of the robot has crossed the black exit strip when viewed from above and the robot is actively following the line."
- Changed "more than 5 seconds" to "5 seconds"
- Changed "non-negative number and is given by" to "minimum of 10 points and is calculated as:"
- Changed "60 - 5 × (number of total lack of progress)" to "MAX(10, 60 - 5 × (number of total lack of progress))"

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1. RoboCupJunior General Rules

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These are the RoboCupJunior General Rules. They apply to every competition that uses this rulebook, including the International RoboCupJunior competition. Under the license above, the organizing committee of a SuperRegional, Regional, or local competition may adapt them as needed for its competition. Check with the organizers of each competition which rules they use.

If you are unsure about any part of the General Rules or the League Rules, you are encouraged to ask on the official RoboCupJunior Forum: https://junior.forum.robocup.org/

You can also ask questions about the rules, or about RoboCupJunior in general, on the official Discord Server (https://robocup-junior.github.io/soccer-rules/discord/).

1.1. Getting Started

If you are new to RoboCupJunior, the Getting Started guides on the Official Website (https://junior.robocup.org/gettingstarted/) explain everything from building your first robot to entering your first competition:

1. **Starting a Team** (https://junior.robocup.org/robocup-beginners-guide/): form a team, build a robot, keep costs down, and find tutorials for your league.
2. **Qualification and Competitions** (https://junior.robocup.org/qualification/): how the season works, how regions qualify teams, and how to enter competitions outside your region.
3. **Your First Competition** (https://junior.robocup.org/your-first-competition/): what to expect at a competition, what to bring, and what to do when something goes wrong.
4. **For Educators** (https://junior.robocup.org/for-educators/): why robotics works in schools, and how to start a program with your students.

1.2. Team Requirements

1.2.1. Team Definition

Team: A team is its robot(s) and the students who build and develop them. The team members are the students who design, build, and program the robot(s) they enter. Membership may change between competition levels as described in Team Changes.

Technical Roles: Every team member must have a defined technical role, for example, mechanical design, electronics and sensors, or software. During technical judging, each member must be able to explain their role and what they contributed to the robot(s). Non-technical tasks, such as documentation, the poster, graphic design, or the presentation, can be shared by the team, but they do not count as a technical role.

Shared Members and Robots: Team members and robots must not be shared between teams.

1.2.2. Age Requirements

Junior Student Members: Must be 14 to 19 years old (inclusive) on July 1st of the competition year.

Junior Mentors and Parent/Chaperones: Must be 19 years or older on July 1st of the competition year.

Entry Leagues: Entry leagues and other "Primary" divisions are not part of the International competition, but many Regional and SuperRegional competitions run them. Their organizers set the age limits, which may differ from the range above.

1.2.3. Team Size

Minimum Team Size: A team must have at least 2 members.

Maximum Team Size:

- Soccer and Rescue Leagues: 4 members.
- OnStage League: 5 members.

Regional and SuperRegional competitions may set their own team sizes, for example, because of venue space. At a higher-level competition (a SuperRegional or International competition the team qualified for), a team must follow that competition's maximum team size, even if the team was larger at its qualifying competition.

1.2.4. Team Changes

Team membership may change between competition levels, for example, when a member can no longer take part. At a higher-level competition, at least half of the team (rounded up) must be students who were members when the team qualified for that competition. New members must take part in designing, building, or programming the robot(s) before they compete, and must meet the Technical Roles requirement. A qualification and the robot(s) belong to the team and cannot be given to another team. How a region reassigns a place that a team does not use is part of the qualification process (https://junior.robocup.org/qualification/).

1.2.5. Team Supervision

Junior Mentor: A Junior Mentor is a supervisor who guides the team and meets the Age Requirements. Junior Mentors are not team members. They must not design, build, or program the robot(s) for the team (see Mentoring and Onsite Assistance).

Junior Mentor Requirement: Every Junior team must have at least one Junior Mentor who is registered with the team, attends the competition with the team, and can be reached by the team and the event organizers throughout the competition.

Junior Mentors and Parent/Chaperones are responsible for supervising their team and have a duty of care for their team members' well-being, as required by their home region's rules. Any concern about a team member's well-being should be reported to the event organizers immediately.

Unless the event organizers decide otherwise, Junior Mentors and Parent/Chaperones may not enter the competition areas during rounds and interviews. They must not pressure or intimidate teams, judges, or the judging process, and must not interfere with robots. Event organizers will handle inappropriate behavior, which may lead to disciplinary action.

1.3. Robot Requirements

1.3.1. Robot Communication

Permitted Communication: During competition rounds, robots may communicate with each other only on the 2.4 GHz band. Their transmission power must never exceed 100 mW EIRP (Effective Isotropic Radiated Power).

Responsibility: Teams are responsible for their robots' communication. Their wireless equipment, and how they use it, must follow the laws of the host country. Spectrum availability is not guaranteed.

Component Communication: Parts of the same robot may communicate with each other.

League Adaptability: Each league may change these communication rules to fit its needs.

1.3.2. Safety and Power Requirements

Electrical Power:

- Robots must not be powered from a wall socket (mains electricity).
- Maximum voltage: 48 V DC or 25 V AC RMS (Root Mean Square).
- Voltage must be easy to measure during inspections. Measuring points must be covered or designed to be safe.

Battery Safety:

- Lithium batteries must be stored in safety bags, and charging must be supervised by team members in competition areas.
- Teams must follow the safety procedures, including how to handle a battery fire and how to evacuate.

Robot Safety Design:

- **Power Management**: Batteries must be firmly mounted and wiring must be safe. Every robot must

have an easy-to-reach way to cut its power immediately in an emergency.

- **Mechanical Safety**: Robots must not have sharp edges, places where fingers can get caught, or other hazards. Actuators must suit the robot's size and purpose.
- **Hazardous Behavior**: If a robot could behave dangerously, the team must tell the event organizers at least two weeks before the competition. If the team discovers such a behavior later, it must tell the organizers immediately and must not use that behavior in competition until the organizers approve it.

1.4. Documentation and Sharing Requirements

1.4.1. RoboCupJunior Team Posters

Purpose: Posters help teams share their robot designs and ideas with judges, other teams, and the public. Posters are displayed in the venue's public competition areas, and RoboCupJunior shares digital copies or photos after the competition.

Size: Posters must be no larger than A1 (59.4 x 84.1 cm).

Content: Posters should summarize the team's design documents and present the robot's capabilities attractively.

1.4.2. Technical Description Video (See League Documentation)

Content:

- **Robot Demonstration**: Show the fully working robot systems and highlight their technical features.
- **Design Process**: Explain the team's design choices and how the team solved problems.
- **Presentation**: The video should be clear and of good quality, and should explain any innovative or unusual techniques.
- **Innovation & Sustainability**: Show new technologies and sustainable practices.

Submission: Each league's guidelines will specify the video length and the deadlines.

1.4.3. Bill of Materials (BOM)

Submission: Teams must submit a Bill of Materials (BOM) that lists the main components and materials of their robot(s).

Details: For each component, the BOM must include:

- Name or description (for example, the part number).
- Supplier or source (including PCBs and machined parts).
- Whether it is new or reused.
- Whether it comes from a kit or is custom-built.

- Price.

Template: For the International competition, a standard BOM template will be provided with the league documentation submissions.

1.4.4. Sharing Team Resources

Sharing: Materials that teams submit as part of their documentation will be shared in the leagues' GitHub repositories: https://github.com/robocup-junior

Credit: Teams must give credit to the creators of any outside work they use and follow its license. The focus should stay on the team's own learning.

1.4.5. Plagiarism Guidelines

External Code Use: Teams may use code written by others, but must give credit to the original authors.

Learning Priority: Teams should focus on learning and should not use complete solutions made by others. Always check the license.

1.4.6. Acceptable Uses of AI

Teams must disclose any generative AI tools they used to create content in their code or documentation (for example, text, figures, or images). Teams must name each AI system they used and briefly explain how they used it. Using AI for editing, grammar correction, or translation into English is common practice and does not need to be disclosed.

1.5. Spirit and Behavior

1.5.1. Behavior

All participants are expected to be respectful and polite to everyone, including other participants, volunteers, referees, the organizers of all Junior and Major Leagues, and the host venue.

1.5.2. Code of Conduct

All organizers, volunteers, team members, mentors, supporters, and visitors must follow the RoboCup Code of Ethics and Conduct (https://robocup.org/conduct). Anything that breaks the Code must be reported in the way the Code describes. The Code gives the formal reporting address (conduct@robocup.org) and explains what to do at the competition, including in an emergency.

1.5.3. Mentoring and Onsite Assistance

Help from other teams, mentors, teachers, parents, sponsors, and online communities is an important part of how teams learn and grow.

For fair competition and the best learning, this help must never do the team's competition work for

them. A good test: the team can explain not only what each part of their robot does, but also how it works.

1.5.4. Teams Onsite

- During the competition, only official team members may represent the team at registration, during setup, and in the competition areas during rounds and interviews.
- At least 2 team members must be present at the competition. If fewer can attend, the team must contact the event organizers as early as possible. The organizers decide whether and how the team may compete. Unless the organizers decide otherwise, a team that competes with fewer than 2 members present is not eligible for awards or for SuperTeam participation.
- Teams are responsible for making sure their members are at the right place at the right time for every scheduled activity.
- During the competition, teams must not receive remote help with their robot, code, or strategy from anyone outside the team, for example, by phone or remote desktop. Help on site is covered by Mentoring and Onsite Assistance.
- Teams that break these rules may face disciplinary action.
- If teams have problems on site, they are encouraged to ask other teams or the organizers for help.

1.5.5. Violations

The event organizers may disqualify teams, team members, Junior Mentors, or Parent/Chaperones from the competition and ask them to leave the venue. This can happen for repeated or serious unacceptable behavior, or for repeated or serious violations of the General Rules or League Rules.

2. Code of Conduct

2.1. Spirit

1. It is expected that all participants (students and mentors alike) respect the aims and ideals of RoboCupJunior as set out in our mission statement.
2. The volunteers, referees, and officials will act within the event's spirit to ensure the competition is competitive, fair, and, most importantly, fun.
3. **It is not whether you win or lose but how much you learn that counts!**

2.2. Fair Play

1. Robots that cause deliberate or repeated damage to the field will be disqualified.
2. Humans who cause deliberate interference with robots or damage the field will be disqualified.
3. It is expected that all teams aim to participate fairly.

2.3. Behavior

1. Each team is responsible for verifying the latest version of the rules on the RoboCupJunior Official website and additional clarifications/corrections on the official forum made by the RoboCupJunior Rescue Committee before the competition.
2. Participants should be mindful of other people and their robots when moving around the tournament venue.
3. Participants are not allowed to enter setup areas of other leagues or teams unless explicitly invited to do so by team members.
4. Teams will be responsible for checking updated information (schedules, meetings, announcements, etc.) during the event. The RoboCupJunior Rescue Committee will provide updated information on notice boards in the venue, the local competition website, or the RoboCupJunior website if possible.
5. Participants and their companions who misbehave may be asked to leave the venue and risk being disqualified from the tournament.
6. Referees, officials, tournament organizers, and local law enforcement authorities will enforce these rules equally to all participants.
7. Teams are expected to be at the venue early on the setup day as important activities will occur. These activities include but are not limited to registration, participation raffle, interviews, captains, and mentor's meetings, among others.

2.4. Mentors

1. Non-team members (mentors, teachers, parents and other family, chaperones, translators, and other adult team members) are not allowed in the student work area.
2. Mentors are not permitted to be involved in building, repairing, or programming their team's robots before and during the competition.
3. In the first instance, mentor interference with robots or referee decisions will result in a warning. If this behavior recurs, the team could face a possible elimination from the tournament.
4. Robots have to be the work of the students. Any robot that appears identical to another robot may be prompted for re-inspection.

2.5. Ethics and Integrity

1. Fraud and misconduct are not condoned. Fraudulent acts may include the following:
    a. Mentors working on the software or hardware of student's robot(s) during the competition.
    b. More experienced/advanced groups of students may provide advice but should not do the work for other groups. Otherwise, the team risks being disqualified.
2. RoboCupJunior reserves the right to revoke an award if fraudulent behavior is proven after the award ceremony occurs.
3. Suppose it is evident that a mentor intentionally violates the code of conduct and modifies and

works on the student's robot(s) during the competition. In that case, the mentor will be banned from future participation in RoboCupJunior competitions.

4. Teams that violate the code of conduct can be disqualified from the tournament. Disqualifying a single team member from further participation in the tournament is also possible.
5. Referees, officials, tournament organizers, and local law enforcement authorities will give a team a warning in less severe cases of violations of the code of conduct. A team can be disqualified immediately without warning for severe or repeated violations of the code of conduct.

2.6. Sharing

1. The spirit of world RoboCup competitions is that teams should share technological and curricular developments with other participants after the tournament. Sharing furthers the mission of RoboCupJunior as an educational initiative.
2. The RoboCupJunior Rescue Committee may publish developments on the RoboCupJunior website after the event.
3. Participants are strongly encouraged to ask questions to their fellow competitors to foster a culture of curiosity and exploration in the fields of science and technology.

3. Field

3.1. Description

1. The field comprises modular tiles, which the organizers can use to make an endless number of courses for the robots to traverse.
2. The field will consist of 30 cm x 30 cm tiles with different patterns. The organizers will not reveal the final selection of tiles and their arrangement until the day of the competition. Competition tiles may be mounted on a hard-backing material of any thickness.
3. There will be a minimum of 8 tiles in a competition field, excluding the start and goal tiles.
4. There are different tile designs (teams can find examples under Section 3.3, "Line").

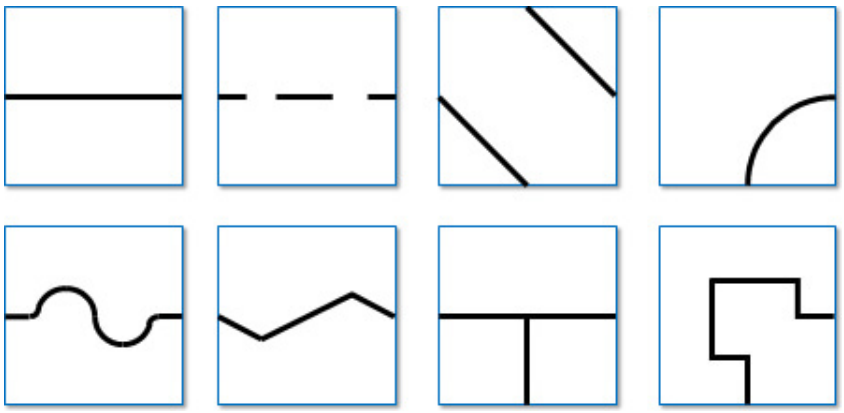
3.2. Floor

1. The floor is white. The floor may be either smooth or textured (like linoleum or carpet) and may have steps of up to 3 mm in height between tiles. Due to the nature of the tiles, there may be steps or gaps in the construction of the field.
2. Competitors should be aware that tiles may be mounted on thick backing or raised off the ground, making it difficult to get back on a tile where the robot comes off the course. No provision will be made to assist robots that drive off a tile to get back onto the tile.
3. Robots must be designed to navigate under tiles that form bridges over other tiles. Tiles placed above other tiles will be supported by pillars at tile corners with a square cross-section of a maximum of 25 mm x 25 mm, making each tile entrance/exit at least 25 cm. The minimum height (space between the

floor and the ceiling) will be 25 cm.

3.3. Line

1. The black line, 1-2 cm wide, may be made with standard electrical insulating tape or printed onto paper or other materials. The black line forms a path on the floor. (The grid lines indicated in the drawings below are for reference only, and competitors can expect tiles to be added or omitted.)
2. Straight sections of the black line may have gaps with at least 5 cm of the straight line before each gap as measured from the shortest portion of the straight part of the line. The length of a gap will be no more than 20 cm.
3. The arrangement of the tiles and paths may vary between rounds.
4. The line will be at least 10 cm away from any edge of the field **(including on elevated sections)**, walls, pillars to support ramps, seesaws, and obstacles that do not lie ahead of the robot's path.
5. The line will end with a goal tile with a 25mm x 300mm strip of red tape in the center of the tile, perpendicular to the incoming line.



3.4. Checkpoints

1. A checkpoint is a tile in which a robot will be manually placed back when a lack of progress occurs.
2. Checkpoints will not be located on tiles with scoring elements.
3. The start tile is a checkpoint where the robot can restart.
4. A checkpoint marker is a marker that indicates to humans which tiles are checkpoints. A disk with 5 mm to 12 mm thickness and up to 70 mm in diameter has been used frequently. Still, it can be different depending on the organizer.
5. The field designers will predetermine the number of **checkpoints** [6] and their locations.

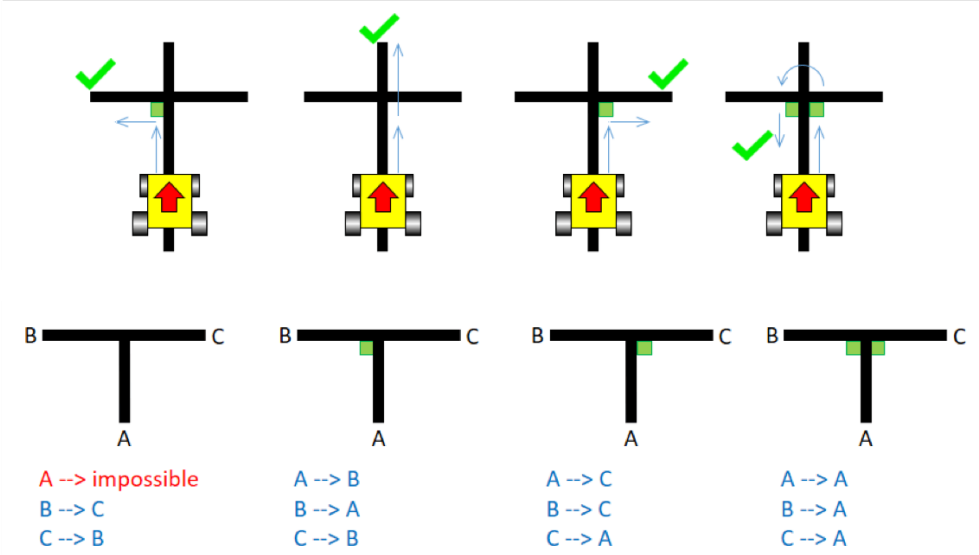
3.5. Speed Bumps, Debris, and Obstacles

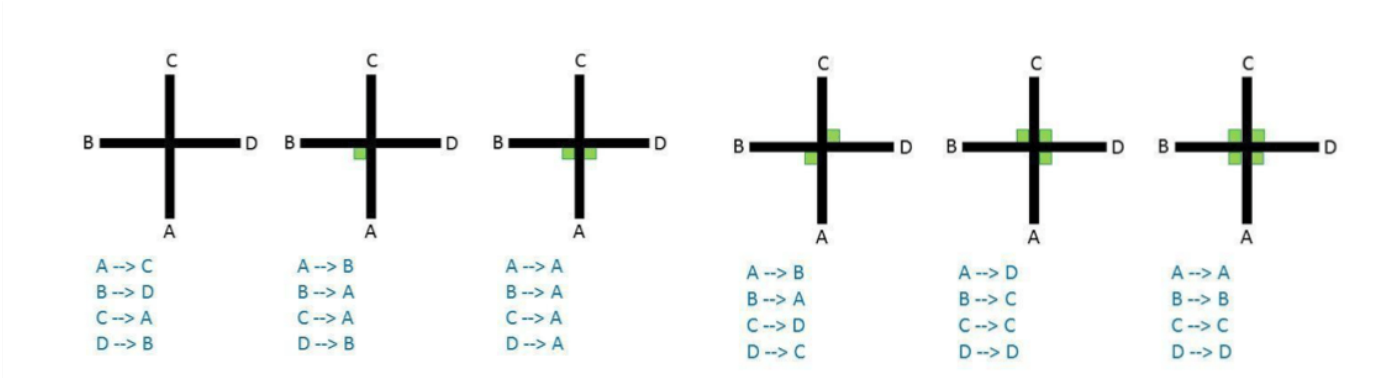
1. The maximum size of a speed bump can be the size of a tile (30cm x 30cm) and will have a height of 1 cm or less and be white. When the speed bump is placed over any black line, the overlap between the speed bump and the black line will be colored black. The organizers will fix speed bumps on the floor.

2. Speed bumps may also be placed anywhere in the evacuation zone. Speed bumps in the evacuation zone are not scored.
3. Debris will have a maximum height of 3 mm. The organizers will not fix it to the floor. The debris consists of small materials such as toothpicks, small wooden dowels, etc.
4. Obstacles may include bricks, blocks, weights, and other large, heavy items. Obstacles will be at least 15 cm high and can be fixed to the floor.
5. An obstacle will not occupy more than one line or tile.
6. A robot is expected to navigate around obstacles. The robot may move obstacles, but obstacles may be very heavy or fixed to the floor. Obstacles will remain where they were moved to, even if that prevents the robot from proceeding.
7. Obstacles will not be placed closer than 25 cm to the edge of the field (including edges of tiles that are elevated by ramps) and inclined tiles.
8. [7]

3.6. Intersections and Dead Ends

1. The organizers can place intersections anywhere except in the evacuation zone.
2. Intersection markers are green and 25 mm x 25 mm in dimension. They indicate the direction of the path the robot should follow.
3. The robot should continue straight ahead if there is no green marker at an intersection.
4. A dead end is when there are two **green markers** [8] before an intersection (one on each side of the line); in this case, the robot should turn around.
5. The intersections are always perpendicular but may have 3 or 4 branches.
6. Intersection markers will be placed just before the intersection. See the images below for possible scenarios.



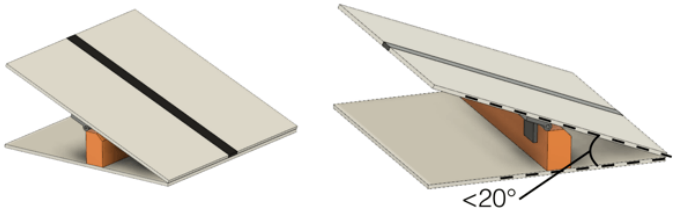


3.7. Ramps

1. Tiles will be used as ramps to allow the robots to 'climb' up and down from different levels.
2. Ramps will not exceed an incline of 25 degrees from the horizontal.
3. More than one tile may be used to build one ramp up or down.
4. The ramp points will be awarded for each individual ramp tile instead of the entire ramp.
5. The line along the ramps can contain gaps, speed bumps, intersections, obstacles, and debris.
6. The ramp must NOT have a drop-off immediately following a rise section, creating a peak-line structure or vice versa.

3.8. Seesaws

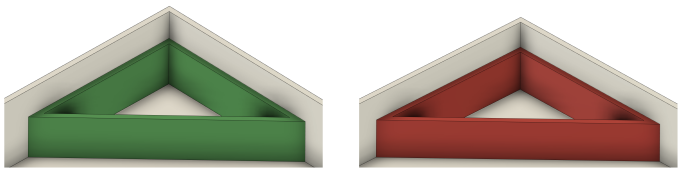
1. A seesaw is a tile that can pivot around a hinge in the center of a regular tile.
2. The seesaw will have an incline of less than 20 degrees when tilted to one side.
3. The seesaw tile will have a straight line with no scoring elements present.



3.9. Evacuation Zone

1. The black line will end at the entrance of the evacuation zone.
2. The black line will begin again at the exit of the evacuation zone.
3. The evacuation zone is 120 cm by 90 cm with walls around the four sides at least 10 cm high and of any color (except for red, green, and black). The posts joining the walls of the evacuation zone can be of any color (except for red, green, and black).
4. At the entrance to the evacuation zone, there is a 25 mm × 250 mm strip of reflective silver tape on the floor.

5. At the exit of the evacuation zone, there is a 25 mm × 250 mm strip of black tape on the floor.
6. The organizers may place an obstacle **anywhere inside the evacuation zone** [9] with a minimum of 10 cm clearance from the wall. Obstacles in the evacuation zone are not scored.
7. Safe evacuation points are defined by right-angled triangles with sides of 30 cm x 30 cm.
    a. There will be one red evacuation point where the dead victim must be placed by the robot and,
    b. There will be one green evacuation point where the living victims must be placed by the robot.
8. The evacuation points are red and green triangles with 6 cm walls and a hollow center.
9. The referee can place the evacuation points in any non-entry/exit corners in the evacuation zone.
10. After a Lack of Progress, the referee may place the evacuation points in new corners.
11. The organizers will fix the evacuation points to the floor. Still, teams should be prepared for slight movements in the evacuation points.



12. The organizers may place white LED lights, mounted **on the wall (light can point into the evacuation zone)** [10], on the upper part of the walls. They may not be placed in the corners where the triangles are located.

3.10. Victims

1. Organizers may locate victims anywhere on the floor of the evacuation zone.
2. A victim represents a person and is in the form of a 4-5 cm diameter sphere with an off-center center of mass and a maximum weight of 80 g.
3. There are two types of victims:
    a. Dead victims are black and not electrically conductive.
    b. Living victims are silver, reflect light, and are electrically conductive.
4. Organizers will locate the victims randomly in the evacuation zone. There will be precisely two live victims and one dead victim placed in the evacuation zone.
5. The organizers may place fake victims (objects or images) **in the evacuation zone. A fake victim may resemble a real victim but will not satisfy all the characteristics of a real victim defined above in Rule (3.10.2 and 3.10.3) (size, shape, color, reflectivity, or conductivity)** [11]. Robots should ignore them.

3.11. Environmental Conditions

1. The environmental conditions at a tournament may differ from those at home. Teams must come prepared to adjust their robots to the conditions at the venue.

2. Lighting and magnetic conditions may vary in the rescue field.
3. The field may be affected by magnetic fields (e.g., under-floor wiring and metallic objects). Teams should prepare their robots to handle such interference.
4. The field may be affected by unexpected lighting interference (e.g., camera flash from spectators). Teams should prepare their robots to handle such interference.
5. All measurements in the rules have a tolerance of ±10%.

4. Robots

4.1. Control

1. Robots must be controlled autonomously. Using a remote control, manual control, or passing information (by external sensors, cables, wirelessly, etc.) to the robot is not allowed.
2. Robots must be started manually by the team captain.
3. Any pre-mapped type of dead reckoning (movements preprogrammed based on known locations or placement of features in the field) is prohibited.
4. A robot must not damage any part of the field in any way.

4.2. Construction

1. Any robot kit or building blocks, either available on the market or built from raw hardware, may be used as long as the design and construction of the robot are primarily and substantially the students' original work.
2. Robots like drones or hovercrafts are prohibited in the challenge due to safety reasons.
3. Teams are not permitted to use commercially produced robot kits or sensor components specifically designed or marketed to complete any single primary task of RoboCupJunior Rescue. Robots that do not comply will face immediate disqualification from the tournament. If there is any doubt, teams should consult the RoboCupJunior Rescue Committee before the competition.
4. Only lasers from classes 1 and 2 are allowed for the safety of participants and spectators. The organizers will check this during the inspection. Teams using lasers must have the datasheet of the laser and submit them before the competition and be able to show them during the competition.
5. Robots may incur damage by falling off the field, making contact with another robot, or contacting field elements. The RoboCupJunior Rescue Committee cannot anticipate all potential situations where damage to the robot may occur. Teams should ensure that all active elements on a robot are adequately protected with resistant materials. For example, teams must protect electrical circuits from all human contact and direct contact with other robots and field elements.
6. When batteries are transported, moved, or charged, it is strongly recommended that safety bags be used. Reasonable efforts should be made to ensure that robots avoid short circuits and chemical or air leaks.
7. **Robots must be equipped with a handle that is to be used to pick them up during the scoring**

run.

8. **Robots must be equipped with a single physical binary switch/button (with exception of buttons that are a part of commercial controller), clearly visible to the referee, for starting the robot at the beginning of the run and when a lack of progress occurs. The procedure performed after a LoP occurs can only include this button and at most one more switch for cutting the power. Teams have to notify the referee about their LoP procedure before each scoring run, and only this procedure is allowed to be performed after a LoP.**

4.3. Team

1. Each team must have only one robot in the field.
2. Each team must comply with the RoboCupJunior General Rules regarding the number of members and each member's age.
3. Each team member must explain their work and have a specific technical role.
4. A student can be registered on only one team across all RoboCupJunior leagues/sub-leagues.
5. A team can only participate in one league/sub-league across all RoboCupJunior leagues/sub-leagues.
6. Mentors/parents are not allowed to be with the students during the competition. The students will have to govern themselves (without a mentor's supervision or assistance) during the long stretch of hours at the competition.
7. Team members may compete in Rescue Line twice (2 international events). After competing in Rescue Line twice, they must move to another RoboCupJunior sub-league.

4.4. Inspection

1. A panel of referees will scrutinize the robots before the start of the tournament and at other times during the competition to ensure that they meet the constraints described in these rules.
2. Using a robot similar to another team's robot from a previous year or the current year is illegal.
3. The team's responsibility is to have their robot re-inspected if modified at any time during the tournament.
4. Students will be asked to explain their robot's operation to verify that its construction and programming are their own work.
5. Students will be asked about their preparation efforts. The RoboCupJunior Rescue Committee may request them to answer surveys and participate in **recorded** [12] interviews for research purposes.
6. All teams must complete a web form before the competition to allow referees to prepare better for the interviews. The RoboCupJunior Rescue Committee will provide instructions on submitting the form to the teams at least 4 weeks before the competition.
7. All teams have to submit their source code before the competition. The organizers will not share the source code with other teams without the team's permission. The organizers will request permission at the registration.

4.5. Violations

1. Any violations of the inspection rules will prevent the offending robot from competing until modifications are made, and the robot passes inspection.
2. Teams must make modifications within the schedule of the tournament, and teams cannot delay tournament play while making modifications.
3. Suppose a robot fails to meet all specifications (even with modifications). In that case, it will be disqualified from that game (but not from the tournament).
4. No mentor assistance is allowed during the competition. (See Section 2, “Code of Conduct”)
5. Any rule violations may be penalized by disqualification from the tournament or the game or result in a loss of points at the discretion of the referees, officials, or RoboCupJunior Rescue Committee.

5. Play

5.1. Pre-game Practice

1. When possible, teams will have access to practice fields for calibration and testing throughout the competition.
2. Whenever there are dedicated independent fields for competition and practice, it is at the organizers' discretion if testing is allowed on the competition fields.

5.2. Humans

1. Teams should designate one of their members as 'captain' and another as 'co-captain'. Only these two team members will be allowed access to the competition fields unless directed by a referee. Only the captain can interact with the robot during a scoring run.
2. The captain can move the robot only when they are told to do so by a referee.
3. Other team members (and any spectators) within the vicinity of the competition field must stand at least 150 cm away from the field unless directed by a referee.
4. No one is allowed to touch the fields intentionally during a scoring run.
5. All pre-mapping activities will immediately disqualify the robot for the round. Pre-mapping is the act of humans providing the robot with information about the field (e.g., location of obstacles, entrance to the evacuation zone, number of tiles after the evacuation zone, etc.) before the game.

5.3. Start of Game

1. Each team has a maximum of 8 minutes for a game. The game includes the time for calibration and the scoring run.
2. Calibration is taking sensor readings and modifying the robot’s programming to accommodate such sensor readings. Calibration does not count as pre-mapping.

3. The scoring run is defined as the time when the robot is moving autonomously to navigate the field, and the referee will record the scores.
4. A game begins at the scheduled starting time, whether or not the team is present or ready. Start times will be posted around the venue.
5. Once the game has begun, the robot is not permitted to leave the competition area.
6. Teams may calibrate their robot in as many locations as desired on the field, but the clock will continue to run. Robots are not permitted to move on their own while calibrating.
7. Once a team is ready to start a scoring run, the team must notify the referee. To start a scoring run, the robot is placed on the start tile of the course, as indicated by the referee. Once a scoring run has begun, no more calibration is permitted, including changing code/code selection.
8. Teams may choose not to calibrate the robot and immediately start the scoring run instead.
9. Individual tiles, obstacles, and other scoring elements may be removed, added, or changed when the robot starts moving to prevent teams from pre-mapping the layout of the fields. These changes may happen based on a die rolled by the referee or with another method of randomization announced by the organizers. For a particular field during a round, the referee will ensure **that the difficulty of the field is kept** [13] similar, and the maximum points are constant.

5.4. Scoring Run

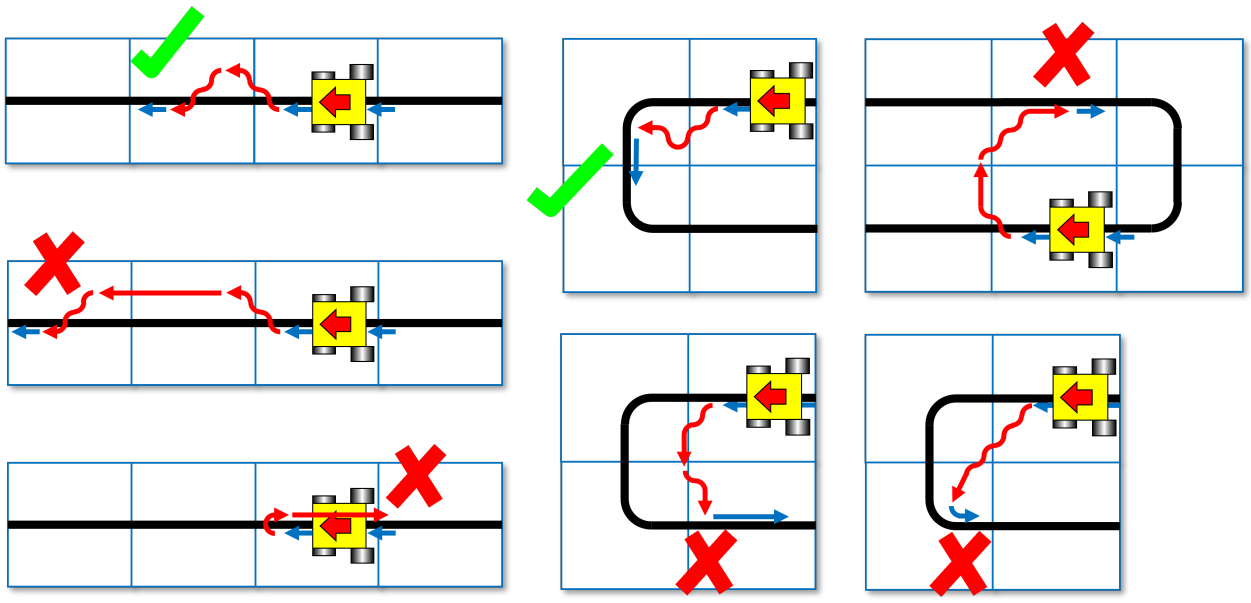
1. Robots will start behind the joint of the start tile and the subsequent tile along the course. The referee will check the correct placement.
2. Modifying the robot during a scoring run is prohibited, which includes remounting parts that have fallen off.
3. Any parts the robot loses intentionally or unintentionally will be left in the field until the run is over. Team members and referees cannot move or remove elements from the field during a scoring run.
4. Teams cannot give their robot any information about the field. A robot is supposed to recognize the field elements by itself.
5. The robot must follow the course completely to enter the evacuation zone and then **exit** [14] the evacuation zone towards the goal tile.
6. The robot has reached a tile when more than half the robot is within that tile when viewed from above and the robot is actively following the line at that point in time.

5.5. Lack of Progress

1. A lack of progress occurs when:
    a. a team captain declares a lack of progress.
    b. a robot loses the black line without regaining it by the next tile in the sequence (see figures at the end of the section).
    c. a robot reaches a line that is not in the intended sequence.
2. If a lack of progress occurs, the robot must be positioned on the previous checkpoint tile facing the

path towards the goal tile and checked by the referee.

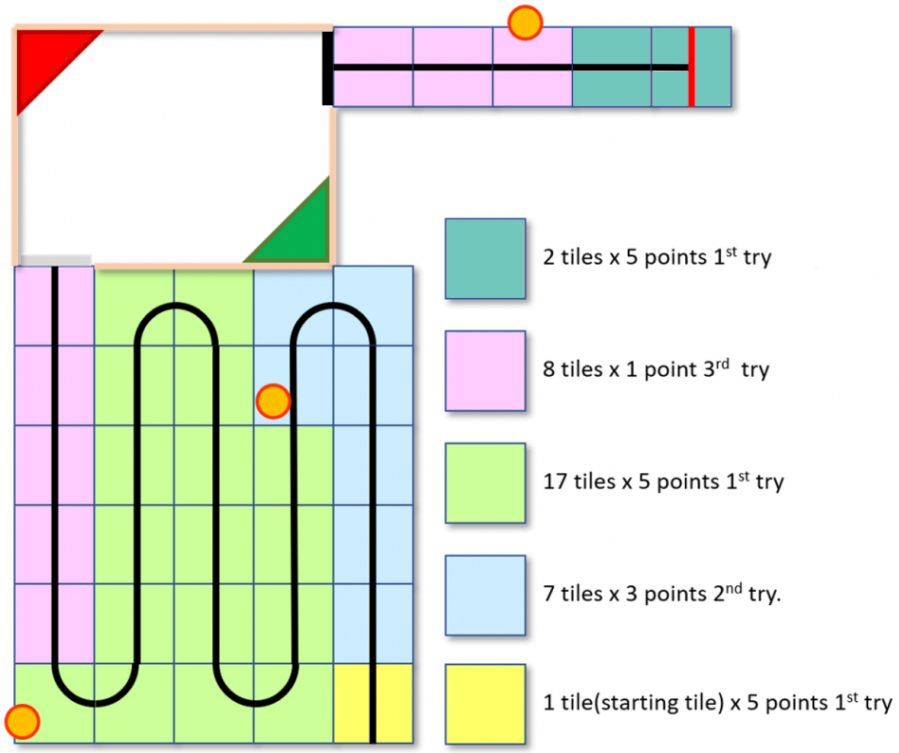
3. After a lack of progress, only the LoP procedure explained to the referee before the run start is allowed to be performed (see Section 4.2, “Construction”).
4. There is no limit to the lack of progress within a **game** [15].
5. After three failed attempts to reach a checkpoint, a robot is allowed to proceed to the next checkpoint.
   a. [16]
6. Suppose a lack of progress occurs in the evacuation zone. In that case, all victims (including ones that have rolled) will remain in their current position. Victims that are held by the robot will be placed roughly on the robot’s location when a lack of progress occurs in the evacuation zone. Suppose a lack of progress occurs as the robot exits the evacuation zone while carrying victims. In that case, the victims will be randomly placed in the evacuation zone.
7. Any seesaws ahead of the robot’s path can be moved in a favorable direction when a lack of progress is called.

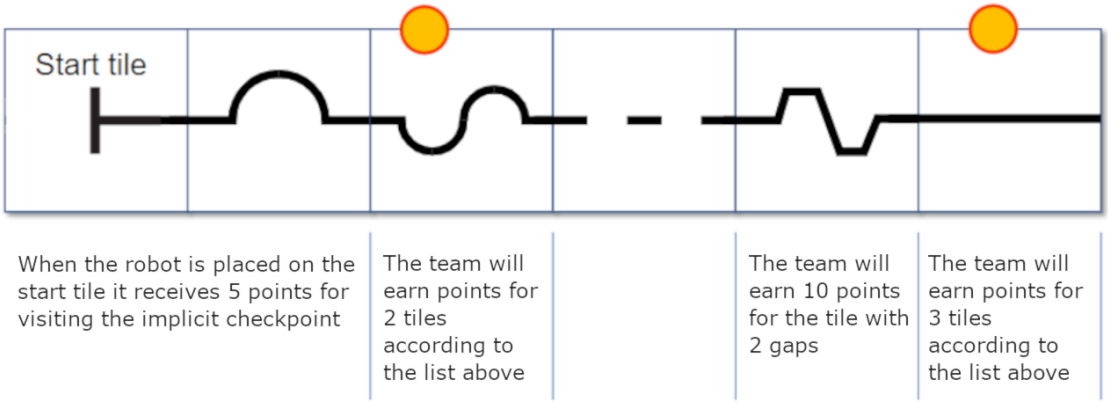


5.6. Scoring

1. A robot is awarded points for successfully navigating each tile with hazards (gaps in the line, speed bumps, intersections, dead ends, ramps, obstacles, and seesaws). Points are awarded per hazard when the robot has reached the next tile in sequence. Point allocations are 10 points per tile with one or more gaps, 10 points per tile with one or more speed bumps, 10 points per intersection/dead end, 10 points per **ramp tile,** [17] 20 points per obstacle, and 20 points per seesaw.
2. Failed attempts at navigating hazards in the field are defined as a Lack of Progress (see Section 5.5, “Lack of Progress”).
3. When a robot reaches a checkpoint tile or stops on the goal tile, it will earn points for each tile it has passed since the previous checkpoint. The points per tile depend on how many attempts the robot has made:

- 1st attempt = 5 points/tile
- 2nd attempt = 3 points/tile
- 3rd attempt = 1 point/tile
- Beyond the 3rd attempt = 0 points/tile





4. Each gap, speed bump, intersection, dead end, ramp, obstacle, and seesaw can only be scored once per intended direction through the course. Points are not awarded for subsequent attempts through the course.
5. The referees will not count any hazards in the evacuation zone towards additional points.
6. Successful victim rescue (SVR): Robots are awarded multipliers for successfully rescuing victims. A successful victim rescue occurs when the victim is entirely moved into the designated evacuation point, and no part of the robot can be in contact with the victim. When the referee determines there has been a successful victim rescue, the referee will remove the victim from the evacuation point to allow more victims to be evacuated. The multipliers are allocated as follows:

- (SLVR) = × 1.4 per successful rescue of a living victim.
- (SDVR) = × 1.4 per successful rescue of the **dead victim. A dead victim placed in the red evacuation point before both living victims have been successfully evacuated is not a successful rescue and earns no multiplier.** [18]

7. Only the victims placed by the robot at the appropriate evacuation point will be awarded multipliers.
8. When a lack of progress occurs between checkpoints (or a checkpoint and the goal) containing an evacuation zone, each of the (SVR) obtained multipliers will be deducted:
   a. (EZLP) = **0.05** [19] x (number of lacks of progress in the area containing an evacuation zone)
   b. **Multipliers earned for successful victim rescues will never be lower than 1.25.**
9. [20]
10. The evacuation zone multiplier is, thus, combined as:

```
(EVACUATION ZONE MULTIPLIER) =
   MAX(1.25, (SLVR)-(EZLP))_1 [21]  | Successful rescue of the first living victim
 x MAX(1.25, (SLVR)-(EZLP))_2 [22]   | Successful rescue of the second living victim
 x MAX(1.25, (SDVR)-(EZLP)) [23]    | Successful rescue of the dead victim
```

Note: The calculation was updated to reflect the wording and reality better.

11. **A robot is awarded 30 points for successfully exiting the evacuation zone. The points are awarded when more than half of the robot has crossed the black exit strip when viewed from above and the robot is actively following the line.**
12. An exit bonus is awarded when the robot has reached the goal tile and has completely stopped for **5 seconds** [24] (this time is included in the total 8 minutes). The exit bonus is a **minimum of 10 points and is calculated as:** [25]

```
(EXIT BONUS) = MAX(10, 60 - 5 x (number of total lack of progress)) [26]
```

13. The multipliers from successful evacuations are multiplied by the score obtained from the line tracing course.

```
(FIELD SCORE) = (LINE TRACING SCORE + EXIT BONUS) x (EVACUATION ZONE MULTIPLIER)
```

5.7. End of Game

1. A team may elect to stop the game early at any time. In this case, the team captain must indicate the team's desire to terminate the game to the referee. The team will be awarded all points earned up to the call for the end of the game. The referee will stop the time at the end of the game, which will be recorded as the game time.
2. The game ends when:

a. the 8 minutes of allowed game time expires

b. the team captain calls the end of the game

c. the robot reaches the goal tile and completely stops for 5 seconds

6. Competition

This chapter outlines the structure of an international RoboCupJunior Rescue competition. The competition format and the inclusion of elements like rubrics based scoring, Technical Challenges and the SuperTeam Challenge may vary in local, regional and super-regional competitions. Please refer to the respective organizer for details.

6.1. Rounds & Scoring

1. The competition will consist of multiple rounds of which the worst one or more will be omitted from the final score. The worst round is defined by the lowest normalized field score of the team.
2. The field score for every round will be normalized with the score of the best team of that round:

```
(NORMALIZED FIELD SCORE) = (FIELD SCORE) / (BEST FIELD SCORE)
```

3. The normalized field scores will be used to calculate the mean. The worst round(s) will not be considered here:

```
(MEAN OF NORMALIZED FIELD SCORES) = (SUM OF NORMALIZED FIELD SCORES EXCLUDING OMITTED
ROUNDS) / (NUMBER OF ROUNDS - NUMBER OF OMITTED ROUNDS)
```

4. The normalized rubrics score is made up of a sum of normalized scores for the individual rubrics as follows:

```
(NORMALIZED RUBRICS SCORE) =
   0.6 x (TDP SCORE) / (BEST TDP SCORE)
 + 0.2 x (VIDEO SCORE) / (BEST VIDEO SCORE)
 + 0.2 x (POSTER SCORE) / (BEST POSTER SCORE)
```

5. The Rubrics for TDP, Video and Poster will be available on the RoboCupJunior website and the RCJ Rescue Community website.
6. The score from the Technical Challenge will be normalized with the score of the best team:

```
(NORMALIZED TECHNICAL CHALLENGE SCORE) = (TECHNICAL CHALLENGE SCORE) / (BEST TECHNICAL
CHALLENGE SCORE)
```

7. The final score is made up of a weighted sum of normalized scores from the field score, the rubrics

and the Technical Challenge as such:

```
(TOTAL SCORE) =
   0.6 x (MEAN OF NORMALIZED FIELD SCORES)
 + 0.2 x (NORMALIZED RUBRICS SCORE)
 + 0.2 x (NORMALIZED TECHNICAL CHALLENGE SCORE)
```

8. Ties in scoring will be resolved based on the mean of normalized field scores.

6.2. Technical Challenge

The Technical Challenge is an additional part of the competition where each team's ability to quickly modify the behavior of their robot will be tested. It consists of one or more mini-tasks with only a limited timespan to solve.

1. The Technical Challenge will take place after the scoring runs have ended.
2. The rules of the individual parts of the Technical Challenge will not be announced before the competition. The teams will only have limited time to prepare for the Challenge.
3. The timeframe for the completion of these tasks will be announced alongside the rules and scoring at a team meeting after the scoring runs.
4. The rules will require the teams to reprogram their robot to change its behavior. There will be no hardware changes required compared to the main scoring runs.
5. The time given will correspond to the difficulty level of the tasks.
6. Any external contact during the Technical Challenge is prohibited; non-team members are not allowed to take place on the competition area or to help the competitors remotely.

6.3. SuperTeam Challenge

The SuperTeam Challenge takes place independently of the main competition and won't influence the team's individual score. It has its own award and is focused on the cooperation between the teams.

1. Each SuperTeam will consist of at least two teams. Teams coming from regions that share a native language will not be part of the same SuperTeam.
2. The rules of the SuperTeam Challenge will be announced at the competition and require the teams of each SuperTeam to work together.
3. The SuperTeam Challenge will require substantial software changes and may require minor hardware adjustments.



It is highly recommended that teams bring some kind of communication hardware or think about a communication mechanism for this challenge.

7. Open Technical Evaluation

7.1. Description

1. The organizers will evaluate your technical innovation during a dedicated time frame. All teams need to prepare for an open display during this time frame.
2. Judges will circulate and interact with the teams. The Open Technical Evaluation is intended to be a casual conversation with a question-and-answer atmosphere.
3. The Open Technical Evaluation's main objective is to emphasize the innovation's ingenuity. Innovative may mean technical advances compared to existing knowledge or an out-of-the-ordinary, simple but clever solution to existing tasks.

7.2. Evaluation Aspects

1. A standardized rubric system will be used, focusing on:
    - creativity
    - cleverness
    - simplicity
    - functionality
2. Your 'work' can include (but is not limited to) one of the following aspects:
    - creation of your own sensor instead of a pre-built sensor
    - creation of a 'sensor module' which is comprised of various electronics resulting in a self-contained module to provide a specific functionality
    - creation of a mechanical invention that is functional but out of the ordinary
    - creation of a new software algorithm for a solution

7.3. Documents

1. Teams must provide documents that explain their work. Each invention must be supported by concise but clear documentation. The documents must show precise steps towards the creation of the invention.
2. The deadline for delivering the documents is scheduled for 3 weeks before the first day of the competition through an online form.
3. Documents must include one Technical Description Paper (TDP), one Poster and one Video. Teams should be prepared to explain their work.
4. All teams must submit their TDP before the competition. The TDP is a public document that will be shared with the community. The competition organizer will ask the team to fill out the web form or ask to submit a PDF file. All teams must strictly follow the guidance on the web form or, in the case of PDF submissions, strictly follow the template provided. If a team does not follow this guidance /

template (including but not limited to the different sections, fonts, sizes and lengths) the score for the document will be 0 and is not going to be evaluated. A template for the TDP and rubrics are available on the RoboCupJunior Rescue Community Website.

5. All teams must submit a Poster file before the competition and bring a physical Poster to the competition venue. The Poster is a public document that will be shared with the community during the Poster Presentation session at the competition venue. The poster should include but is not limited to: the name of the team, country, league, robot description, robot capabilities, controller, the programming language used, sensors included, method of construction, time used for development, cost of materials, and awards won by the team in its country, etc. A guide for the poster format and rubrics are available on the RoboCupJunior Rescue Community Website.
6. All teams must create and submit a Video before the competition. The Video should be short and showcasing the work of the team. These videos will be presented during the competition and should summarize the key aspects of the team's project, design process, and innovations. A guide for the video format and rubrics are available on the RoboCupJunior Rescue Community Website.

7.4. Sharing

1. Teams are encouraged to review others' posters, TDPs and presentations.
2. Teams awarded certificates must post their documents and presentation online when the RoboCupJunior Rescue Committee asks.

8. Conflict Resolution

8.1. Referee and Referee Assistant

1. All decisions during gameplay are made by the referee or the referee assistant, who are in charge of the field, persons, and objects surrounding them.
2. During gameplay, the decisions made by the referee or the referee assistant are final.
3. After gameplay, the referee will ask the captain to sign the score sheet. Captains will be given a maximum of 1 minute to review the score sheet and sign it. By signing the score sheet, the captain accepts the final score on behalf of the entire team. In case of further clarification, the team captain should write their comments on the score sheet and sign it.

8.2. Rule Clarification

1. If any rule clarification is needed, please contact the International RoboCupJunior Rescue Committee through the RoboCupJunior Forum.
2. If necessary, even during a tournament, a rule clarification may be made by members of the International RoboCupJunior Rescue Committee.

8.3. Special Circumstances

1. If particular circumstances, such as unforeseen problems or capabilities of a robot occurs, rules may be modified by the RoboCupJunior Rescue Committee Chair in conjunction with available committee members, even during a tournament.
2. Suppose team captains/mentors do not attend the team meetings to discuss problems, and the resulting rule modifications described at 8.3.1. In that case, the organizers will understand that they agreed and were aware of the changes.

[1] Changed from "in the entrance with" to "at the entrance by"

[2] Changed from "the exit with" to "at the exit by"

[3] Changed from "spheres with an off-center center of mass of 4 to 5 cm in diameter" to "spheres of 4 to 5 cm in diameter with an off-center center of mass"

[4] Changed from "reflective silver which is" to "reflective silver and"

[5] Changed from "black, which is not" to "black and not"

[6] Changed from "checkpoint markers" to "checkpoints"

[7] In previous version this said "In the evacuation zone, obstacles may be placed anywhere with a minimum of 10 cm clearance from the wall. Obstacles in the evacuation zone are not scored."

[8] Changed from "green marks" to "green markers"

[9] Changed from "inside the evacuation zone. In the evacuation zone, organizers may put the obstacle anywhere" to "anywhere inside the evacuation zone"

[10] Changed from "perpendicular to the wall" to "on the wall (light can point into the evacuation zone)"

[11] Changed from "that resemble real victims in the evacuation zone" to "in the evacuation zone. A fake victim may resemble a real victim but will not satisfy all the characteristics of a real victim defined above in Rule (3.10.2 and 3.10.3) (size, shape, color, reflectivity, or conductivity)"

[12] Changed from "videotaped" to "recorded"

[13] Changed from "the difficulty of the field will be kept" to "that the difficulty of the field is kept"

[14] Changed from "out of" to "exit"

[15] Changed from "round" to "game"

[16] In previous version this said "The team captain may make further attempts at the course to earn additional points from scoring elements that have not already been earned before reaching the next checkpoint."

[17] Changed from "ramp," to "ramp tile,"

[18] Changed from "dead victim if both living victims have already been successfully evacuated." to "dead victim. A dead victim placed in the red evacuation point before both living victims have been successfully evacuated is not a successful rescue and earns no multiplier."

[19] Changed from "-0.05" to "0.05"

[20] In previous version this said "Multipliers earned for successful victim rescues will never be lower than 1.25."

[21] Changed from "((SLVR)+(EZLP))_1" to "MAX(1.25, (SLVR)-(EZLP))_1"

[22] Changed from "((SLVR)+(EZLP))_2" to "MAX(1.25, (SLVR)-(EZLP))_2"

[23] Changed from "((SDVR)+(EZLP))" to "MAX(1.25, (SDVR)-(EZLP))"

[24] Changed from "more than 5 seconds" to "5 seconds"

[25] Changed from "non-negative number and is given by" to "minimum of 10 points and is calculated as:"

[26] Changed from "60 - 5 × (number of total lack of progress)" to "MAX(10, 60 - 5 × (number of total lack of progress))"