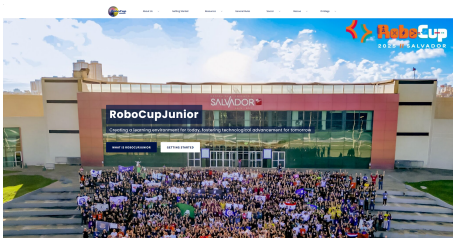
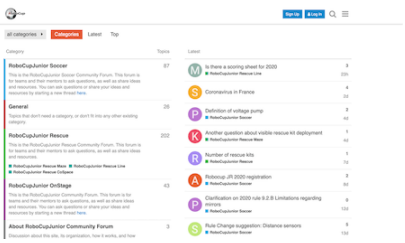
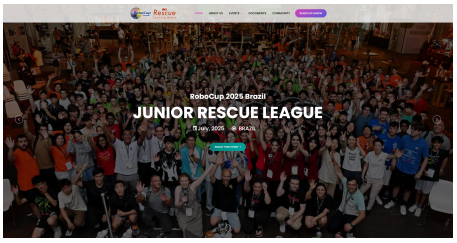
RoboCupJunior Rescue Simulation Rules 2027

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	
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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

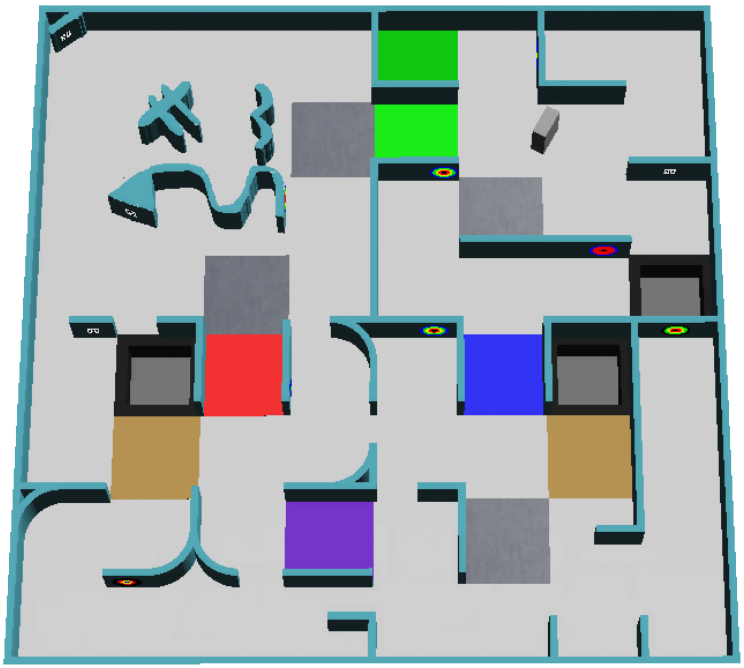
Please read through the RoboCupJunior General Rules before proceeding with these rules, as they are the premise for all rules. The English rules published by the RoboCupJunior Rescue Committee are the only official rules for RoboCupJunior Rescue Simulation 2027. The translated versions each regional 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.

The RoboCupJunior Rescue Simulation rules are developed and reviewed by the RoboCupJunior Rescue Committee. The simulation platform is developed and maintained by the Platform development team.

The "robot" refers to "virtual robot" in these rules.

Scenario

Rescue teams can use robots to navigate complicated, dangerous, or hard-to-access environments for search and rescue operations to minimize the risk to humans. In this challenge, the autonomous controller for a robot must be developed to search and identify wall tokens while recognizing the environment in a simulated hazardous rescue scenario. The robot must navigate through challenging terrains without getting stuck, search for wall tokens, and signal the locations of the wall tokens alongside the map of the maze environment to human search teams.



Summary

Since this challenge simulates a rescue environment, the robot's goal is to locate as many wall tokens as possible while simultaneously navigating and mapping the environment, including previously unknown areas. The field consists of up to four areas. Area 1 is always part of the field, while Areas 2 to 4 are optional and may be left out by the organizers. Areas 1 to 3 feature a tile-based, maze-like layout, whereas Area 4 is not tile-based. Teams are encouraged to explore interesting simultaneous localization and mapping (SLAM) algorithms. [1]

If the robot is stuck anywhere in the field, **a Lack of Progress (LoP) can be called and the robot is placed back** [2] at the last visited **checkpoint, or at** [3] the starting tile if the robot has not reached any checkpoint.

Changes from the 2026 RoboCupJunior Rescue Simulation Rules

- Changed "Since this simulates a rescue environment, the robot's goal should be to try its best to locate all wall tokens by navigating and mapping simultaneously, i.e., map out unknown areas. There are four areas. Areas 1 to 3 consist of a tile-based system maze-like layout. Area 4 (optional area) is not tile-based, and teams are encouraged to explore interesting simultaneous localization and mapping algorithms." to "Since this challenge simulates a rescue environment, the robot's goal is to locate as many wall tokens as possible while simultaneously navigating and mapping the environment, including previously unknown areas. The field consists of up to four areas. Area 1 is always part of the field, while Areas 2 to 4 are optional and may be left out by the organizers. Areas 1 to 3 feature a tile-based, maze-like layout, whereas Area 4 is not tile-based. Teams are encouraged to explore interesting simultaneous localization and mapping (SLAM) algorithms."
- Changed "it can be restarted" to "a Lack of Progress (LoP) can be called and the robot is placed back"
- Changed "checkpoint or" to "checkpoint, or at"
- Added "own simulation"
- Added "(the simulated courses)"
- Changed "Black holes" to "Holes"
- Changed "simulator's time will run faster" to "the battery will drain faster"
- Changed "time shown in the image below will run faster" to "battery bar will decrease faster"
- Deleted "The first time the robot enters a swamp, while it is inside, the simulation time will be consumed 5 times faster than the normal rate. Then, on each subsequent entry into the same swamp, this rate will increase by one point (x6, x7...) until it reaches the limit of x10."
- Added "A hole is a tile with an opening in the floor into which the robot can fall."
- Added "Contact Tiles"
- Added "Contact tiles are special tiles where the robot's battery can be replaced during the game. Contact tiles are represented by cyan-colored tiles. The robot must remain stationary on the tile while its battery is being replaced."
- Changed "letter" to "smiley"
- Changed "Letter victims" to "Smiley victims"
- Changed "Letter victims are uppercase letters printed on or attached to the wall. They are printed in black, using a sans serif typeface such as "Arial". The letters represent the health status of the victim." to "Smiley victims are represented by smiley-face emoji printed in black on or attached to the wall. The facial expression of the emoji represents the health status of the victim, of which there are three types:"
- Changed "Φ" to "sad face"
- Changed "Ψ" to "neutral face"
- Changed "Ω" to "happy face"

- Changed "letters" to "emoji"
- Added "They can be placed on any wall along the course, except walls in passages connecting areas."
- Changed "fake victim" to "fake wall token"
- Changed "Letter victims" to "Smiley victim"
- Changed "-PI and PI radians" to "0 and 2 PI radians"
- Changed "letter" to "smiley"
- Added "Battery"
- Added "The robot has a battery that will drain depending on the motor speed. The battery level will be displayed in the supervisor window, above the timers. Teams are expected to characterize its behavior through testing."
- Added "To prevent it from running out of power, the robot can be taken to a contact tile (see Contact Tiles) to have the battery replaced. To do this, the robot must remain stationary on the contact tile for 5 seconds of simulated time."
- Added "Passing through swamps accelerates battery drain, since the motors have to work harder to get through them."
- Changed "videotaped" to "recorded"
- Changed "No one is allowed to touch the simulation environments intentionally during a game." to "No one other than the referee is allowed to intentionally interact with the simulation environment during a game."
- Changed "No program changes or updates after each round’s deadline are allowed." to "No program changes or updates are allowed after the official deadline for each round, as announced by the organizers."
- Changed "control" to "supervisor"
- Changed ". The game management system makes this judgment" to ", as determined by the supervisor"
- Added "simulated"
- Changed "must return" to "is returned"
- Changed ". The robot is re-placed by the simulation engine and its" to "by the simulation engine, and its"
- Changed "game manager" to "supervisor"
- Changed "Letter victims" to "Smiley victims"
- Changed "Letter victims" to "Smiley victims"
- Changed "Letter victims" to "Smiley victims"
- Changed "The robot identifies a victim as a hazard or vice versa." to "The robot identifies a smiley victim as a cognitive target, or a cognitive target as a smiley victim."
- Changed "game manager" to "supervisor"
- Changed "between 1 and 2" to "between 1 and 2.2"

- Added "contact tiles as 'k';"
- Added "contact tile,"
- Changed "correctness + 1" to "correctness × 1.2 + 1"
- Added "The battery runs out."
- Changed "game manager" to "supervisor"

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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. Simulation platforms

1. We will be running games on a platform called Webots. For the setup guide, see the Platform wiki page.

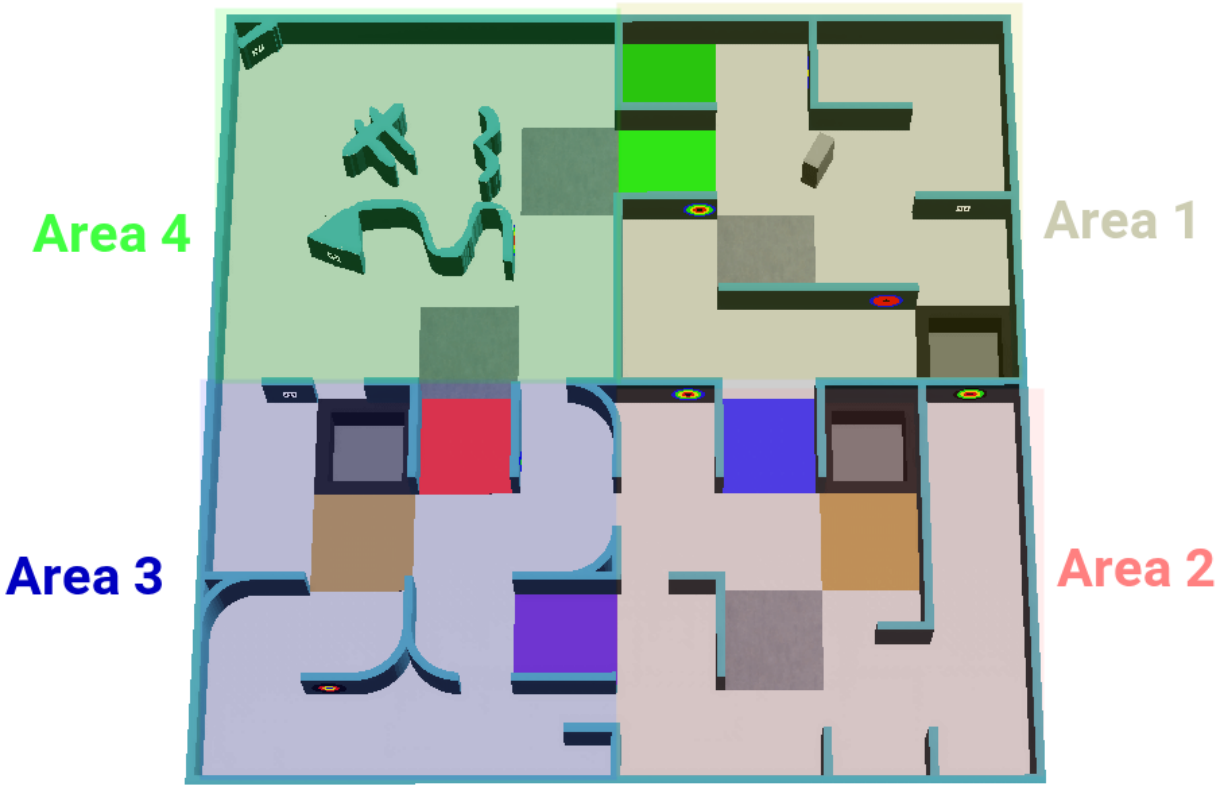
2. Teams are required to create programs to solve maze tasks.
3. The organizers will run the games on a server-client model and prepare one RJ-45 socket for teams to connect to the game server. **Teams must prepare a computer and an Ethernet cable to run the prepared programs.** Documentation is available on the Remote Controller page.
4. Teams are encouraged to develop their **own simulation** worlds **(the simulated courses)** and upload these to the forum to enable sharing.
5. The following OpenGL configurations will be used at the competition if there are no further announcements from the organizers.
    - Ambient Occlusion: Low
    - Texture Quality: Low
    - Max Texture Filtering: 4
    - Shadow: Disabled
    - Anti-aliasing: Disabled

3.2. Description

1. The field may be divided into four distinct areas with different types of walls for the robot to navigate around.
2. All areas are connected by a passage of one standard tile in width. A color will mark the floor of this passage.
3. The field layout will consist of a collection of tiles with a horizontal floor, a perimeter wall, and walls within the field.
4. Regions the robot cannot physically traverse, including openings that are smaller than the robot's width, will not contain wall tokens.
5. For area 4 the course may require diagonal movement. The robot's movement is not aligned to the cardinal directions (north, east, south, or west).

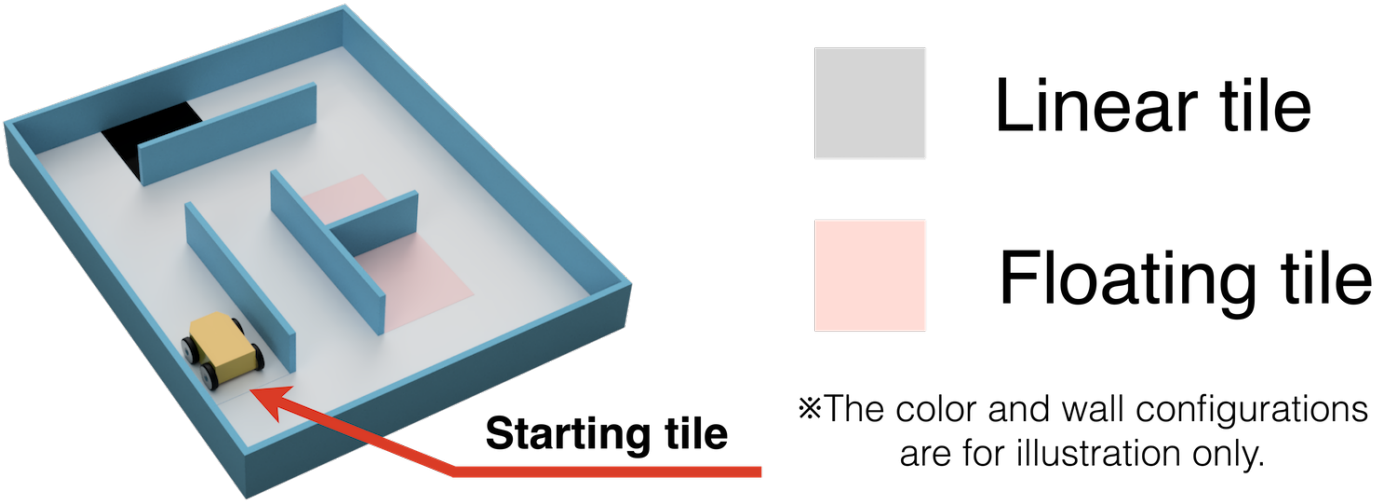
3.3. Tiles, Areas, and Walls

1. The field is divided into tiles of 12cm by 12cm in dimension. The tiles are not physical structures but rather a concept of how the field is generated. For areas 2 and 3, quarter-tiles are considered, where each tile is subdivided into four 6cm by 6cm squares.
2. The walls will have a thickness of 1cm and a height of 6cm.
    - Area 1: Walls can be placed on the edges of each tile.
    - Area 2: Walls can be placed on the edges of each quarter tile.
    - Area 3: Walls can be placed on the edges of each quarter tile. Organizers can round a 90-degree corner into a quarter circle.
    - Area 4: This area's layout is not based on a tile system, meaning walls and obstacles are not placed according to a grid system (i.e., arbitrarily).
        - There will be various objects, e.g., boxes, inside this area. Note that these objects will not vary by height (within the context of the robot).



3. Pathways for the robot must be at least the width of the robot itself and may open into foyers more expansive than the pathways.
4. Passages connecting areas (e.g. 1 → 2, 3 → 4) will be distinctively color-coded. Each passage consists of a single tile with standard tile width and must have two sides surrounded by a wall such that the tile has an unambiguous entrance and exit.
5. One of the tiles in Area 1 is the starting tile, where a robot should start the run.

6. Tiles from which the starting tile can be reached by consistently following the leftmost or rightmost wall are called 'linear tiles'. Tiles from which the starting tile cannot be reached this way are called 'floating tiles'. The concept of the quarter tile is not taken into account here.
7. **Holes** [4] will affect the determination of the tile type (linear or floating) since they can be considered virtual walls.



3.4. Division of Areas

The colors of the passages are as follows:

	Area 1	Area 2	Area 3	Area 4
Area 1		Blue	Yellow	Green
Area 2	Blue		Purple	Orange
Area 3	Yellow	Purple		Red
Area 4	Green	Orange	Red	

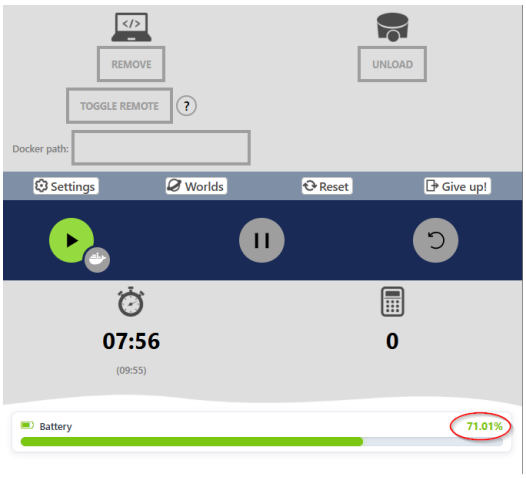
※The actual color tones will follow the platform implementation.

3.5. Checkpoints

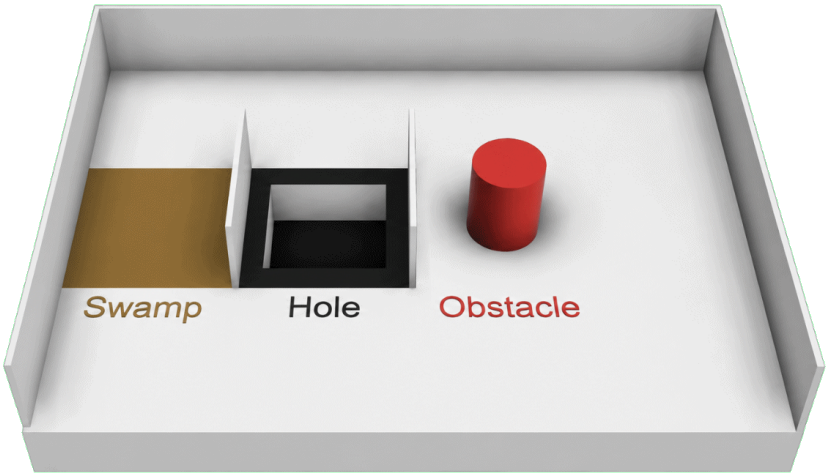
1. Silver tiles in the field represent checkpoints.
2. Silver tiles can be placed anywhere on the field.
3. Area 4 will contain checkpoints immediately after the passages to Area 4.

3.6. Swamps, Obstacles, and Holes

1. All these items can be placed anywhere in the field with the following restrictions.
2. Swamps:
    a. The color is brown.
    b. While the robot is on this tile, **the battery will drain faster** [5]. This means that the **battery bar will decrease faster** [6].

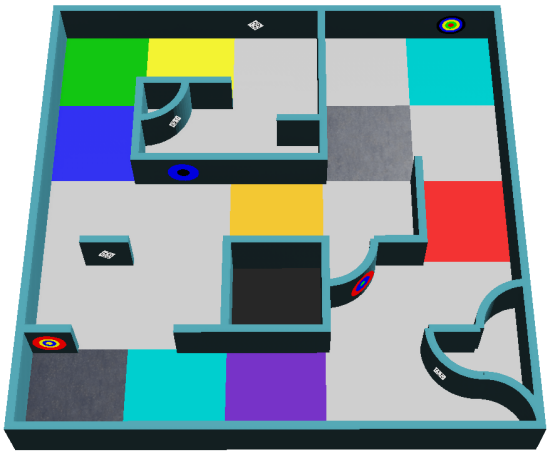


    c. [7]
3. Obstacles:
    a. May be fixed to the floor.
    b. May be any shape, including rectangular, pyramidal, spherical or cylindrical.
    c. The color of the obstacle is not specified.
    d. Obstacles affect the width of the pathway.
    e. The center of the obstacle will always be on a tile and not on the edge between them.
    f. There will be no more than one obstacle on a tile.
4. Holes:
    a. **A hole is a tile with an opening in the floor into which the robot can fall.**
    b. The edge of the holes is colored black and will be 1.5cm from neighboring tiles.
    c. The robot has to avoid the hole.



3.7. Contact Tiles

Contact tiles are special tiles where the robot's battery can be replaced during the game. Contact tiles are represented by cyan-colored tiles. The robot must remain stationary on the tile while its battery is being replaced.



3.8. Wall Tokens

1. There are two kinds of wall tokens - **smiley** [8] victims and cognitive targets.
2. **Smiley victims** [9] are represented by a 2cm by 2cm image placed anywhere on walls (including curved surfaces). However, they are not placed in the passages connecting areas.
3. **Smiley victims are represented by smiley-face emoji printed in black on or attached to the wall. The facial expression of the emoji represents the health status of the victim, of which there are three types:** [10]
    a. Harmed victim [H]: **sad face** [11]
    b. Stable victim [S]: **neutral face** [12]
    c. Unharmed victim [U]: **happy face** [13]

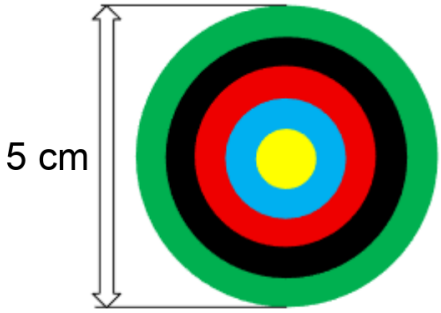


4. On the walls, we can also find wall tokens with the same symbols as the victims, but where the **emoji** [14] are three-dimensional, as shown in the image below. This depth will be detectable with one of the sensors provided in the robot customizer. These wall tokens are fake and must not be reported to the supervisor or included on the map.



5. Cognitive targets represent hazmats in the area where they are located. **They can be placed on any wall along the course, except walls in passages connecting areas.**
6. They have the shape of a circle with a diameter of 5 cm. The outermost circle has a diameter of 5 cm, consisting of up to five concentric rings. The innermost circle has a diameter of 1 cm, and the diameter of each subsequent outer ring increases by 1 cm, resulting in rings with diameters of 1 cm, 2 cm, 3 cm, 4 cm, and 5 cm.
7. The rings and the circle can have different colors. The color of the rings and the circle correspond to a numerical value:
    a. Black = -2
    b. Red = -1
    c. Yellow = 0
    d. Green = 1
    e. Blue = 2

8. The type of hazmat represented by cognitive targets can be calculated by summing up the value of the 4 rings and the circle. Depending on the sum, the type of hazmat can be determined. If the value of the sum is not listed below, the target must be treated as a **fake wall token** [15].
    a. Flammable Gas [F]: sum = 0
    b. Poison [P]: sum = 1
    c. Corrosive [C]: sum = 2
    d. Organic Peroxide [O]: sum = 3
9. Adjacent rings of the same color are not merged. The robot must always consider each of the 5 rings separately and sum the value for all 5 rings, regardless of whether colors repeat.



Yellow, Blue, Red, Black, Green

0+2-1-2+1 = 0
→ **Flammable Gas**

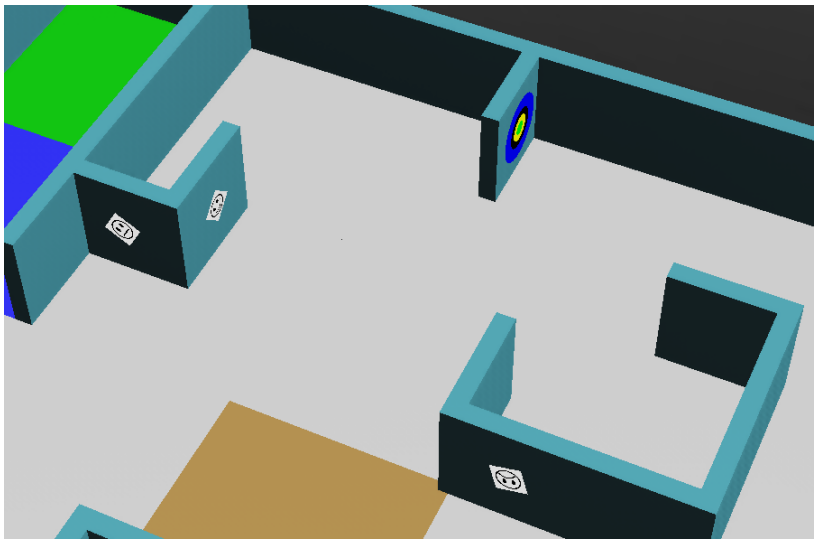


Blue, Yellow, Black, Black, Black

2+0-2-2-2 = -4
→ **fake wall token**

Example of a cognitive target: The numbers are from the center outwards.

10. **Smiley victim** [16] signs can be rotated between **0 and 2 PI radians** [17] (0 to 360 degrees) in the roll dimension.



4. Robots

4.1. Construction

1. The organizers provide the robot model used on each platform.
2. Using the robot customizer tool, teams can customize their robot's hardware (sensor locations, sensor types, wheel location, etc.).
3. An upper bound to the budget is introduced. Each component costs a certain amount which teams can view in the Robot Customiser Tool. This upper bound is 3000. The number of components is also limited, which can be viewed using the same tool.

4.2. Sensors

1. The robot has the following sensors.
    a. Location sensor GPS to detect where the robot is in the field.
    b. Color sensor to detect floor color.
    c. Distance sensors to measure distance to surrounding walls or obstacles.
    d. RGB cameras to search for **smiley** [18] victims and cognitive target signs, detect floor color, and much more.
    e. LiDAR to measure the distance to surrounding walls or obstacles.
    f. Inertial measurement unit (IMU) sensors: gyroscopic and accelerometers.
2. The RoboCupJunior Rescue Committee will have created the simulation world and robot with noise that is similar to real-world noise levels. Teams should ensure their programs are robust to this noise. Organizers will not change the noise levels within the simulation for the competition. All teams are expected to design their systems with these realistic conditions in mind.

4.3. Battery

The robot has a battery that will drain depending on the motor speed. The battery level will be displayed in the supervisor window, above the timers. Teams are expected to characterize its behavior through testing.

To prevent it from running out of power, the robot can be taken to a contact tile (see Contact Tiles) to have the battery replaced. To do this, the robot must remain stationary on the contact tile for 5 seconds of simulated time.

Passing through swamps accelerates battery drain, since the motors have to work harder to get through them.

4.4. Control

1. Robots must be controlled autonomously.
2. The referee will start robots.
3. Robots may utilize various maze navigation algorithms. Any pre-mapped type of dead reckoning (movements predefined based on known locations or placement of features in the field) is prohibited.

4.5. 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.

4.6. Inspection

1. Students will be asked to explain the operation of their programs to verify that all are their own work.
2. Students will be asked about their preparation efforts. The RoboCupJunior Rescue Committee may request them to answer surveys and participate in **recorded** [19] interviews for research purposes.
3. 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.
4. All teams have to submit their source code and proper documents before the competition. If the team agrees, the organizers may share them online after the competition such that other teams can draw inspiration and learn from them.

4.7. Violations

1. If the team's robot or program violates the rules, the team must make modifications within the schedule of the tournament, and teams cannot delay tournament play while making modifications.
2. No mentor assistance is allowed during the competition. (See Section 2, "Code of Conduct")
3. 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-round Practice

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

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 areas where the simulation environments are located unless otherwise directed by a referee.
2. The referee performs all operations of the simulation environment in-game, such as starting the game and operating external actions such as LoP or stopping the game early at any time.
3. **No one other than the referee is allowed to intentionally interact with the simulation environment during a game.** [20]

5.3. Before the game

1. The organizers will announce in advance how to participate in the games, which will vary depending on how the competition is conducted. It is the team's responsibility to check and follow the announcements.
2. Failure to comply with the announcements, whether intended or unintended, will result in points being deducted between 20% and 100% from that game's score. The percentage will be determined by the organizer based on fairness among the teams and throughout the competition. Teams will not be allowed to comment on this decision.
3. If a team fails to play in a game for any reason, the score of the game will be 0 points.
4. Organizers will only reveal Competition World for each round for the first time just before games.
5. **No program changes or updates are allowed after the official deadline for each round, as announced by the organizers.** [21]
6. 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.
7. Pre-mapping the field or the locations of wall tokens is prohibited. Pre-mapping activities will result in immediate robot disqualification for the round.

5.4. Start the game

1. The next team in the game order must wait their turn near the game area. The referee will give the teams a maximum of 2 minutes to prepare to start the game.

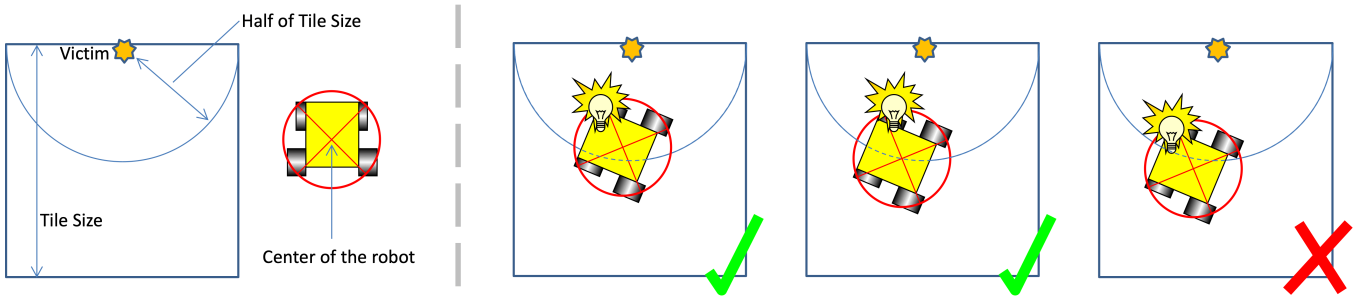
2. The game will start with a referee's operation.
3. The team cannot touch game-related equipment after the game starts for any reason.
4. The game time allowed is 8 minutes in simulated time. At the same time, a second timer running in real time will appear in the **supervisor** [22] window, with a limit of 10 minutes. The game ends when either timer expires, whichever comes first.
5. A "visited tile" means that the center of the robot is inside the tile**, as determined by the supervisor** [23].

5.5. Lack of progress

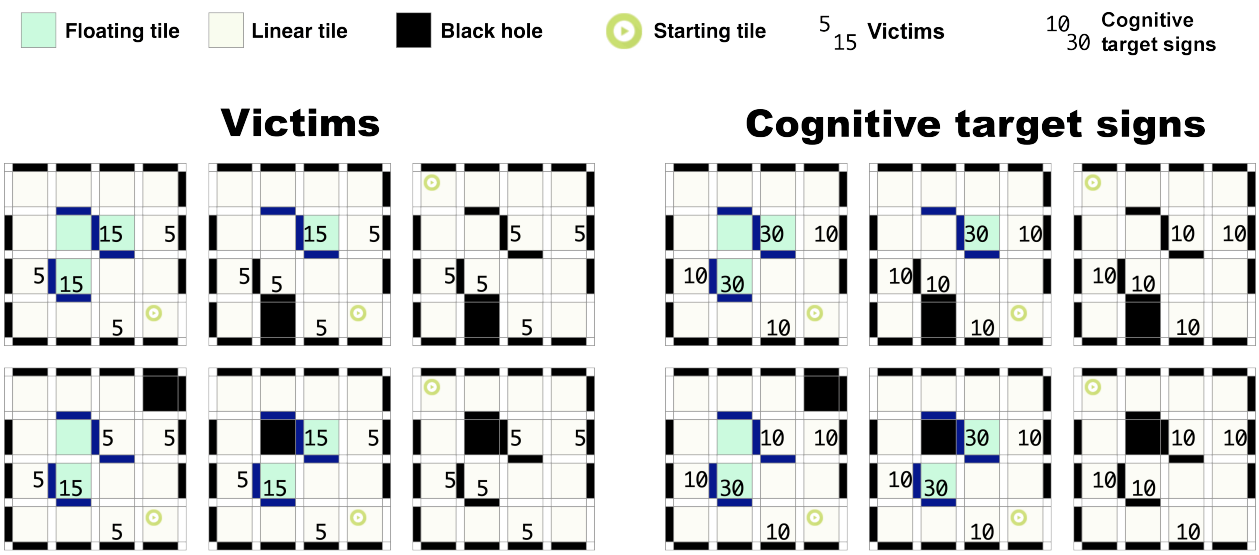
1. A Lack of Progress (LoP) occurs when:
   a. The robot has fallen into a hole.
   b. The robot is in a fixed location for 20 seconds or more of **simulated** time (automatically called).
   c. The referee determines the robot is not entirely static but stuck in a motion sequence.
   d. The robot can call the LoP autonomously.
   e. In other cases, calling for LoP rests on the team captain, but the referee must make the final decision. However, depending on how the game is run, this may not apply.
2. If there is a lack of progress, the robot **is returned** [24] to the last visited checkpoint (or the start tile if it never reached a checkpoint) **by the simulation engine, and its** [25] direction cannot be specified by the team. Refer to Section 5.4, "Start the game" for the definition of a visited tile.
3. When a LoP is triggered, the engine will send the character "L" to the robot.

5.6. Scoring

1. To identify a wall token, the robot must stop at each one for at least 1 second. After that time, it must send a command to the **supervisor** [26] with the type of the wall token in a platform-specific format.
2. For successful wall token identification (TI), the center of the robot must be equal to or less than half a tile distance from the location of the wall token when the robot indicates a wall token has been identified.



3. Wall token identification (TI). Points are awarded for each successful identification of a wall token on the field.
   a. For wall tokens located on a linear tile in Area 1 to 3
      i. **Smiley victims** [27]: 5 points
      ii. Cognitive target signs: 10 points
   b. For wall tokens located on a floating tile in Area 1 to 3 and all wall tokens in Area 4
      i. **Smiley victims** [28]: 15 points
      ii. Cognitive target signs: 30 points

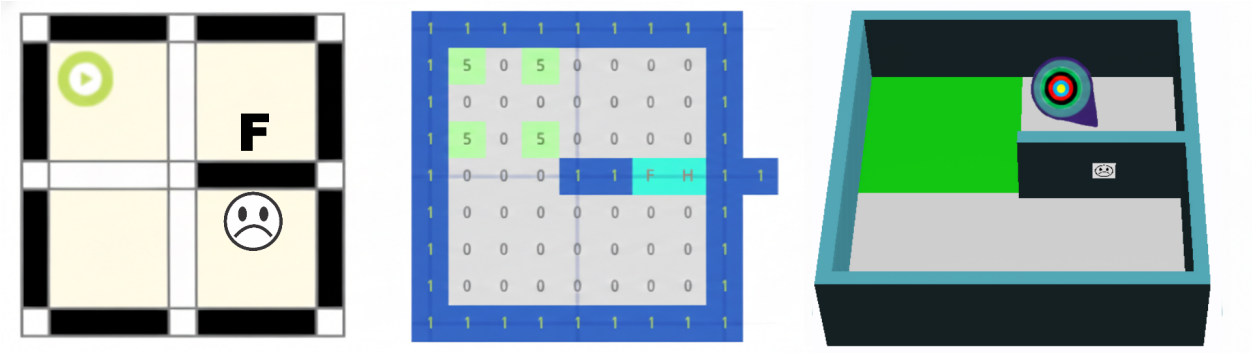


4. Wall token type identification (TT). Additional points are awarded if the reported type of the victim or cognitive target is correct.
   a. **Smiley victims** [29]: 10 points
   b. Cognitive target sign: 20 points
5. Wall token misidentification (TMI). A misidentification will cause a 5-point deduction. However, the total score cannot be below zero.

   The following is considered a misidentification:

   a. The robot reports a location that is more than half a tile away from the true position of the wall token.
   b. The robot identifies a wall token where there is none.
   c. **The robot identifies a smiley victim as a cognitive target, or a cognitive target as a smiley victim.** [30]
6. Successful checkpoint negotiation (CN). A robot is awarded 10 points for each visited checkpoint. Refer to Section 5.4, “Start the game” for the definition of a visited tile.
7. Lack of progress (LoP). Each LoP will cause a 5-point deduction. However, the total score will never go below zero.

8. Area multipliers (AM).
    a. The scores for TI, TT, and CN obtained in each of the four areas will be multiplied by a unique multiplier. The multipliers are 1, 1.25, 1.5, and 2 for areas 1, 2, 3, and 4, respectively.
9. Successful exit bonus (EB). A robot will be awarded an additional 10% of the obtained total score as an exit bonus if: it can identify at least one wall token and return to the starting tile while sending an 'exit' command to the **supervisor** [31] to finish the game.
10. Mapping bonus (MB).
    a. The robot may submit a matrix with the maze map at any time. The maze map should be encoded in the following prescribed format. The map aims to encode the environment's geometry, key elements such as holes, and token locations. The mapping bonus is a multiplier **between 1 and 2.2** [32].
    b. For Area 1, 2 and 3:
        i. Each quarter tile and its surrounding edges and vertices will be represented by a cell (value).
        ii. Walls are marked by '1'; holes as '2'; swamps as '3'; checkpoints as '4'; starting tile as '5'; tile with obstacle as 'x'; **contact tiles as 'k';** passages from 1 to 2 as 'b', 1 to 3 as 'y', 1 to 4 as 'g', 2 to 3 as 'p', 2 to 4 as 'o' and 3 to 4 as 'r'; wall tokens as the corresponding wall token code (H,S,U,F,P,C,O) and any other tiles/edges/vertices should be '0'.
        iii. There will not be any tile that is simultaneously two or more of the following options: swamp, hole, checkpoint, **contact tile,** starting tile, tile with obstacle, or area passage.
        iv. For curved walls in area 3, the vertex should be represented by a '0'
        v. The presence of a wall token should be indicated in the cell corresponding to its respective wall. If multiple wall tokens are present on the same wall, their symbols should be concatenated in order based on both tokens' absolute positions on the map: first from top to bottom, then from left to right.



        vi. Organizers can store maps in any rotation as long as it is a multiple of 90°
        vii. Organizers will check the correctness of a submitted map matrix against the matrix representing the real map (real map matrix).
            A. Organizers will use the starting tile to align the two maps' matrices. The two values are compared for every non-zero entry on both the real and submitted map matrices.
            B. If the two values match, the correct count is incremented. Otherwise, the incorrect count is incremented.

C. The correctness is given by the ratio of the correct count over the sum of the correct count and incorrect count.

D. Organizers will calculate the correctness for each possible orientation of the submitted map matrix aligned to the real map matrix. The maximum value will be used.

viii. The mapping bonus multiplier will be the **correctness × 1.2 + 1** [33]

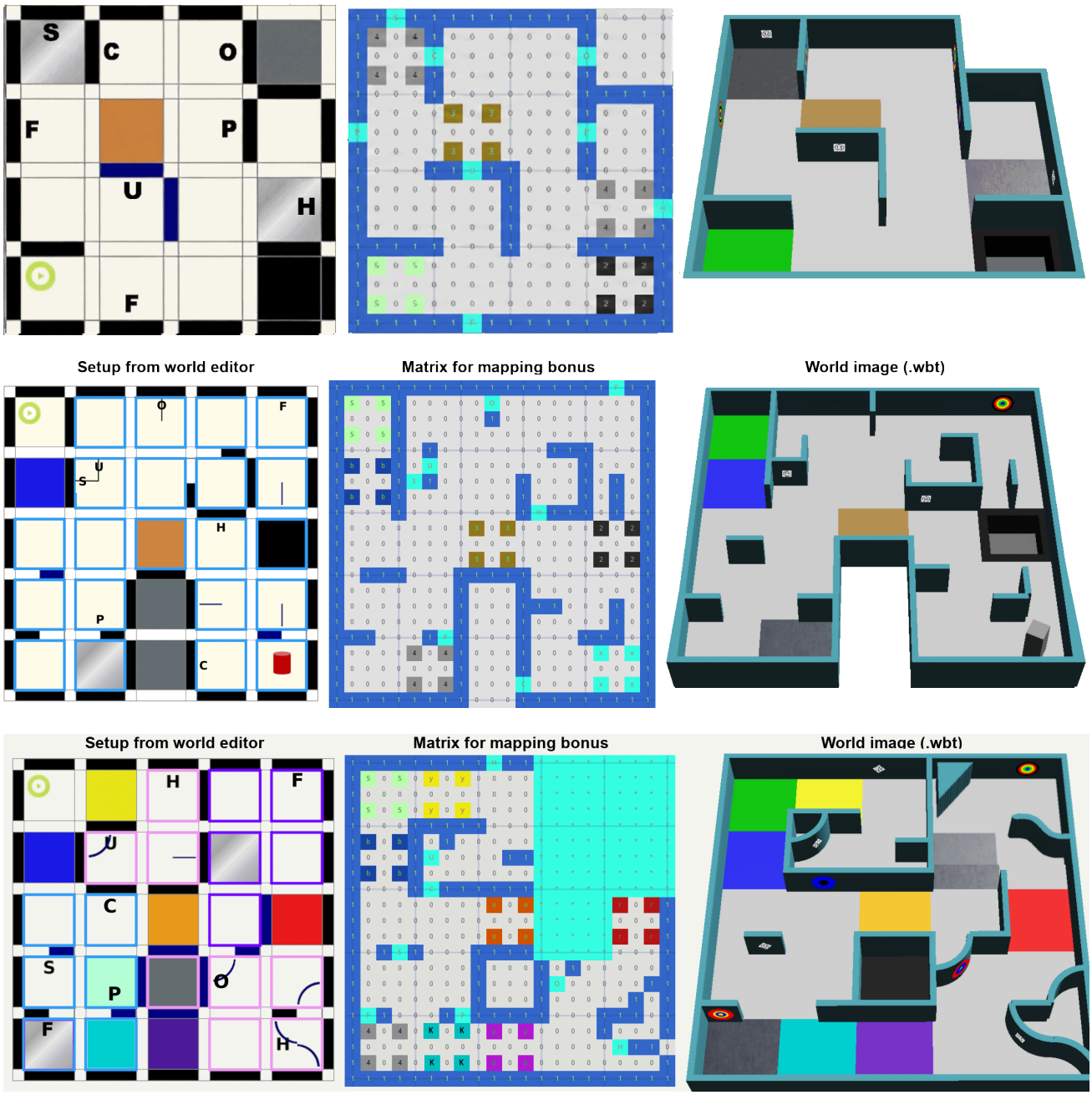
ix. Ambiguous edge cases will be noted in the official documentation. For new edge cases that are not defined, please contact the International RoboCupJunior Rescue Committee or the platform development team.

x. The method of submitting a map matrix is described in the documentation and example codes located in the platform releases.

c. For Area 4

   i. Simply fill area 4 elements with '*'. This includes the border of area 4.

d. Examples



11. There are no duplicate rewards. For example, if a robot visits a checkpoint multiple times, only one successful checkpoint negotiation will be rewarded. The same result applies to all other scoring rules.

12. Scoring will be automated through the platform scoring engine.

$$\textbf{Field Score} = \left(\sum_{i=1}^{4} (\textbf{TI}_i + \textbf{TT}_i + \textbf{CN}_i) \cdot \textbf{AM}_i - \textbf{TMI}_i - \textbf{LOP}_i\right) \cdot \textbf{EB} \cdot \textbf{MB}$$

Example:

TI	Wall Token Identification
TT	Wall Token Type Identification
CN	Checkpoint Negotiation
TMI	Wall Token Misidentification
LOP	Lack Of Progress
EB	Exit Bonus
MB	Map Bonus

The multipliers are 1, 1.25,1.5 and 2 for areas 1, 2, 3 and 4 respectively

	AM	TI				TT		CN	Sum-TI, TT, CN	TMI	LOP	Sum-TMI & LOP
score ea.		5	10	15	30	10	20	10		-5	-5	
Area 1	1	2	4	0	0	2	3	1	140	1	2	-15
Area 2	1.25	1	1	3	2	4	3	1	287.5	0	1	-5
Area 3	1.5	2	2	4	3	6	3	1	465	2	1	-15
Area 4	2	0	0	2	2	2	2	1	320	0	2	-10
									1212.5			-45

	Sub-total for TI, TT, CN	1212.50
	Sub-total TMI & LOP	-45.00
		1167.50
With 10% EB	1167.5 x 1.1	1284.25
With MB (assuming all correct)	1284.25 x **2.2**	**2825.35**

5.7. End of Play

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 at the end of the game.
2. The game ends when:
   a. The time expires (the simulated time or the real time timer, whichever comes first. See Section 5.4, "Start the game").
   b. **The battery runs out.**
   c. The robot sends an 'exit' command to the **supervisor** [34].
   d. The team captain calls the end of the game. Depending on how the game is run, this may not apply.

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.

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) any of the following aspects:
    - Creation of a new software algorithm for a solution
    - Creation of a custom robot structure from the Erebus Robot Customization Tool

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. All teams must submit a short video demonstrating how to execute their robot controller on a provided example map in a server-client setup. This video will be a formal part of the documentation submission. It ensures that teams are familiar with the competition setup and helps organizers

verify that teams understand how the setup works. The video should be submitted alongside the Technical Description Paper, Poster, and Project Video.

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 "Since this simulates a rescue environment, the robot's goal should be to try its best to locate all wall tokens by navigating and mapping simultaneously, i.e., map out unknown areas. There are four areas. Areas 1 to 3 consist of a tile-based system maze-like layout. Area 4 (optional area) is not tile-based, and teams are encouraged to explore interesting simultaneous localization and mapping algorithms." to "Since this challenge simulates a rescue environment, the robot's goal is to locate as many wall tokens as possible while simultaneously navigating and mapping the environment, including previously unknown areas. The field consists of up to four areas. Area 1 is always part of the field, while Areas 2 to 4 are optional and may be left out by the organizers. Areas 1 to 3 feature a tile-based, maze-like layout, whereas Area 4 is not tile-based. Teams are encouraged to explore interesting simultaneous localization and mapping (SLAM) algorithms."

[2] Changed from "it can be restarted" to "a Lack of Progress (LoP) can be called and the robot is placed back"

[3] Changed from "checkpoint or" to "checkpoint, or at"

[4] Changed from "Black holes" to "Holes"

[5] Changed from "simulator's time will run faster" to "the battery will drain faster"

[6] Changed from "time shown in the image below will run faster" to "battery bar will decrease faster"

[7] In previous version this said "The first time the robot enters a swamp, while it is inside, the simulation time will be consumed 5 times faster than the normal rate. Then, on each subsequent entry into the same swamp, this rate will increase by one point (x6, x7...) until it reaches the limit of x10."

[8] Changed from "letter" to "smiley"

[9] Changed from "Letter victims" to "Smiley victims"

[10] Changed from "Letter victims are uppercase letters printed on or attached to the wall. They are printed in black, using a sans serif typeface such as "Arial". The letters represent the health status of the victim." to "Smiley victims are represented by smiley-face emoji printed in black on or attached to the wall. The facial expression of the emoji represents the health status of the victim, of which there are three types:"

[11] Changed from "Φ" to "sad face"

[12] Changed from "Ψ" to "neutral face"

[13] Changed from "Ω" to "happy face"

[14] Changed from "letters" to "emoji"

[15] Changed from "fake victim" to "fake wall token"

[16] Changed from "Letter victims" to "Smiley victim"

[17] Changed from "-PI and PI radians" to "0 and 2 PI radians"

[18] Changed from "letter" to "smiley"

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

[20] Changed from "No one is allowed to touch the simulation environments intentionally during a game." to "No one other than the referee is allowed to intentionally interact with the simulation environment during a game."

[21] Changed from "No program changes or updates after each round's deadline are allowed." to "No program changes or updates are allowed after the official deadline for each round, as announced by the organizers."

[22] Changed from "control" to "supervisor"

[23] Changed from ". The game management system makes this judgment" to ", as determined by the supervisor"

[24] Changed from "must return" to "is returned"

[25] Changed from ". The robot is re-placed by the simulation engine and its" to "by the simulation engine, and its"

[26] Changed from "game manager" to "supervisor"

[27] Changed from "Letter victims" to "Smiley victims"

[28] Changed from "Letter victims" to "Smiley victims"

[29] Changed from "Letter victims" to "Smiley victims"

[30] Changed from "The robot identifies a victim as a hazard or vice versa." to "The robot identifies a smiley victim as a cognitive target, or a cognitive target as a smiley victim."

[31] Changed from "game manager" to "supervisor"

[32] Changed from "between 1 and 2" to "between 1 and 2.2"

[33] Changed from "correctness + 1" to "correctness × 1.2 + 1"

[34] Changed from "game manager" to "supervisor"