



Junior Robotics Competition 2018 RoboJunior Soccer Rules



Preface:

In the JRC 2018 RoboJunior Soccer event, two teams each composed of two to four students compete; using their own built and programmed autonomous mobile robots. The soccer ball used is a well-balanced infrared (IR) electronic ball set to pulse mode (for example: HiTechnic Infrared Electronic Ball -IRB 1005 or similar). The special field is built in a way that resembles the actual field for human soccer and the goals are colour-coded.

The Robots are required to have full autonomy. Students competing in the event must do all the construction and programming of their robots without any help or interference from their teachers or mentors.

Rules and Regulations:

The Senior Soccer Judge will apply all the rules fairly and without prejudice. All the decisions made by the Senior Judge during the games are final. Any argument with the Senior Judge or the assistant judges will result in a warning. If the argument continues or another occurs, this will result in immediate disqualification from the game. At the conclusion of the game, the judge will ask the captains to sign the score sheet. By signing the score sheet the captains accept the final score on behalf of the entire team.

1. PREQUALIFICATION

- 1.1. Each team, in the presence of the Senior Judge, qualify each of their competing robots. Robots must be measured in an upright position with all their parts extended. The maximum size (diameter) of each robot must not exceed 22.0 centimeters and the weight of each robot must not exceed 1,100 grams.
- 1.2. Each team must demonstrate, to the satisfaction of the Senior Soccer Judge, that their robots are able to recognize and follow the Infrared Electronic Ball in pulse mode. **Failure to accomplish that will automatically disqualify the team from competing.**
- 1.3. All team members will be interviewed by the Soccer Chief Judge to ensure that **all team members** have adequate knowledge of the construction and programming of the robots. The interview may be carried out at any time during the two-day competition.

2. THE TEAM

A team must designate a captain for each game. The captains communicate with the judges on behalf of their team. All team members who are competing in the game are allowed to be around the field, however, no member is allowed to lean on or touch the field. Only the captains are allowed to touch their robots during the game and only if instructed by the judge.

3. THE ROBOTS

- 3.1. Each team can compete with a maximum of two qualified robots. The substitution of robots during the competition within the team or with other teams is forbidden.
- 3.2. No robot is allowed to emit infrared light. However, optical sensors (e.g. infrared distance sensors) may be used as long as they do not affect other robots. Robots must not produce magnetic interference in other robots on the field. Any negative effect of a competitor's robot on other robots must be proven by the claiming team. Final resolution is decided by the Senior Soccer Judge.

Infrared light reflecting materials must not be used on the exterior of robots. If robots are painted, they must be painted matte. Minor parts that reflect infrared light could be used as long as other robots are not affected. A team claiming that their robot is affected by the other team's robot reflecting infrared light has to prove this interference. Final resolution is decided by the Senior Soccer Judge.
- 3.3. It is not allowed to use any kind of remote control during the game. The team captain of the game manually starts the robots, and then they must continue to operate autonomously. The Judge can interrupt a game in progress if any kind of interference from spectators is suspected (IR emitters, camera flashes, mobile phones, radios, computers, etc.).



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- 3.4. Robots are not allowed to use any kind of communication during game play unless the communication between the two robots is via Bluetooth class 2 or class 3 (range shorter than 20 meters) or via ZigBee. Teams are responsible for their communication. The availability of frequencies is not guaranteed.
- 3.5. Robots must be built and programmed to move in more than one direction. Robots must respond to the ball in a direct forward movement. For example, it is not enough that the robot just moves left and right in front of its own goal, but it must also move directly towards the ball in a forward movement.
- 3.6. All robots may have a stable handle to hold and lift them. The handle must be easily accessible, for example on top of a robot. The dimensions of the handle may exceed the 22.0 cm height limitation, but the part of the handle that exceeds this 22.0 cm limit cannot be used to mount components of the robot. The weight of the handle is to be included in the calculation of the maximum allowable weight of the robot.
- 3.7. The Robots that do not abide by the specifications/regulations are not allowed to participate. If violations are detected during a running game, the team is disqualified for that game. If similar violations occur repeatedly, the Senior Soccer Judge can disqualify the offending team from the competition.

4. THE FIELD

4.1. Dimensions of the field:

The playing field is 122 cm by 183 cm. The field is marked by a white line, which is part of the playing field. Around the playing field, beyond the white line, is an outer area of 30 cm width. Total dimensions of the field, including the outer area, are 182 cm by 243 cm.

4.2. Walls:

Walls are placed all around the field, including behind the goals and the out area. The height of the walls is 14 cm. The walls are painted matte black.

4.3. Goals:

The field has two goals, centered on each of the shorter sides of the playing field. The goal inner space is 60 cm width, 10 cm high and 74 mm deep, box shaped. It has a crossbar on top (to prevent robots from entering the goal and to allow checking if a goal is scored). The goal “posts” are positioned over the white line marking the limits of the field. The crossbar is exactly over the white line. The interior walls and the crossbar of each goal are painted, one goal yellow, the other goal blue. The exterior (including the goal post and frame) are painted black (see the field diagrams at the end of the rules).

4.4. Floor:

The floor consists of green carpet on top of a hard level surface. All straight lines on the field should be painted and have a width of 20 mm.

4.5. Markings on the Field: Neutral Spots, Centre Circle, and Penalty Areas:

There are five neutral spots defined on the field. One is in the center of the field. The other four are adjacent to each corner, located 45 cm along the long edge of the field, aligned with each goal post towards the middle of the field (from the goal post). The neutral spots are circular measuring 1 cm in diameter and are drawn in black.

A Centre Circle is 60 cm in diameter, drawn with a thin black marker. It is used for guidance during kickoff.

The Penalty Areas, in front of each goal, are marked by a 20 mm wide black line, and are 30 cm wide and 90 cm long. The line is part of the area. A robot is considered inside the Penalty Area when it is completely inside.

4.6. Lighting and Magnetic Conditions:

A The fields should be placed in a way that the influence by external infrared light is as low as possible and that the magnetic field of the earth is disturbed as little as possible. Perfect conditions cannot be guaranteed, however. Teams must come to tournaments being prepared to calibrate their robots based on the lighting and magnetic conditions at the venue.

5. THE BALL

The soccer ball used is a well-balanced infrared (IR) electronic ball set to pulse mode (for example: HiTechnic Infrared Electronic Ball- IRB 1005 or similar). The Organizers supply the balls for the competition games but not for practices.



6. THE GAMEPLAY

6.1. Length of Game:

The game consists of two halves with a break between them. The duration of each half and of the break will be indicated on the games' schedules which are distributed on the first day of the competition.

The game clock will run for the duration of the halves without stopping, except if deemed necessary by the Senior Soccer Judge. The game clock will be run by the Senior Judge or the assistant Judge.

6.2. Team Readiness :

Teams must be present at the field, with their already inspected and approved robots, when they are scheduled to start their game. If a team is late by more than 5 minutes, it automatically forfeits the game and the winning team gets the 2 points, however the score (goals) is recorded as 0-0.

Note that the Senior Soccer Judge can make changes to the schedule of the games, at any time, if necessary. The above paragraph will not apply if the Senior Soccer Judge decides to reschedule teams. All teams will be given adequate notice of the changes.

6.3. Get Set, Get Ready, Go!:

At the start of the first half of the game, a referee will toss a coin. The team mentioned first in the draw shall call the coin. The winner of the toss can choose which end to kick to, or to kick off first. The loser of the toss will settle for the other option. After the first half, teams will switch sides. The team not kicking off in the first half of the game will kick off to begin the second half of the game.

Each half of the game begins with a kickoff. All robots must be located on their own side of the field and must be halted. The ball is positioned by the Judge in the center of the field.

The team kicking off places their robots on the field first. Robots cannot be placed nor remain behind the goal line or in the outer area. Robots cannot be repositioned once they have been placed.

The team not kicking off will now place their robots on the defensive end of the field. All robots on the team not kicking off must be at least 30 cm away from the ball (that means outside the center circle). The Judge may adjust the placement of the robots to make sure that the robots are placed properly within the field positions.

On the Judge's command (usually by whistle), all robots will be started immediately by each captain. Any robots that are started early will be removed by the Judge from the field and treated as a damaged robot.

6.4. Human Interference:

Except for the kickoff, human interference from the teams (e.g. touching the robots) during the game is not allowed unless explicitly permitted by the Judge. Violating team/member(s) can be disqualified from the game. The Judge can help robots to get unstuck, but only if the ball is not being disputed near them, and also if that situation was created from the interaction between robots (i.e. it was not a design or programming flaw of the robot alone).

The Judge will pull back the robots just enough for them to be able to move freely again.

6.5. Ball Movement:

A robot must not take hold of the ball. The robot cannot take full control of the ball by removing all of its degrees of freedom. Examples include fixing a ball to the robot's body; surrounding a ball using the robot's body to prevent access by other robots; fully encircling the ball; or completely trapping the ball with any part of the robot's body. The ball must not stop rolling while a robot is moving. The ball must rebound when rolled into a robot.

If a robot takes full control of the ball for more than 10 seconds, the Judge will designate the violating robot as a damaged robot. The ball is then placed in the centre point and the game continues.

Note that it is permitted to use a rotating drum that imparts dynamic back spin on the ball to keep the ball on its surface. Such a device is called a dribbler. Other players must be able to access the ball.

6.6. Scoring:

A goal is scored when the ball strikes or touches the interior back wall of the goal, or when it is completely inside the goal area. Goals scored either by an attacking or defending robot have the same end result: they give one goal to the team on the opposite side. After a goal, the game will be restarted with a kickoff from the team who was scored against.



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Before a kickoff, all damaged or out-of-bounds robots are allowed to return to the playing field immediately if they are ready and fully functional.

6.7. Goalie:

The first defending robot moving into the penalty area on a team's defending side completely (with every part of it) is designated as goalie until a part of it leaves the penalty area

6.8. Pushing:

Within the penalty area, the goalie has priority. Attacking robots are not supposed to push the goalie in any way. If the attacker and the goalie touch each other and at least one of them has physical contact with the ball, the ball will be moved to the nearest unoccupied neutral spot immediately. If a goal is scored as a result of this pushed situation, it will not be granted.

6.9. Lack-of-Progress:

Lack-of-progress occurs if there is no progress in the game play for a minimum of 20 seconds, and the situation is not likely to change. Typical lack of progress situations are when the ball is stuck between the robots; when there is no change in ball and robot's positions; or when the ball is beyond detection or reach of all robots on the field.

The lack-of-progress is decided and declared by the Judge. After a visible and loud count, the Judge will call "lack-of-progress" and will move the ball to the nearest unoccupied neutral spot. If this does not solve the lack of progress, the Judge can move the ball to different neutral spots.

6.10. Out-of-Bounds and "Out-of-Reach":

If a robot's entire body moves out beyond the white line of the field completely, it will be called for being out-of-bounds. When this situation arises, the robot is given a one-minute penalty, and the Judge asks the team to remove the robot from the field. There is no time stoppage for the game itself. The robot is allowed to return if a kickoff occurs before the penalty has elapsed.

The one-minute penalty starts when the robot is removed from play. Out-of-bounds robots can be fixed if the team needs to do so. After the penalty time has elapsed, the robot will be placed on the unoccupied neutral spot nearest to where it has been taken off, and not directly aiming towards the ball.

A Judge can waive the penalty if the robot was accidentally pushed out-of-bounds by any other robot. In such a case, the Judge may have to slightly push the robot back onto the field.

The ball can leave and bounce back into the playing field.

When the ball remains outside the playing field for more than 10 seconds, or when any of the robots are unable to return it into the playing field (without their whole body leaving the playing field). The Judge will call "out-of-reach", and will move the ball to the nearest unoccupied neutral spot. The Judge determines if the ball is out-of-reach.

6.11. Damaged Robots:

If a robot is damaged, it has to be taken off the field and must be fixed before it can play again. Even if repaired, the robot must remain off the field for at least one minute or until the next kickoff is due. If all robots have moved out-of-bounds, the penalties are discarded and the match resumes with a neutral kickoff.

A robot is considered damaged especially when:

- it does not respond to the ball, or is not able to move (it lost pieces, power, etc.).
- it continually moves into the goal or out of the playing field.
- it turns over on its own accord.

Computers and repair equipment are not permitted around the field during the game. A team member must take the damaged robot to the designated team table. A Judge may permit robot sensor calibration, laptops and other tools in the playing area, only for the 5 minutes before the start of each half.

After a robot has been fixed, it will be placed on the unoccupied neutral spot nearest to where it had been taken off, and not directly aiming towards the ball. A robot can only be returned to the field if the damage has been repaired. Only the Judge determines if a robot is damaged. A robot can only be taken off or returned with the Judge's permission.

If both robots from the same team are deemed damaged during the game, the clock continues and the remaining team gets one initial goal and rests while waiting for the opponent's return to play. The remaining team will also get one additional goal for each minute the opponent's robots remain damaged.



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After five minutes of absence, the team with no functional robots forfeits the game. However, these rules only apply when neither of the two robots from the same team was damaged as the result of play interference from the opposing team.

6.12. Interruption of Game:

In principle, a game will not be stopped.

A Judge can stop the game if the ball malfunctions and a replacement is not readily available, or if there is a situation where the Judge needs to confer with an official of the Competition. When the Judge has stopped the game, all robots must be stopped and remain on the field untouched. The Judge may decide whether the game will be resumed from the point at which the game was stopped, or by a kickoff.

7. CODE OF CONDUCT

7.1. Fair Play and Behaviour:

All participants are expected to play a fair and clean game of robot soccer. Robots are not allowed to deliberately interfere with or cause damage to the other robots during the game. Robots are not allowed to cause damage to the field or to the ball during the game.

Humans are also not allowed to cause deliberate interference with robots or damage to the field or the ball.

All participants are expected to treat each other with respect and to adhere to the rules and regulations of the competition. Participants must respect the decisions of the Soccer Judges.

7.2. Official Challenges:

A team has the right to challenge the qualification of the opponent's robot if the robot's size, weight, or construction does not respect the regulations. The challenge must be voiced to the Judge by the game's team captain only and before the start of a game. If the Judge determines that the challenge is frivolous or unfounded, he or she may dismiss it. A team who repeatedly presents frivolous or unfounded challenges may risk disqualification.

7.3. Teacher-In-Charge and Mentors:

The teacher-in-charge and mentors (chaperons, parents, or any member from the public) are not allowed to assist in the construction or programming of the robots. For safety reasons, only the teacher-in-charge and the officially registered chaperon(s) are allowed to stay at the students work areas. These teachers and chaperons must refrain from touching the robots or giving any verbal directions to repair or re-program any robot. Violators may risk the disqualification of their team.

7.4. Soccer Judges and Assistant Judges:

All decisions during the game are made by the Soccer Judge or the Soccer Judge's Assistant who is in charge of a field, and the persons and the objects surrounding the field. During a gameplay, the decisions made by the Soccer Judge and/or the Soccer Judge's Assistant are final.

Any argument with the Judge or the Judge's Assistant can result in a warning (yellow card). If the argument continues or another occurs, this may result in immediate disqualification from the game (red card).

At the conclusion of the game, the team captains must review and sign the score sheet. By signing the score sheet the captains accept the final score on behalf of the entire team.

8. ADDITIONAL REQUIREMENTS

8.1. Robot Construction:

Robots must be constructed exclusively by the student members of a team. Mentors, teachers, parents or companies may not be involved in the design, construction, and assembly of robots.

For the construction of a robot, any robot kit or building block may be used as long as the design and construction are primarily and substantially the original work of a team. This means that commercial kits may be used but must be substantially modified by the team. It is not allowed to mainly follow a construction manual, or to just change unimportant parts.

Indications for violations are the use of commercial kits that can basically only be assembled in one way, or that robots from different teams, build from the same commercial kit, all basically function or look similar.

Robots must be constructed in a way that they can be started by the captain without the help of another person.



8.2. Robot Programming:

Robots must be programmed exclusively by student members of the team. Mentors, teachers, parents or companies should not be involved in the programming and debugging of robots.

For the programming of the robots, any programming language, interface or integrated development environment (IDE) may be used. The use of programs that come together with a commercial kit (especially sample programs or pre-sets) or substantial parts of such programs are not allowed. It is not allowed to use sample programs, not even if they are modified.

8.3. Robot Inspection and Team Member Interviews:

Robots must be inspected and certified every day before the first game is played. The Soccer Judge may request other inspections if necessary. The routine inspections include verification of size, weight, and construction.

The Competition Coordinator or the Soccer Chief Judge may arrange to interview all team members during the event. The teams must bring both robots and their computer code to the interview. They will be interviewed about the construction and programming of their robots and the development process.

An interviewer may ask the team for a demonstration. The interviewer may also ask the team to write a simple program during the interview to verify that the team is able to program its robot.

Failing the interview may disqualify the team from maintaining (if applicable) their first, second or third place. It is acceptable that different team members have varied skills in programming and/or construction.

APPENDIX

Required for the 2 on 2 soccer event:

Available in Montreal at different retailers and through ordering on line
Brault & Bouthillier, RobotShop, HiTechnic (USA), etc

- HiTechnic Infrared Ball ([IRB1005](#))
- HiTechnic IRSeeker V2 ([NSK1042](#)) to locate and provide the direction to the IRBall
- HiTechnic Compass Sensor ([NMC1034](#)) to determine the orientation of the playing field and the heading to the goal



Field diagram

