



RoboCupJunior Soccer Rules 2012

RoboCupJunior Soccer Technical Committee 2012:

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These are the official rules for RoboCupJunior 2012. They are released by the RoboCupJunior Soccer Technical Committee for Soccer. These rules have priority over any translations.

1. TEAM

1.1 Regulations

A **team** consists of one or more members.

Each team must have a **captain**. The captain is the person responsible for communication with the referee. The team can replace its captain during the competition. The captain is not allowed to wear any yellow or blue clothes that can be seen by the robot (to avoid interference with the goal colour).

1.2 Violations

Teams that do not abide by the rules are not allowed to participate.

The referee can require the team captain to change clothes or to be replaced by another team member if interference with goal colour is suspected.

2. ROBOTS

2.1 Number of robots / substitution

Each team is allowed to have at most two robots. The substitution of robots within a team or with other teams is forbidden.

2.2 Interference

Robots are not allowed to be coloured yellow or blue in order to avoid interference with the goal colours. Yellow or blue parts used in the construction of the robot must either be occluded by other parts from the perception by other robots or be taped/painted with a neutral colour.

The robot must not emit infrared light. **However, infrared-distance-sensors may be used as long as they do not affect other robots.**

Infrared light reflecting materials must not be used on the outside. If robots are painted, they must be painted matte. Minor parts are irrelevant as long as robots are not affected. The supposed affected team has the burden of proof that it is affected.

2.3 Control



The use of remote control of any kind is not allowed. Robots must be started manually by humans and be controlled autonomously.

2.4 Communication

Robots are not allowed to use any kind of communication during game play unless the communication between two robots is via bluetooth class 2 or class 3 (range approximately 20 meters). Teams are responsible for their communication. The availability of frequencies cannot be guaranteed.

2.5 Agility

Robots must be constructed and programmed in a way that their movement is not limited to only one dimension (that means one axis). They must move in all directions, for example by turning. Robots must respond to the ball in a direct forward movement. For example, it is not enough to basically just move left and right in front of the own goal, but to also move directly towards the ball in a forward movement.

Robots must be constructed and programmed in a way that they do not enter the goal. Robots are allowed to use the cross-bar.

2.6 Handle

All robots must have a stable handle to hold and to lift them. The handle must be easily accessible, for example on top of the robot. The dimensions of the handle may exceed the 22 cm height limitation. The handle must not be used to mount components of the robot.

2.7 Additional regulations of the sub-leagues

A tournament may be organized in different sub-leagues. Each sub-league (e.g. "Open League" and "Light Weight League") may have its own additional regulations, including regulations affecting the construction of robots. Such regulations will be passed by the RoboCupJunior Soccer Technical Committee and become a part of this rule.

2.8 Violations

Robots that do not abide by the above specifications/regulations are not allowed to play. If violations are detected during a running game the team is disqualified for that game. If similar violations occur repeatedly, the team can be disqualified from the tournament.

3. FIELD

3.1 Kinds of fields

Two different kinds of fields, named SOCCER A and SOCCER B, may be used at a tournament.

3.2 Dimensions of the field

SOCCER A: The playing-field is 122 cm by 183 cm. The corners are flattened.

SOCCER B: The playing-field is 122 cm by 183 cm. Around the field is an out-area of 30 cm width. Total dimensions of the field, including the out-area, are 182 cm by 243 cm. The field is marked by a white line between 10 mm and 20 mm width. The line is part of the field.

3.3 Walls

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

3.4 Goals



SOCCER A: The width of each goal is 45 cm, centered on each of the shorter sides of the playing-field. The goal is 14 cm high. It has a cross-bar on top (to prevent robots from entering the goal). The interior of the goal including floor, walls and cross-bar are painted, one side yellow, the other side blue. The exterior is painted black.

SOCCER B: The width of each goal is 60 cm, centered on each of the shorter sides of the playing-field. The goal is 10 cm high. It has a cross-bar on top (to prevent robots from entering the goal). The interior of the goal including floor, walls and cross-bar are painted, one side yellow, the other side blue. The exterior is painted black.

3.5 Floor

The floor consists of green carpet on top of a hard surface.

3.6 Neutral spots

There are five neutral spots defined in 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 spots are marked black.

3.7 Center circle

A center circle will be drawn on the field. It is 60 cm in diameter. It is a thin black marker line. It is there for Referees and Captains as a guidance during kick-off.

3.8 Penalty areas

SOCCER A: In front of each goal there is a 30 cm wide and 75 cm long penalty area.

SOCCER B: In front of each goal there is a 30 cm wide and 90 cm long penalty area.

SOCCER A and SOCCER B: The penalty areas are marked by a white line between 10 mm and 20 mm width. The line is part of the area.

A robot is inside the Penalty Area when it is completely inside.

3.9 Lighting and Magnetic Conditions

The fields should be placed in a way that the the influence by external infrared light is as low as possible and that the magnetic field of the earth is disturbed as little is 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.

4. BALL

4.1 General ball specification

A well-balanced electronic ball shall be used. The ball will emit infrared (IR) light. For SOCCER A and SOCCER B, a pulsed ball will be used.

4.2 Official suppliers for pulsed balls

Currently, there is one ball that has been approved by the RoboCupJunior Soccer Technical Committee:

- RoboSoccer RCJ-05 ball operated in MODE A (pulsed)
made by EK Japan/Elekit (www.elekit.co.jp)

Technical details are in the “Technical Specification for pulsed Soccer Ball” which are attached to these rules.



4.3 Tournament balls

Balls for the tournament must be made available by the organizers. Organizers are not responsible for providing balls for practice.

5. GAME PLAY

5.1 Game procedure and length of a game

The game will consist of two halves. The duration of each half is 10-minutes. There will be a 5-minute break in between the halves.

The game clock will run for the duration of the halves without stopping (except if or when the referee wants to consult an official). The game clock will be run by the referee or an assistant.

Teams are supposed to be at the table 5 minutes before their game starts. Teams can be penalized one goal per minute at the referee's discretion if they are late for the game start. If a team does not report within 5 minutes of the game start, it forfeits the game and the winning team is awarded a 5-0 win.

5.2 Pre-match meeting

At the start of the first half of the game, the referee will toss a coin. The team mentioned first in the draw shall call the coin. The winner of the toss can choose either which end to kick to, or to kick off first. The loser of the toss will decide 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.

5.3 Kick-off

Each half of the game begins with a kick-off. All robots must be located on their own side of the field. All robots must be halted. The ball is positioned by the referee 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 out area. Robots cannot be moved 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 30cm away from the ball (that means outside the center circle).

The referee may adjust the placement of the robots.

On the referee'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 referee from the field and treated as a damaged robot.

5.4 Human interference

Except for the kick-off, human interference (e.g. touching the robots) during the game is not allowed unless explicitly permitted by the referee. Violators can be disqualified from the game.

5.5 Ball movement

A robot cannot hold a ball. Holding a ball means taking full control of the ball by removing all of its degrees of freedom. Examples for ball holding include fixing a ball to the robot's body, surrounding a ball using the robot's body to prevent access by others, encircling the ball or somehow trapping the ball with any part of the robot's body. If a ball stops rolling while a robot is moving or a ball does not rebound when rolled into a robot, it is a good indication that the ball is trapped.

The only exception to holding is the use of 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.

5.6 Scoring

A goal is scored when the whole of the ball is inside the goal or if it strikes the back wall of the goal.

5.7 Goalie

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

5.8 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 be disallowed.

5.9 Lack of progress

Lack of progress occurs if there is no progress in the gameplay for a reasonable period of time and the situation is not likely to change. Typical lack of progress situations are when the ball is stuck between robots or between the robot and the wall or no robot is able to detect the ball at its location. The referee 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 referee can move the ball to different neutral spots.

5.10 Out (in SOCCER B only)

The ball is considered as **out** if the whole of the ball is out of the playing area. If a ball is out, the referee will reposition the ball on a neutral spot. The captain of the team whose robots did not touch the ball last can choose between the two neutral spots on the half of the field where the ball went out. If one of these neutral spots is occupied by a robot, the captain can also choose to reposition the ball to the center of the field. The decision of the captain must be made immediately by pointing on a neutral spot. If the captain does not decide immediately, the referee will choose a neutral spot instead.

5.11 Damaged robots

If a robot is damaged, it has to be taken off the field and must be fixed before it can play again. A damaged robot must remain off the field for at least one minute.

A robot is damaged especially when:

- it does not respond to the ball
- it continually moves into the goal
- it turns over on its own accord
- it is stuck to a wall or a corner and cannot free itself continually

After a robot has been fixed it will be placed on the unoccupied neutral spot nearest to where it has been taken off, and not directly aiming towards to the ball. A robot can only be returned to the field if the damage has been repaired.

Only the referee decides whether a robot is damaged. A robot can only be taken off or returned with the referee's permission.

If both robots from the same team are deemed damaged during game play, 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. After five minutes of absence, the team with no functional robots forfeits the game. However, these rules only apply when none of the two robots of a team were damaged as a consequence of a breach of the rules by the other team.



5.12 Multiple defense

Multiple defense occurs if more than one robot from the defending team enters its penalty area with some part and substantially affects the game. The robot farther from the ball will be moved to the center neutral spot.

If multiple defence happens repeatedly, the robot will be deemed damaged.

5.13 Interruption of Game

In principle, a game will not be stopped.

The referee can stop the game if there is a situation on or around the field which the referee wants to discuss with an official of the tournament or if the ball malfunctions and a replacement is not readily available.

When the referee has stopped the game, all robots must be stopped and remain on the field untouched. The referee may decide whether the game will be continued/resumed from the situation in which the game was stopped or by a kick-off.

6. CODE OF CONDUCT

6.1 Fair Play

It is expected that the aim of all teams is to play a fair and clean game of robot soccer. It is expected that all robots will be built with consideration to other participants.

Robots are not allowed to cause deliberate interference with or damage to other robots during normal game play.

Robots are not allowed to cause damage to the field or the ball during normal game play.

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

6.2 Behavior

All participants are expected to behave themselves. All movement and behavior is to be of a subdued nature within the tournament venue.

6.3 Help

Mentors (teachers, parents, chaperones and other adult team-members) are not allowed in the student work area unless it is explicitly **but temporarily permitted by a member of the organizing committee**. Only participating students are allowed to be inside the work area.

Mentors must not touch, build, repair or program any robots.

The substitution of robots during the competition within the team or with other teams is forbidden.

6.4 Sharing

An understanding that has been a part of world RoboCup and RoboCupJunior competitions is that technological and curricular developments should be shared with other participants during and after the competition.

6.5 Spirit

It is expected that all participants, students, mentors and parents alike, will respect the RoboCupJunior mission. ***It is not whether you win or lose, but how much you learn that counts!***

6.6 Violations / Disqualification



Teams who violate the code of conduct can be disqualified from the tournament. It is also possible to disqualify and exclude from further participation in the tournament only a single person or a single robot.

In less severe cases of violations of the code of conduct, a team will be given a warning by showing it a yellow card. In severe or repeated cases of violations of the code of conduct a team can be disqualified immediately without a warning by showing it the red card.

7. CONFLICT RESOLUTION

7.1 Referee and referee assistant

All decisions during the game are made by the referee or the referee assistant, who are in charge of the table, the field, and the persons and objects surrounding it. During game play, the referees' decisions are final.

Any argument with a referee or the assistant can result in a warning. If the argument continues or another argument occurs, this may result in immediate disqualification from the game.

At the conclusion of the game, the referee 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.

7.2 Rule clarification

Rule clarification may be made by members of the RoboCupJunior Soccer Technical Committee, if necessary even during a tournament.

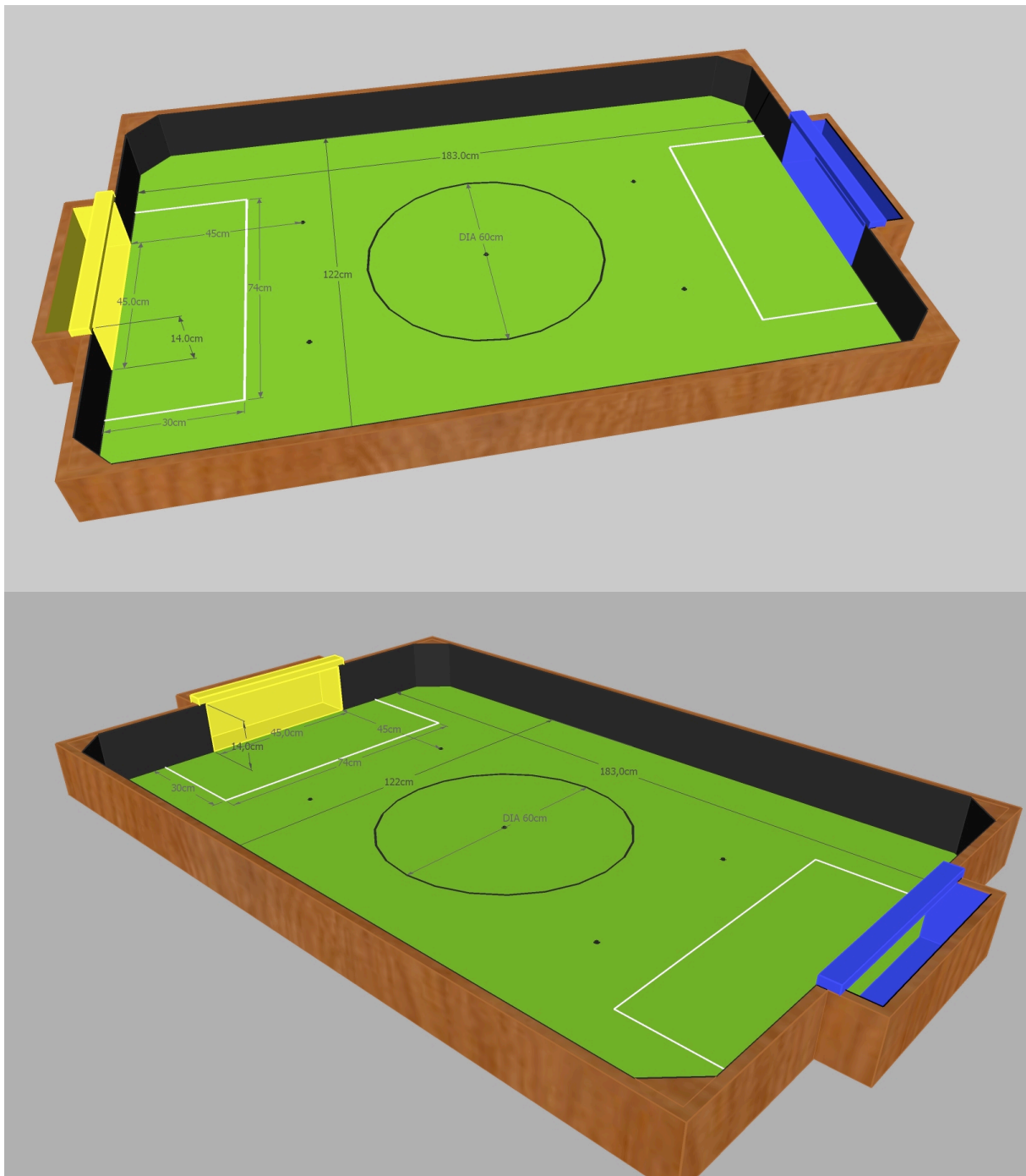
7.3 Rule modification

If special circumstances, such as unforeseen problems or capabilities of a robot occur, rules may be modified by members of the RoboCupJunior Soccer Technical Committee, if necessary even during a tournament.

7.4 Regulatory statutes

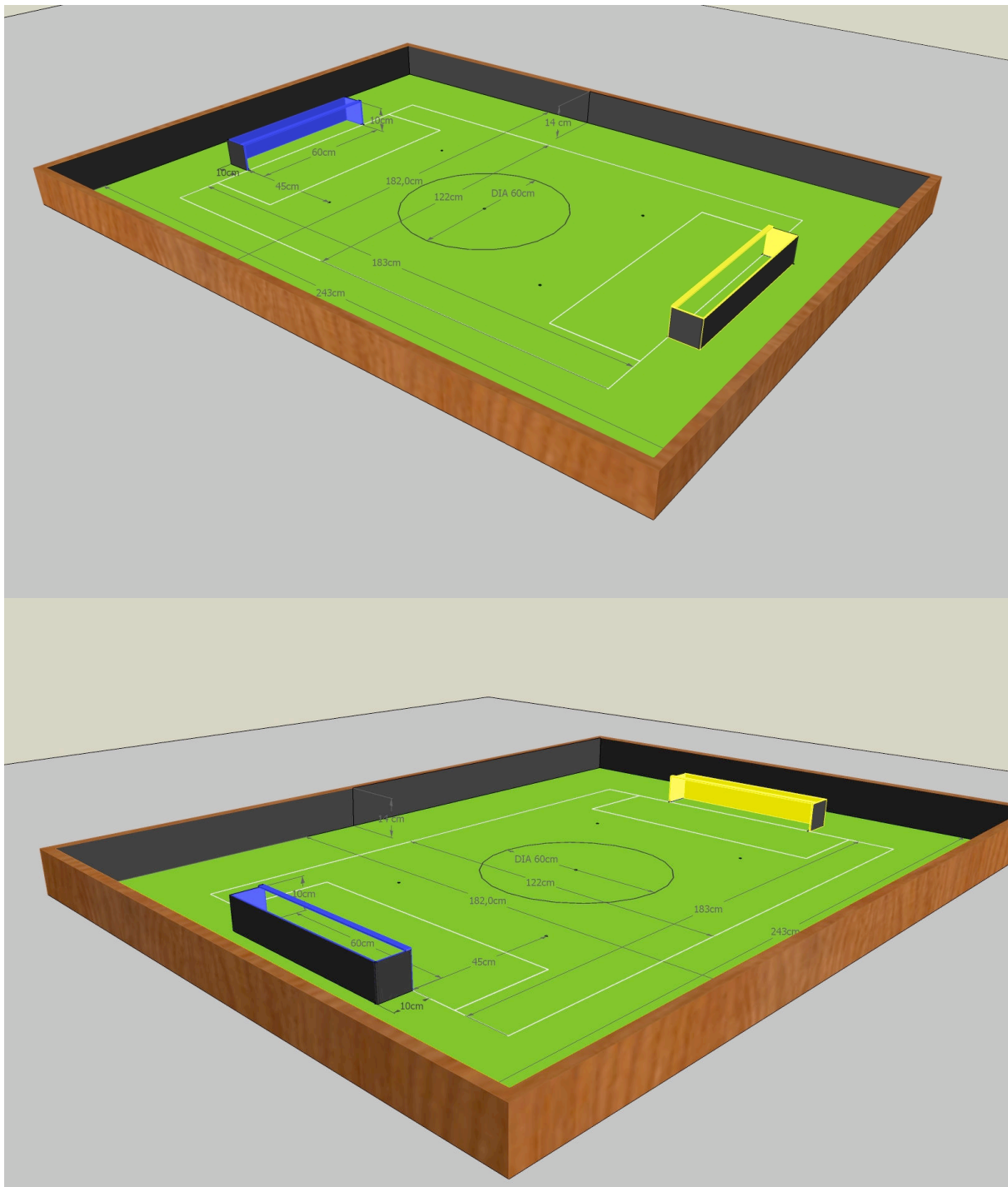
Each RoboCupJunior competition may have its own regulatory statutes to define the procedure of the tournament (for example the superteam system, game modes, the inspection of robots, interviews, schedules, etc.). Regulatory statutes become a part of this rule.

SOCCKER A field



Grafics designed by Ricardo Sampaio

SOCCKER B field



Grafics designed by Ricardo Sampaio

League Regulations 2012

1. Preamble

According to rule 2.7 of the RoboCupJunior Soccer Rules, each league has its own additional regulations. They become a part of the rules.

Soccer will consist of two sub-leagues. This sub-leagues are called “**Open League**” and “**Light Weight League**”. They differ only in the weight of the robots. Each sub-league can be further divided into primary and secondary.

2. Regulations

2.1 Dimensions and limitations

Robots will be measured in an upright position with all parts extended. A robot’s dimensions must not exceed the following limits:

sub-league	Open League	Light Weight League
size / diameter	Ø 22.0 cm	Ø 22.0 cm
height	22.0 cm *	22.0 cm *
weight	2400 g **	1100 g **
ball-capturing zone	3.0 cm	3.0 cm
voltage	15.0 V ***	12.0 V ***

* The handle of a robot may exceed the height.

** The weight of the robot includes that of the handle.

*** Taking into account the way the power packs of a robot are connected (parallel or series), the total nominal output of all power packs and all connected power packs used by a robot cannot exceed 15.0 V for Open League and 12.0 V for Light Weight League. Voltage pumps are not permitted. Each robot must be equipped with accessible terminals to verify the voltage of each power pack unless the nominal voltage is obvious by looking at the robot, its power packs and connections.

Ball-capturing zone is defined as any internal space created when a straight edge is placed on the protruding points of a robot. This means the ball must not enter the concave hull of a robot by more than 3 cm. Furthermore, it must be possible for another robot to take possession of the ball.

2.2 Construction

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

For the construction of the robots any robot kit or building block may be used as long as the design and construction are primarily and substantially the original work of the team. This means that commercial kits may be used but must be substantially modified by the team. It is neither allowed to mainly follow a construction manual, nor to just change insignificant parts.

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

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

2.3 Programming



Robots must be programmed exclusively by student members of the team. Mentors, teachers, parents or companies may 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 presets) or substantial parts of such programs are not allowed.

It is not allowed to use sample programs, not even if they are modified.

2.4 Burden of proof

Proof must be supplied by each team that their robots match these regulations, for example by a detailed documentation or log book. Teams may be interviewed about their robots and the development process at any time during a tournament.

During an interview, at least one member from each team must be able to explain particularities about the team's robots, especially with regards to its construction and its programming. 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.

2.5 Violations

Robots that do not match the above regulations are not allowed to play. If violations are detected during a running game, the team is disqualified for that game. If similar violations occur repeatedly, the team can be disqualified from the tournament.



Technical Specification for pulsed Soccer Ball

1. Preamble

Answering to the request for a soccer ball for RCJ tournaments that would be more robust to interfering lights, less energy consuming and mechanically more resistant, the RCJ Soccer Technical Committee defined the following technical specifications with the special collaboration from EK Japan and HiTechnic.

It is expected that balls complying to this specification will progressively replace the old non-modulated IR light balls used until now, between 2009 and 2010. For 2011, see rule 4.2 of the RoboCupJunior Soccer Rules.

Producers of these balls must apply for a certification process upon which they can exhibit the RCJ-compliant label and their balls used in RCJ tournaments.

Balls with these specifications can be detected using specific sensors from HiTechnic (IRSeeker - information on distance and angle) but also common IR remote control receivers (TSOP1140, TSOP1240, GP1UX511QS, ... - on-off detection with a possible gross indication of distance).

2. Specifications

2.1 IR light

The ball emits infra-red (IR) light of wavelengths in the range 920nm - 960nm, pulsed at a square-wave carrier frequency of 40kHz. The ball should have enough ultra bright, wide angle LEDs to minimize unevenness of the IR output.

2.2 Diameter

The diameter of the ball shall be in the range 74mm - 80mm. A well-balanced ball shall be used.

2.3 Drop Test

The ball must be able to resist normal game play. As an indication of its durability, it should be able to survive, undamaged, a free-fall from 1.5 meters onto a hardwood table or floor.

2.4 Modulation

The 40kHz carrier output of the ball shall be modulated with a trapezoidal (stepped) waveform of frequency 1.2kHz. Each 833-microsecond cycle of the modulation waveform shall comprise 8 carrier pulses at full intensity, followed (in turn) by 4 carrier pulses at 1/4 of full intensity, four pulses at 1/16 of full intensity and four pulses at 1/64 of full intensity, followed by a space (i.e. zero intensity) of about 346 microseconds. The peak current level in the LEDs shall be within the range 45-55mA. The radiant intensity shall be more than 20mW/sr per LED.

2.5 Battery Life

If the ball has an embedded rechargeable battery, when new and fully charged it should last for more than 3 hours of continuous use before the brightness of the LEDs drops to 90% of the initial value. If the ball uses replaceable batteries, a set of new high-quality alkaline batteries should last for more than 8 hours of continuous use before the brightness of the LEDs drops to 90% of the initial value.

2.6 Coloration

The ball shall be neutral in color. In particular, it must not have any green, blue or yellow coloration (to avoid confusion with the colors of the field and goals).

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Kicker Power Check Device

RoboCupJunior Soccer Technical Committee intends to introduce a kicker power check device. The following kicker power check device will be used in the upcoming season on a trial basis. In case this kicker power check device proves itself, the RoboCupJunior Soccer Technical Committee intends to include it into the rules on a mandatory basis in 2013.

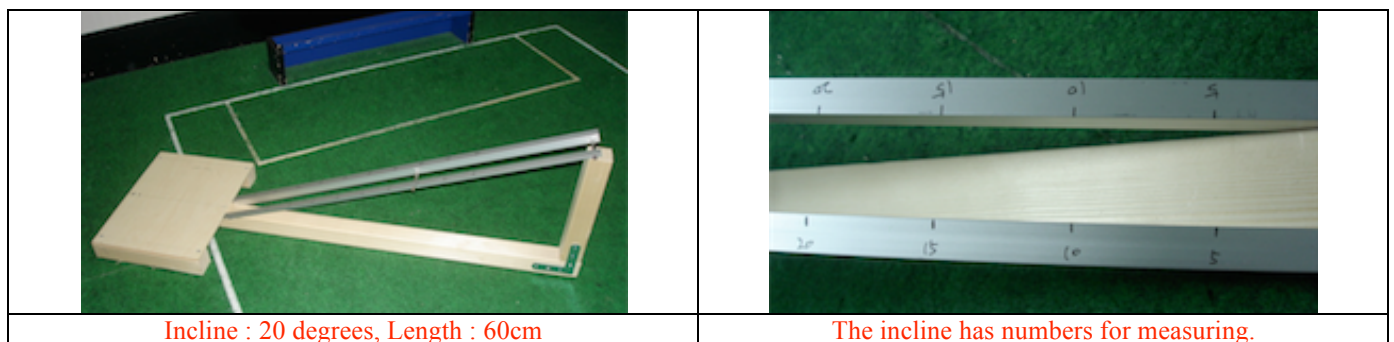
1. Preamble

This kicker power check device can measure the power of the kicker of a RoboCupJunior robot kicker. It is quite easy to build with common materials.

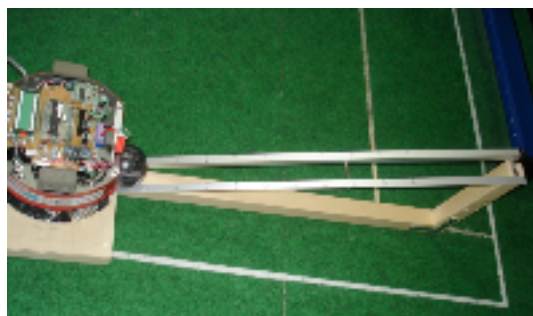
2. Materials

2x2: L=6ft	1	3mm spacers: L=40mm	2
Wood board: 225mmx300mm T=4mm	1	Strap tie L	2
Aluminum angle bars: 15mm L=60 cm	2	Screws	several

3. Overview images



4. Inspection



- 1st step: A Team puts its robot along with a ball on the device (as shown on the photo).
- 2nd step: A Team activates the robot's kicker for a single shot.
- 3rd step: After the shot, an inspector can measure the length of the ball rising on the device.

4. Kicker power limits

The limit of the kicker power has yet to be determined. The upcoming RoboCupJunior competition shall be used to test the kicker power check device and to determine reasonable limits.

However, currently, (at an angle of 20 degrees) a length of 22 cm seems reasonable.