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# **RULES BOOK - L.A.R.C.**

HUMANOID SOCCER LEAGUE

AND

SPL (NAO) SOCCER LEAGUE

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## **2018**

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## **1 VERSION CONTROL**

0.0.0 - First Release.

0.0.1 - Include Images, minor corrections.

0.0.2 - Ball change for humanoid.

0.0.3 - Include Chapter 7; Schedule for Team Leader meeting and Referee Training.

0.0.4 - Updated chairs' names and image of the ball

Current Version is 0.0.4

## 2 INTRODUCTION

### 2.1 ROBOCUP HUMANOID LEAGUE

In the Humanoid League, autonomous robots with a human-like body plan and human-like senses play soccer against each other. The robots are divided into three size classes: KidSize (40-90cm height), TeenSize (80-140cm height) and AdultSize (130-180 cm height). In the KidSize soccer competition teams of four, highly dynamic autonomous robots compete with each other. Dynamic walking, running, and kicking the ball while maintaining balance, visual perception of the ball, other players, and the field, self-localization, and team play are among the many research issues investigated in the Humanoid League.

### 2.2 ROBOCUP STANDARD PLATFORM LEAGUE (SPL)

The RoboCup Standard Platform League is a RoboCup robot soccer league, in which all teams compete with identical robots. The robots operate fully autonomously, i.e. there is no external control, neither by humans nor by computers. The current standard platform used is the humanoid NAO by Aldebaran Robotics(**NAO**).

### 2.3 REGISTRATION, CLARIFICATIONS AND RULES

The team registrations for the Humanoid League and for the Standard Platform League (SPL) will be open **SEPARATELY**. The main idea is to have **TWO** different leagues, as in RoboCup: Humanoid League and SPL.



However, if we have less than THREE teams pre-registered in the leagues Humanoid KidSize and Standard Platform (SPL), ONE unique category will be made, combining the teams from these both categories. This is possible because NAO's height is similar to the height adopted by the robots in the Humanoid KidSize category, which prevent the robots from being damaged. Exceptions will be handled by the organizing committee.

Even if we have only one category composed by SPL and Humanoid KidSize, the awards will be separated by the classification of each team within its category. It means, for example, first, second, third places for humanoids and first, second and third places for NAOs. Also, a first place award is granted for a direct confront between the best humanoid team and the best SPL team, called Mixed category.

Thus, due to the possibility of having one unique league, the field will be unified and adapted. Even if we achieve two competitions (one for Humanoid and another one for SPL) the field will be only one, according to the specifications presented in the rules.

### 3 SETUP OF THE ENVIRONMENT

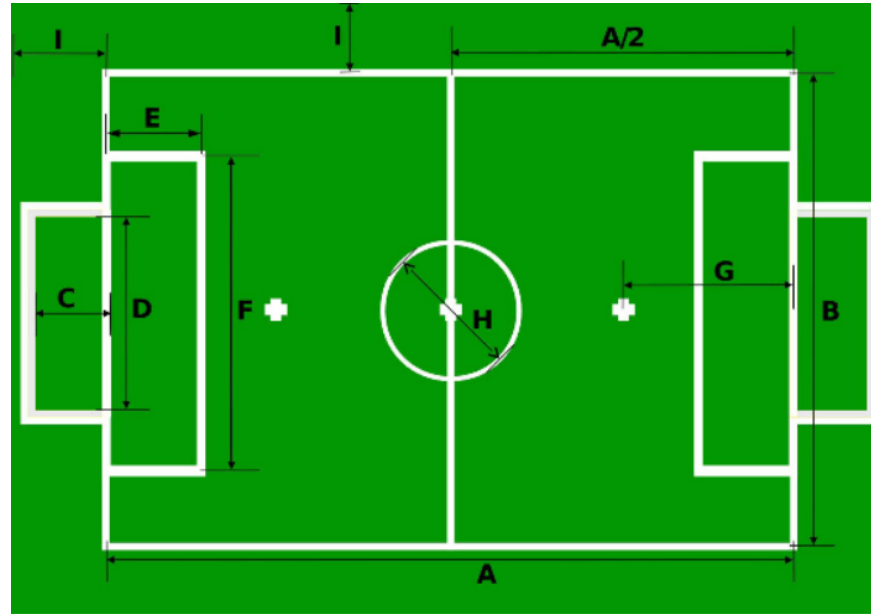
#### 3.1 FIELD CONSTRUCTION

Considering the limitations of this year, only one arena will be set up. If the number of teams increase in the next few years, it will be possible to increase the amount of arenas, also, if more teams join the leagues, maybe in a near future it will be possible to create a different arena for each league, following the RoboCup rules.

The humanoid and the SP league arena is a soccer field which consists of a green carpet mounted on a rectangular, flat wooden base with a total area of length 6.75 m and width 4.50 m.

- a) The field surface will continue for 80cm beyond the limit lines in every side.
- b) The field surface is made of a green carpet or felt.
  - Color is not specified, but it should not be too dark.
- c) The field lines should be painted in white using acrylic paint, matte or glossy, with at least three coats of paint, according to the specifications of the image 1 (A-B-C-D-E-F-G-H)
- d) All lines width must has 50 mm wide
- e) the wooden base must be flat, leveled, plain and hard, with no amendments between boards
  - If there are amendments, be aware that there is no gap between the amendments. For example, if mdf or compensated boards were used, use dowels to join the boards, taking care to avoid unevenness between boards.

Figure 1 – Field Dimensions.



Source: “Adapted from” RoboCup Humanoid Rules(**HumanoidRules**)

Image Quotation	Description	Dimensions (cm)
A	Field Length	675
B	Field Width	450
C	Goal Depth	50
D	Goal Width	180
E	Goal Area Length	45
F	Goal Area Width	260
G	Penalty Mark Distance	135
H	Center Circle Diameter	110
I	Border Strip Width ("a" item)	80 (min.)

### 3.2 GOALS POSTS

- a) The goals should be assembled following orientations of Figures 2 and 3, using 4" PVC tubes, or similar 10cm diameter tubes.
- b) Goal posts must be mainly painted white
- c) Behind the goal should be mounted a wooden frame making possible to fit a net with the dimensions shown in figure 2
- d) The net and a wooden frame to support the goal, must be mounted according to Figures 7 and 8
- e) The wooden frame also serves as a support to keep the goal erect, so it should be bolted, or similarly fixed, to the goalposts
- f) The wooden frame and net dimensions are shown in figure 3
- g) Both net and frame must be colored mainly in dark colors, preferentially black
- h) The net spacing should not exceed 50 mm

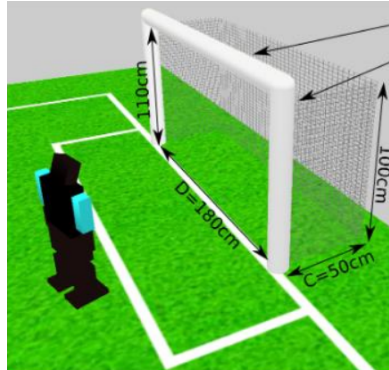
### 3.3 ILUMINATION

The lighting conditions depend on the actual competition site. As the league moves towards natural lighting conditions, the fields will be placed near or under windows where possible.

Local organizers should discuss with the technical committee if additional lighting will be needed to meet the minimum lighting requirements.

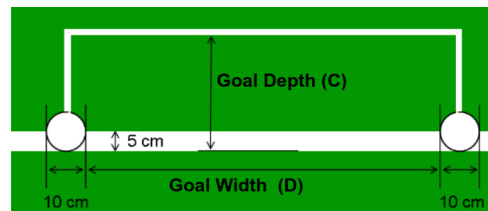
Lighting is not required to be even and hotspots may occur on the fields.

Figure 2 – Goal Dimensions.



Source: "Adapted from" RoboCup Humanoid Rules(**HumanoidRules**)

Figure 3 – Goal Dimensions footprint.



Source: "Adapted from" RoboCup Humanoid Rules(**HumanoidRules**)

Some irregularities may occur and they include sun streaming through windows, light bulbs turning off, light bulbs being replaced, etc.

### 3.4 BALLS

In the past years, only the SPL ball were used in the game for one single combined category, and there are two reasons for that, the first one is the amount of teams forced the organization to use only one ball, and the second one, arises from the fact that Standard Platform Robot NAO has strict limitations for kicking not allowing them to use any other kind of ball.

For the first time, as we reached the minimal quantity of teams, this year there will be two different kinds of balls. One for each league, always following RoboCup rules. Three balls, of each kind of ball, should be made available by the local committee.

#### **3.4.1 Humanoid League**

The Humanoid official ball will be the same used in the RoboCup Kid Size League, i.e. a Adidas 2018 Fifa WorldCup size 1 ball. See Figure 4. Having a circumference of 460 to 480 mm, weighting approximately 200 grams.

#### **3.4.2 Standard Platform League**

The Standard Platform League official ball is the same used in RoboCup SPL and it is a soft foam ball with a black and white soccer ball print. See Figure 5. They are 100 mm in diameter and weigh 44 grams. These balls are available by writing to

info@sportpaint.de (in German or English) and asking to order the "pu schaumstoffball 10cm 100ss". Each ball costs EUR 2.50 plus shipping, where shipping cost depends on the destination. Be warned that these balls usually takes from 2 to 3 months to be delivered.

### **3.4.3 Mixed League**

Due to the SPL robot limitations the mixed category will use the same ball used in SPL as previously cite in section 3.4.2.

Figure 4 – 2018 Fifa WorldCup Ball Humanoid  
League



Source: “Adapted from” [www.addidas.com.br](http://www.addidas.com.br)



Figure 5 – Foam Ball  
Standard Platform  
League.



Source: “Adapted from”  
<http://www.tiffany.com/gifts/baby-gifts/soccer-ball-baby-bank-24598721>

## 4 PLAYERS

In both categories the match will be played by two teams, each consisting of not more than 4 players. At most one player may be designated as goalkeeper, the others are all field players.

Robots participating in the Humanoid League and SPL competitions must act autonomously while a competition is running. No external power supply, teleoperation, remote control, or remote brain of any kind is allowed.

### 4.1 SPL - HARDWARE

All teams must use gray, red, blue, or orange plated NAO humanoid robots manufactured by Soft-Bank Robotics. Absolutely no modifications or additions to the robot hardware are allowed. No additional hardware is permitted including off-board sensing or processing systems. Additional sensors besides those originally installed on the robots are likewise not allowed. A computer will be provided by the event organizers for the purpose of sending GameController messages to the robots. The only exceptions are:

- a) Setting the passive wrist joints to a fixed position either with glue or a transparent or white duct tape.
- b) Protecting the fingers with white finger protectors provided by the manufacturer or with transparent or white duct tape.
- c) A memory stick may remain in the head during operation. Only ordinary USB flash memory keys that sit flush or recessed to the head casing may be utilized. Other USB dongles or devices, as well as memory sticks that are not flush or recessed, are not permitted.

## 4.2 HUMANOID - HARDWARE

Robots participating in the Humanoid League competitions must have a human-like body plan, as shown in Fig. 2. They must consist of two legs, two arms, and one head, which are attached to a trunk.

Robots in humanoid league must be equipped with a handle, to be picked up safely and with no harm to the robot and the handler. The robots must be able to stand upright on their feet and to walk on their legs. Robots need to be able to recover from a fall (get back to a standing position). The only allowed modes of locomotion are bipedal walking, running and jumping. All actions of the robots must be kinematically equivalent to humanoid motions

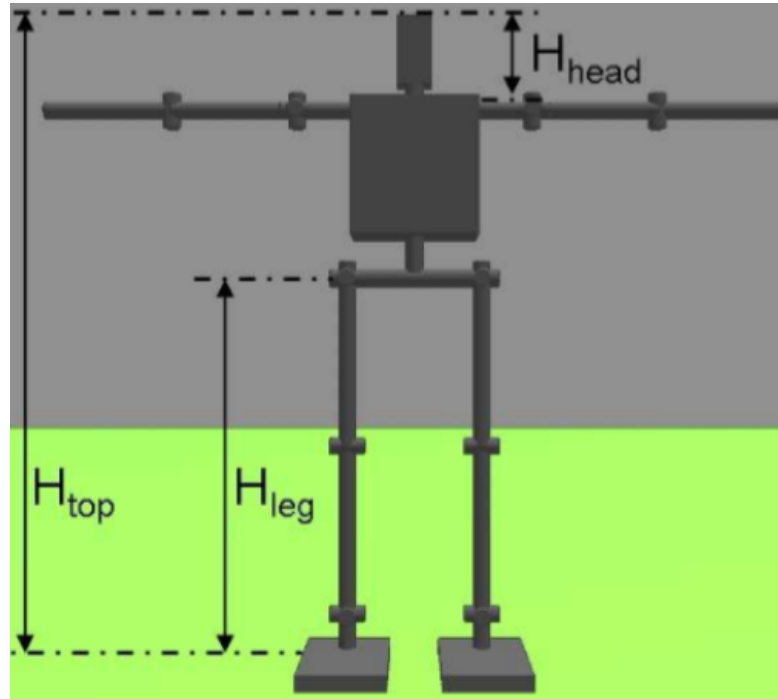
## 4.3 DIMENSIONS RESTRICTIONS

Based on  $H_{top}$ , the following size restrictions apply:  $40cm \leq H_{top} \leq 90cm$  to play in the KidSize class,  $H_{top}$  is defined as the height of the robot when standing upright (with fully extended knees) and  $H_{COM}$  denotes the height of the robot's center of mass, measured in upright posture.

All robots participating in the Humanoid League must comply with the following restrictions:

- a) Each foot must fit into a rectangle of area  $\frac{(2.2 * H_{COM})^2}{32}$ .
- b) Considering the rectangle enclosing the convex hull of the foot, the ratio between the longest side of the rectangle and the shortest one, shall not exceed 2.5 .
- c) The robot must fit into a cylinder of diameter  $0.55 * H_{top}$ .
- d) The robot does not possess a configuration where it is extended longer than  $1.5 * H_{top}$ .
- e) The length of the legs  $H_{leg}$ , including the feet, satisfies  $0.35 * H_{top} \leq H_{leg} \leq 0.7 * H_{top}$ .

Figure 6 – Foam Ball Standard Platform League.



Source: Author adapted from humanoid league 2017

- f) The height of the head  $H_{head}$ , including the neck, satisfies  $0.05 * H_{top} \leq H_{head} \leq 0.25 * H_{top}$ .
- g)  $H_{Head}$  is defined as the vertical distance from the axis of the first arm joint at the shoulder to the top of the head.

- h) The leg length is measured while the robot is standing up straight.
- i) The length is measured from the first 360 rotating joint where its axis lies in the plane parallel to the standing ground to the tip of the foot.
- j) The minimum length of the arm, measured from the first joint, is  $H_{top} - H_{leg} - H_{head}$

The basic compulsory equipment must not have any political, religious or personal statements. A player removing his jersey or shirt to reveal any political, religious or personal statements will be sanctioned by the competition organiser. The team of a player whose basic compulsory equipment has political, religious or personal slogans or statements will be sanctioned by the Latin American Robotic Competition or any other applicable entities.

#### 4.4 SENSORS

Teams participating in the Humanoid League competitions are encouraged to equip their robots with sensors that have an equivalent in human senses.

These sensors must be placed at a position roughly equivalent to the location of the human's biological sensors.

In particular,

- a) The only active external sensor allowed is sound (human-like with respect to volume and frequency) with one loudspeaker on the robot.
- b) The loudspeaker may be placed in the head, neck or trunk of the robot. Any other active sensor (emitting light, sound, or electromagnetic waves into the environment in order to measure reflections) is not allowed.
- c) External sensors, such as cameras and up to two microphones, may not be placed in the legs or arms or the torso of the robots.

- d) They must be placed in the robot's head and above any neck joint.
- e) The number of cameras is limited to a stereo vision setup (i.e., max. 2 cameras with a large overlap) only. Monocular vision is also allowed.
- f) The Field of view of the robots is limited at any time to 180 degrees. This means that the maximum angle between any two points in the overlap of the field of view of all cameras mounted on the robot must be less than 180 degrees.
- g) Also the pan-tilt motion of the head and the cameras mounted on the robot's head is restricted to be more human like not only with respect to the field view but also to the range of motion of 360 the neck joints. Therefore, the mechanism to pan the camera is limited to 270 degree pan, which means  $\pm 135degrees$  from the position looking straight ahead.
- h) The mechanism to tilt the camera is limited to  $\pm 90degrees$  (measured from the horizontal line). Furthermore, if positioned at the center mark the robot may not be able to see both goals in any tilt angle and in any standing or walking posture of the robot. Touch sensors, force sensors, and temperature sensors may be placed at any position on the robot

Sensors inside the robot may measure all quantities representing the local state of the system, including (but not limited to) voltages, currents, forces, movements, accelerations, and rotational speeds. They can be at any position inside the robot. Measurements from earth magnetic field sensors may not be used in the software and - in case of doubt - the code must be made available to members of the Technical Committee for inspection.

#### 4.5 COMMUNICATION (BOTH LEAGUES)

The information of this section regards both leagues, unless stated otherwise.

- a) Robots may communicate only via the wireless network provided by the organizers, which must support the referee box. The total bandwidth of the robots belonging to one team may not exceed 1 Mbit/s.
- b) The robots must not rely on the availability or quality of the wireless network. They must be able to play if the network is not available or of low quality.
- c) Only robots are allowed to communicate by WLAN.
- d) During gameplay, any robot playing the game is only allowed to be connected by Ethernet lan.
- e) No other wireless communication is allowed onsite.
- f) All other wireless hardware must be deactivated. A team may be disqualified if one of the team members violates this rule.
- g) Robots in play may communicate with each other at any time during a game.
- h) Any kind of transmission from an external computer or an out of play robot to the playing robots is prohibited. This implies that any monitoring is only done by receiving UDP communication from the robots using an external computer connected by ethernet LAN to the oficial wireless router.
- i) Sending any direct or indirect transmission from an external computer to the robots has to take place during a timeout or service. That can be done using a wireless or direct cable between the computer and the robot during maintenance of the robot.
- j) Connecting a LAN cable to the robot is automatically considered service.
- k) Any other type of communication with the robot, excluding verbal communication of the robot handler and pressing a button to start or stop the robot's general behaviour, has to be announced to the referee so a service penalty can be given to the respective robot.

- l) If the team does not announce the communication before starting it, an additional 30 second penalty is given to the team.
- m) In case of repeated violation, the referee may take disciplinary actions against the team.
- n) Teams may not use any type of communication, excluding verbal communication, with robots in play.
- o) In case of doubt that a team violates this rule, the code must be made available to members of the Technical Committee for inspection.
- p) During the game an official game controller/referee box will be used. It uses UDP to broadcast information to the robots like elapsed time, current score, game state (ready, set, playing, finished) and the robot-specific penalized state. The source code is open.
- q) The gamecontroller used for humanoid league will be the same as used in RoboCup Kid-Size League or similar made available by RoboCup. The source code of the game controller/referee box is available from <https://github.com/RoboCup-Humanoid-TC/GameController>, see also <https://www.robocuphumanoid.org>.
- r) The gamecontroller used for Standard Platform league will be the same as used in RoboCup SPL or similar made available by RoboCup.
- s) Each team will get a range of IP addresses that can be used both for their robots and their computers. The network configuration (e. g. IP addresses, channels, SSIDs, and required encryption) of the fields will be announced at the competition site. Each team will also be allocated a single UDP port on which broadcast will be permitted. Specifically, a team's port will be 10000 plus that team's GameController number
- t) The return packets must be addressed directly to the GameController PC (i. e. not broadcast) and sent on the GameController return UDP port specified by the symbol *GAMECONTROLLER\_RETURN\_PORT* in *RoboCupGameControlData.h*.



- u) The source distribution of the GameController provides the header file RoboCupGameControlData.h that defines all messages sent by the GameController to the robots.
- v) Teams and their robots must not listen into another team's communication
- w) To encourage teams to use the referee box, 15 seconds advantage is given to teams using the referee box in any stoppage of the game.
- x) In RoboCup SPL is permitted a coach robot, however, for the sake of simplicity, this resource will not be allowed in LARC-SPL.

## 5 REFEREES

The referees and the robot handlers are the only persons that are allowed on the carpeted area (i. e. the field and the border area). Each match is controlled by a main referee who has full authority to enforce the Laws of the Game in connection with the match to which they has been appointed(**Rules**).

To assistance the main referee, a gamecontroller referee and an assistant referee will be nominated. All decisions and acts from both must be announced outloud to the main referee.

The head referee and the assistant referees should wear clothing and socks of black or dark blue color (blue jeans are acceptable) and avoid reserved colors for the ball, the goals, and player markings in their clothing. They may enter the field in particular situations, e. g., to remove a robot when applying a penalty. They should avoid interfering with the robots as much as possible. Before competition begun, the local chair should conduct a meeting with all team leaders to align all rules through a referee training. This training should include Head referee, Assistant referee and Gamecontroller referee.

### 5.1 HEAD REFEREE

The decisions of the referee regarding facts connected with play, including whether or not a goal is scored and the result of the match, are final. The referee may only change a decision on realising that it is incorrect or, at their discretion, on the advice of an assistant referee or the fourth official, provided that they has not restarted play or terminated the match.

The Referee:

- a) Enforces the Laws of the Game

- b) Controls the match in cooperation with the assistant referees and, where applicable, with the fourth official
- c) Ensures that any ball used meets the requirements of section 3.4
- d) Ensures that the players' equipment meets the requirements of chapter 4
- e) Acts as timekeeper and keeps a record of the match
- f) Stops, suspends or abandons the match, at their discretion, for any infringements of the Laws
- g) Stops, suspends or abandons the match because of outside interference of any kind
- h) Stops the match if, in their opinion, a player is seriously injured and ensures that he is removed from the field of play. An injured player may only return to the field of play after the respective penalty time is over (replaces: after the match has restarted)
- i) Allows play to continue until the ball is out of play if a player is, in their opinion, only slightly injured ensures that any player bleeding from a wound leaves the field of play. The player may only return on receiving a signal from the referee, who must be satisfied that the bleeding has stopped
- j) Allows play to continue when the team against which an offence has been committed will benefit from such an advantage and penalises the original offence if the anticipated advantage does not ensue at that time
- k) Punishes the more serious offence when a player commits more than one offence at the same time takes disciplinary action against players guilty of cautionable and sending-off offences. They is not obliged to take this action immediately but must do so when the ball next goes out of play
- l) Takes action against team officials who fail to conduct themselves in a responsible manner and may, at their discretion, expel them from the field of play and its immediate surrounds
- m) Acts on the advice of the assistant referees regarding incidents that they has not seen
- n) Ensures that no unauthorised persons enter the field of play

- o) Indicates the restart of the match after it has been stopped
- p) Provides the appropriate authorities with a match report, which includes information on any disciplinary action taken against players and/or team officials and any other incidents that occurred before, during or after the match

The head referee signals game starts, restarts, and the case of game stuck by a single whistle. In general, the head referee first whistles and then announces the reason for the whistle. The only exception is the case of the kick-off, in which the reason for the whistle is obvious. The whistle defines the point in time at which the decision is made. In case of a local or global game stuck, this is also announced verbally. By two whistles, the head referee terminates the first half; by three whistles he terminates the second half, i. e. the whole game. Goals should be indicated verbally and by the head referee pointing with one arm towards the center of the field. In the penalty kick shoot-out, the head referee keeps the time. Any decision of the head referee is valid. There is no discussion about decisions during the game, neither between the assistant referees and the head referee, nor between the audience or the teams and the head referee. The main referee's decision is final and can not be changed afterwards by video proof. The head referee may decide at any point before or during a game to relocate any objects around the field, or direct persons to another position around the field. The intent of using same-colored goals is to remove artificial landmarks. Robots should be able to localize with the SPL field and its "normal" surroundings. Introducing new team-specific artificial landmarks is against the spirit and intention of the league's progress. The application of this rule needs to be well considered and should be reserved for situations which seem constructed by one team or another, but will ultimately be the head referee's decision alone.

## 5.2 ASSISTANT REFEREE

One assistant referee may be appointed whose duties, subject to the decision of the referee, are to indicate:

- a) If when the whole of the ball leaves the field of play
- b) If which team is entitled to a corner kick, goal kick or throw-in
- c) If when a player may be penalised for being in an offside position
- d) If when a substitution is requested
- e) If when misconduct or any other incident occurs out of the view of the referee
- f) If when offences have been committed whenever the assistant referees have a better view than the referee (this includes, in certain circumstances, offences committed in the penalty area)
- g) If whether, at penalty kicks, the goalkeeper moves off the goal line before the ball is kicked and if the ball crosses the line

In the event of undue interference or improper conduct, the referee will relieve an assistant referee of their duties and make a report to the league chair.

After the end of the game the assistant referee, must proceed to fill the specific form with the results of the game, collecting the signatures from both team leaders and deliver it to the chair as soon as possible.

### 5.3 GAMECONTROLLER REFEREE

The other Assistant referee is responsible to operate the gamecontroller. The appointments of the gamecontroller referee are:

The operator of the GameController sits at a PC outside the playing area. He or she will signal any change in the game state to the robots via the wireless as they are announced by the head referee.

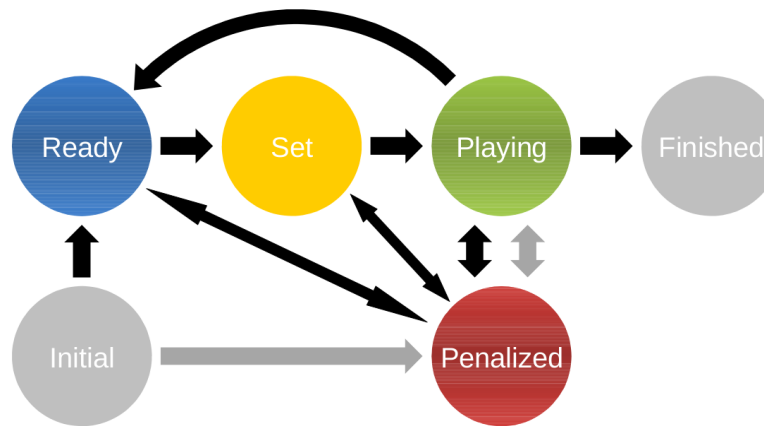
Please note that for the kick-off, the moment of whistling is determining, not the verbal announcement of the head referee. He or she will also inform the assistant referees when a timed penalty is over and a robot has to be placed back on the field. He or she

should announce to the head referee when the ball is in play on kick-off (if this occurs because 10 seconds have elapsed in the playing state) by stating “Ball in Play”. The operator is also responsible for keeping the time of each half, i. e., he or she stops the clock after a goal or game stuck, and continues it at the kick-off. The operator should count using his or her fingers the remaining seconds in a half once the time remaining is 5 seconds or less to the head referee.

The gamecontroller referee must be aware of which robot is being penalized, in order to not impair the team beyond what is been determined by the head referee.

## 6 THE GAME

Figure 7 – Button interface transitions are shown in gray.  
GameController transitions are shown in black.  
However, any transition possible can actually be  
sent by the GameController.



Source: Author adapted from SPL 2017 (SPLRules)

In both leagues, a game consists of three parts, i. e. the first half, a half-time break, and the second half. Each half is 10 minutes counted from the initial kick-off. The half-time break is also ten minutes — during this time both teams may change robots,

change programs, or do anything else that can be done within the time allotted. The teams will change the goal defended during the half-time break.

The game has 3 states, which are ready, set and playing. The initial and finish states are only virtual to those operating the gamecontroller. There is also a 6 state which concerns to the robot.

So the gamecontroller has 6 states, three game states, two virtual ones and one for the robots accordingly to the figure 7, After booting, the robots are in their initial state. The robots are not allowed to be moving in any fashion besides initially standing up. Shortly pressing the chest button will switch the robot to the penalized state.

In ready state, the robots walk to their legal kick-off positions. They remain in this state, until the head referee decides that there is no significant progress anymore (after a maximum of 45 seconds). If the robots cannot listen to gamecontroller or are not able to go to their field positions they can be manually put in the positions conf. ??.

In Set state, the robots stop and wait for kick-off.

In the playing state, the robots are playing soccer

A robot is in penalized state when it has been penalized. It is not allowed to move in any fashion, i. e. also the head has to stop turning.

In both leagues, no humans are allowed on the field while the ball is in play, except robot handlers and referee. Even being able to manipulate de robots inside the soccer field, the robot handler must receive permission from the referee prior to do so. Each team may designate only one person as robot handler. The robot handler of a team may not touch a robot of another team in order to avoid any (unintentional or intentional) damage to that robot.



## 6.1 ALLOWANCE FOR LOST TIME

Allowance is made in either period for all time lost through:

- a) Substitutions
- b) Assessment of injury to players
- c) Removal of injured players from the field of play for treatment
- d) Wasting time
- e) Any other cause

The allowance for time lost is at the discretion of the referee.

## 6.2 PENALTY KICK

If a penalty kick has to be taken or retaken, the duration of either half is extended until the penalty kick is completed.

## 6.3 KICK-OFF

A kick-off is a way of starting or restarting play:

- a) at the start of the match
- b) after a goal has been scored
- c) at the start of the second half of the match
- d) at the start of each period of extra time, where applicable

A goal may not be scored directly from the kick-off. Either the ball must move 20 cm from the kick-off point or must be touched by another player before being kicked into the goal. If the ball is kicked directly into the goal the kick-off is awarded to the opposing team.

Before a kick-off at the start of the match or extra time

- a) A coin is tossed and the team that wins the toss decides which goal it will attack in the first half of the match.
- b) The other team takes the kick-off to start the match.
- c) The team that wins the toss takes the kick-off to start the second half of the match.
- d) In the second half of the match, the teams change ends and attack the opposite goals.
- e) After a team scores a goal, the kick-off is taken by the other team.
- f) All players must be in their own half of the field of play
- g) The opponents of the team taking the kick-off are at least 0.75 m from the ball until it is in play
- h) The ball must be stationary on the center mark
- i) The ball is in play when it is touched or 10 seconds after the referee signal.

#### 6.4 DROPPED BALL

A dropped ball is a method of restarting play when, while the ball is still in play, the referee is required to stop play temporarily for any reason not mentioned elsewhere in the Laws of the Game.

The game is continued at the center mark. A goal can be scored directly from a dropped ball. The procedure for dropped ball is the same as for kick-off, except that the players of both teams must be outside the center circle. The ball is in play immediately

after the referee gives the signal. If a player moves too close to the ball before the referee gives the signal, a kick-off is awarded to the opponent team

#### 6.5 THE BALL OUT OF PLAY

The ball is out of play when it has wholly crossed the goal line or touch line, whether on the ground or in the air, or play has been stopped by the referee

#### 6.6 GOAL

A goal is scored when the whole of the ball passes over the goal line, between the goalposts and under the crossbar, provided that no infringement of the Laws of the Game has been committed previously by the team scoring the goal.

#### 6.7 FREE KICKS (DIRECT AND INDIRECT)

The free kicks will be voted during referee training conf. chapter 5. If applicable, the rules that will be used are the same as the RoboCup humanoid kid-size league.

## 6.8 THROW-IN

In both leagues, a throw-in is a method of restarting play. A throw-in is awarded to the opponents of the player who last touched the ball when the whole of the ball crosses the touch line, either on the ground or in the air. A goal cannot be scored directly from a throw-in.

If the ball leaves the field it will be replaced on the field by the referee or an assistant referee. There is no stoppage in play.

## 6.9 THE THROW-IN FOR SPL

Throw-in lines will be marked (as dots at the end of the throw-in lines and short dashes along the line) by the technical committee at the start of competition with a felt-tip pen — these lines are intended to stay invisible to robots but provide a guide to referees.

These two throw-in lines are 400 mm away from the sidelines and run parallel to them inside the playing area.

Each throw-in line is 7m long. If the ball goes over a sideline then the assistant referee will replace the ball back on the field on the throw-in line on the same side of the field as the ball went out of play. The ball will be replaced on the throw-in line at the farthest back of these two locations:

- a) one meter back from the point it went out or
- b) one meter back from the location of the kicking robot.

We define ‘back’ as being towards the goal of the team that last touched the ball.

Note that if the one meter placement would cause the ball to be placed off the end of the throw-in line, then it should be placed at the end of the throw-in line, and not beyond. If the ball goes over an end-line then the assistant referee will replace the ball back on the field according to the following rules:

- a) If the ball was last touched by the defensive team then the ball is replaced on the closest endpoint of the throw-in line.
- b) If the ball was touched by the offensive team, the ball is replaced on the throw-in line at the farthest back of these two locations: a) one meter back from the location of the kicking robot, or b) at the halfway line.

#### 6.10 THE THROW-IN FOR HL

The positions for replacement of the ball are described in the following with respect to the touch lines and always meant to be in a distance of about 40cm orthogonal to the position on the touch line and inwards to the playing field.

If the whole of the ball passes over a touch line then the assistant referee will replace the ball back on the field on the same side of the field as the ball went out of play. The ball will be replaced in one of three positions:

- a) If the referee cannot determine which robot was the last to touch the ball before it left the field, then the ball is replaced directly in from the point at which the ball left the field.
- b) Otherwise, the ball is placed one meter back from the point it went out, where 'back' is defined as being towards the goal of the team that last touched the ball.

In any case, the ball cannot be placed closer than the length of the goal area to either end of the field. Balls are deemed to be out based on the team that last touched the ball, irrespective of who actually kicked the ball. After placing the ball, the ball is in play immediately.

#### 6.11 THROW-IN FOR MIXED LEAGUE

The throw-in for mixed category will follow the same rules as humanoid league.

#### 6.12 CORNER KICK

A corner kick is a method of restarting play. A corner kick is awarded when the whole of the ball passes over the goal line, either on the ground or in the air, having last touched a player of the defending team, and a goal is not scored.

If the ball leaves the field it will be replaced on the field by the referee or an assistant referee. There is no stoppage in play. If the whole of the ball passes over a goal line then the ball will be replaced back on the field according to the following rules:

- a) If the referee cannot determine which robot was the last to touch the ball before it left the field, then the ball is replaced in about 1 meter distance from the corner of the field
- b) If the ball was last touched by the defensive team then the ball is replaced in a distance of about the goal area length from the closest corner of the field

#### 6.13 MERCY RULE

A game will conclude once the game score shows a goal difference of 10. Ending the game is mandatory once a goal difference of 10 is reached.

## 6.14 PENALTY KICKS

The referee chooses the goal at which the kicks will be taken. The referee tosses a coin and the team whose captain wins the toss decides whether to take the first or the second kick.

Subject to the conditions explained below, both teams take five kicks. The kicks are taken alternately by the teams. If, before both teams have taken five kicks, one has scored more goals than the other could score, even if it were to complete its five kicks, no more kicks are taken. The player performing the penalty kick may enter the goal area. A goalkeeper who is injured while kicks are being taken from the penalty mark and is unable to continue as goalkeeper may be replaced by a named substitute provided his team has not used the maximum number of 2 substitutes permitted.

With the exception of the foregoing case, only players who are on the field of play at the end of the match, which includes extra time where appropriate, or which are suffering from a removal penalty or are currently in service, are eligible to take kicks from the penalty mark.

Only the eligible players and match officials are permitted to remain on the field of play when kicks from the penalty mark are being taken

The robot must be placed at a distance from the penalty mark of  $1.5 * H_{top}$  of the robot which is going to shoot.

The robot has 3 minutes to conclude the penalty shootout. If the ball touches the goalkeeper and stands outside the goal the penalty is over. It is considered a valid goal if the ball touches the goalkeeper and enters the goal.

### 6.14.1 Tie Criteria

There are two situations where the penalties needs to take place:

- a) There was a tie in regular time in the finals
- b) There was a tie in the Round Robin

In both cases there is the possibility of tie after the shootouts. To untie, the following criteria must be followed, consider all penaltys:

1. kick the ball into the goal / scores more often.

If this is a tie:

2. kick the ball into the goal area more often.

If this is a tie:

3. Touch the ball more often.

If this is a tie:

4. After sum up all times of the penaltys, which ended with score, the team which needed less time to score the goals.

If this is a tie:

5. After sum up all times of the penaltys, which ended inside goal area, the team which needed less time to kick the ball into the goal area.

If this is a tie:

6. After sum up all times of the penaltys, which did not enter the goal area nor enter the goal, the team which needed less time to touch the ball

If a tie persists a coin is flipped.



## 6.15 OTHER MATTERS

Other matters are going to be addressed in site during referee training. To be held in the first warm-up day in november, 07, 2017 at 07:00 pm (19h00)

Some of the items that are going to be discussed are Illegal defense, illegal attack and faults.

Please, make sure that your team appointed at least two members for referreing who should be present in the training. It is recommended tha the team leader also participate in the referee training.

Non-attendance to the training implies the irrevocable consent of all decisions that may be taken.

Non-attendance to the training, also does not relieve, the team or the player, of the knowledge of what was decided.

## **7 WINNER AND RANKINGS**

### **7.1 WINNING THE MATCH**

In both leagues the team which scored more goals than the other is the winner of the match.

If the two teams scored the same number of goals, the game will be a draw.

The following points will be given based on the result of each game:

- a) Win = 3 pts
- b) Draw = 1 pt
- c) Lose = 0 pts

### **7.2 LEAGUE SCORING SYSTEM**

The league scoring system adopted will be running points, that is the one of all against all inside each league. The team that scores more points after all games is the champion of that league.

The champion of the Humanoid league and the champion of the Standard Platform League will face each other in the mixed league. In this league only one game will define the champion of the mixed league.

### 7.3 PENALTY SHOOTOUT

If two teams ended up tied after all games i.e. if a team's obtained points is the same as another team's after all rounds, the following evaluations will be applied in order to qualify them.

- a) 1. Penalties according to section 6.14
- b) 2. The difference between goals for and goals against per game
- c) 3. The average goals for per game
- d) 4. Game result between the teams directly

### 7.4 PLAGIARISM

Plagiarism, loosely the unattributed use of other people's words, code, and ideas will not be tolerated by this committee.

The teams and team members that plagiarize other people's work and present it as their own will be disqualified. For a first offense, the team and team members will be banned from LARC for two years (usually the current and next year).

Harsher penalties will be applied to repeat offenders or extremely serious cases of plagiarism. A team may be disqualified at any time for plagiarism, even after the competition has started. LARC will not reimburse teams for any expenses related to their disqualification.