

# **AndroSot (Android Soccer Tournament)**

## **Laws of the Game 2017**

(updated 14/3/2017)

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### **Abstract**

The official version of the rules of the game for AndroSot is modified by the rules of the game for MiroSot as initiated by FIRA President Professor Jong - Hwan Kim and by the rules of the game for 2008 AndroSot as proposed by Professor Bing - Rong Hong. Some comments from Professor Jacky Baltes, the HuroCup Chair, have also been applied to the rules for AndroSot. After the games during FIRA Malaysia Cup 2014-2015, the important changes in this year consisted of (1) unifying the global camera, (2) adopting a new playing field, follow the FIRA World Cup 2015 and (3) defining several controversial issues more clearly. In order to promote the game, a 10-year milestone for AndroSot is proposed as follows:

2011~2017: 3-vs-3. Each team has 3 fully autonomous androids.

2018~2025: 5-vs-5. Each team has 5 fully autonomous androids

\*: The laws has been modified subject to Leaders and Referees of FIRA Malaysia Cup 2017 meeting at PTSB Kulim.



# 1. Setting up the Game

## 1.1 The Field (Appendix A)

### 1.1.1 Playing Surface and Dimensions

- (a) A **black (non-reflective)** flat and hard rectangular playing surface is **carpeted**. The playing field is **320cm x 180cm** (inside on carpet) and surrounded by **5cm** thick and **1.8 cm high white side walls**. All the side walls should be painted in white and fixed to the carpet.
- (b) The playing field should be on a level surface so that when a ball is placed anywhere on the field, it does not start to roll.

### 1.1.2 Markings on the Playing Field

- (a) All lines and markings are set covering with white non-reflective paint.
- (b) All lines are **1.9~2 cm** thick.
- (c) The penalty kick and free kick points are circles of a radius of **5cm**. They should be placed on the center of the penalty line and a point **30cm** away from the center, respectively. The free ball circles have a radius of **3cm** radius and are parallel with the free kick point, with both sides at a **40 cm** distance.
- (d) The center circle has a radius of **30 cm**.

### 1.1.3 The Goal

- (a) The goal is **80 cm** wide.
- (b) There are no posts or nets at the goal.
- (c) The goal is bounded by an **80cm** goal line. The three white walls **5 cm** thick and **2 cm** high have inside lengths of **15 cm**, **80 cm**, and **15 cm**, respectively.

### 1.1.4 The Goal Line

The goal line is a **2cm** thick and **80cm** long line in front of the goal. It can be noted that the front of the line is aligned with the surface of the base side walls.

### 1.1.5 The Penalty Line, Penalty Area, Penalty Kick Point

- (a) The penalty line is **1.9~2cm** thick and consists of a line segment of **80 cm**, which parallels the goal line, two quarter circular arcs of radius **25cm**, and two line segments of **35 cm**.
- (b) The penalty areas are comprised of the area contained by the penalty line and the goal line.
- (c) The penalty kick point is at the center of the penalty line.

### 1.1.6 The Ball

An orange golf ball is used as the ball, which is **42~44mm** in diameter and **40~50g** in weight.

### 1.1.7 The Field Location

The field should be indoors.

## 1.2 Vision and Lighting

1.2.1 The lighting conditions should be within **600~800 Lux** any where on the playing field.

The lighting should be diffused and evenly distributed. Flicker free lighting is recommended.

1.2.2 Both the cameras are unified as the **HD Pro C920 web-camera** made by Logitech in FIRA2015, which was adopted by the Championship of AndroSot game in FIRA2014. The camera is cheaper (its price < 100 USD) but able to provide on board H.264 compression and full 1080p high-definition video recording. The focus, light balance, and frame rates are all excellent, with the latter touching 30 frames per second at 720p and 29 frames per second at 1080p.

1.2.3 The locations of the two team's cameras (unified cameras) should be back to back and restricted to over and above the center of the center circle of the playing field so that the cameras get similar frames and need not be moved after the side change at half time. The location of the over head camera system should be at a height of **3.3m~3.5m** so as to capture the frames over the range of **420cmx 230cm** on the playing field.

1.2.4 Besides the cameras above the playing field, the goal keeper of each team may possess its own camera (the field of view of the camera must be limited to less than **180 degrees**), as shown in **Appendix B**. The image of the camera may be sent via a wireless communication channel as described in [Rule 3.5.3](#) to an off-board computer for processing.

1.2.5 All active distance sensors are disallowed from setting up on the android to measure the relative distances among androids.

## 2. The Overall System and Robots

### 2.1 The Overall system (**Appendix C**)

2.1.1 A match is played by two teams, each consisting of at most three robots, including one goalkeeper.

2.1.2 Each team may prepare one or more android for substitution.

2.1.3 All robots are controlled by off-board computers. (The goalkeeper with its own camera could be fully autonomous).

2.1.4 At most, two designated team members are allowed to access the playing field during a game (if instructed so by the referee), except during timeouts and halftime.

2.1.5 A team must make sure that all necessary equipment to play a match is close to the playing field.

## 2.2 The Robots

2.2.1 The robot should be a biped android.

2.2.2 The height of each robot shall be limited to  $30 \leq H \leq 60$  cm. Each foot must fit into a rectangle of area  $0.035 \times H^2$ . The height of the head, including the neck, should be within  $0.1H$  to  $0.2H$ . The foot length of each robot cannot be greater than 70% of its height. The arm length of each robot cannot be greater than 60% of its height, as shown in **Appendix D**.

2.2.3 The visible part of the robot should be non-reflective black or silver in color.

## 2.3 Color patches

2.3.1 All androids must have (at least) a  $3.5\text{cm} \times 3.5\text{cm}$  solid region of their team color patch, blue or yellow, visible from the top. Note that the team color area must be larger than  $3.5\text{cm}$  in length and  $3.5\text{cm}$  in width. The maximum area of color patch set on the top side of each android is  $7\text{ cm} \times 7\text{ cm}$ .

2.3.2 The team color, either blue or yellow, as assigned by the organizers, will identify the robots on a team. The color assigned to each team must not be changed during the match.

2.3.3 The remaining area of the patch can be any color except orange, yellow, blue, white, or another similar color.

## 3 The Game

### 3.1 Game Duration

3.1.1 The *duration* of a game shall be two equal periods of 7 minutes each, with a half time break of 5 minutes.

3.1.2 If a team is not ready to resume the game after half time, an additional 2 minutes shall be allowed. If the team is still not ready after the second break, that team will be disqualified from the game.

### 3.2 Game Commencement and Progress

3.2.1 At least 60 minutes before the commencement of a game, either the transmission frequency or the color should be decided by the toss of a coin.

3.2.2 Just 5 minutes before the commencement of the game, the kick off and side must be decided by the toss of a coin. The winning team should choose either kick off or side, and the losing team must choose the rest.

3.2.3 At the start of the game, each team must have proper working robots on the playing field as defined in [Rule 2.1](#).

3.2.4 At the beginning of **each half time** and after a goal has been scored, the ball is put at the center point. The attacking team is allowed to position its robots freely in its own half, but only one robot is able to be within the center circle of its own half. Then the defending team can place its robots freely in its own half except within the center circle. With a signal from the referee, the game is (re) started and all robots may move freely. The ball should be kicked out of the center circle ~~or passed towards the teammates first~~. If this is not done, the kick-off must be repeated. The defensive team is not allowed to enter the center circle until the ball has been moved by the team at the kick-off or until the contest has already resumed for **10 seconds**. If the kick-off is done incorrectly again, a free kick will be called in favor of the other team.

3.2.5 After the halftime, the teams have to change sides unless both teams agree not to change sides.

### 3.3 Winning

3.3.1 The Winner: A goal is scored when the center of the ball passes over the goal line.

This means that a goal is scored when the ball has touched the black area behind the gold line, as shown in the figure below.



The winner of a game shall be decided by the number of goals scored.

3.3.2 The Tiebreaker:

- (a) If the tournament rules call for a tie breaker, it will be resolved as follows:
  - 1) In the event of a tie after the second half, the winner will be decided by the sudden death scheme ("Golden Goal"). The game will be continued after a **5-minute-break** for a maximum period of **3minutes**. The team managing to score the first goal will be declared the winner.
  - 2) If a tie persists even after the extra **3minutes**, the winner shall be decided through penalty kicks.

- (b) Each team takes three penalty kicks, which are carried out as per [Rule4.5](#). The only differences to this rule are that
- 1) Only a kicker and a goalkeeper are allowed on the playground.
  - 2) The kicker can try to score within **30seconds**, until the ball is touched by the goalkeeper, or until the ball enters the goal area.

### **3.4 Interruptions**

The game is interrupted whenever the referee blows the whistle. The human operator must then stop the communication between the robots and the host computer.

**3.4.1 Relocations:** Relocation of androids may be done by a human operator only during

- a) timeouts, halftime, and foul as described in [Rule4](#). All androids must be relocated within **10 seconds** after the whistle.
- b) When a robot falls down and is unable to stand up on its own for more than **10 seconds**, or the robot does not move for more than **10seconds** and has obstructed the opposing robots, the referee instructs a team handler to remove the robot and repair it if necessary. A repaired or substituted robot can re enter the match by being placed at the center line facing outwards. The robot can start moving after a minimum delay of **30 seconds**.

**3.4.2 Timeouts and Substitutions:** Four time outs with a maximum combined duration of **8 minutes** will be permitted for each team while a game is in progress. During timeouts and at half time, unlimited substitutions can be made. When a timeout is desired while the game is in progress, the concerned team should call 'time-out' to notify the referee, then the referee will stop the game at an appropriate moment. The game will restart with a freeball on the side of the concerned team if a timeout has been called during the game.

### **3.5 Transmissible Information**

**3.5.1** While the game is not in progress, the teams may transmit any information to and from the robot that they wish. Upon commencement of the game through the referee, the teams may send a start signal to their robots. If the referee interrupts or ends the game, the teams must immediately send a stop signal to their robots.

**3.5.2** While the game is in progress, humans must not interact in any way with the system under any circumstances. The system must send and receive any information to and from the robots autonomously during that time.

**3.5.3** The robots can be controlled by use of the following wireless communication: [Bluetooth](#), [802.11](#), [1.8G](#), [WiFi](#), [ZigBee](#), [40MHz](#), and/or [750MHz](#). Before the game starts, all the team must notify the referee of the working frequency of the wireless module on all of the robots (the controllers). If the team uses FM radios, the team must prepare

reserved channels to avoid the influence of frequencies interfering with each other.

## 4. Fouls

### 4.1 Advantage

The referee may decide not to call a foul if the fouled team has an advantage.

### 4.2 Free-Ball

4.2.1 The referee will call a free-ball when

- a) a robot is colliding with another robot of the opposing team, either intentionally or otherwise: the referee will call such fouls that directly affect the play of the game.
- b) a stalemate occurs for **10 seconds** outside of **the penalty area**. For this rule, a stalemate occurs when no robot is touching the ball or if two or more opposing robots are blocking the ball. **No free ball given if the robot within 90 degree open angel forward with the ball (consider robot approaching the ball)**

4.2.2 When a free ball is called within any quarter of the playing field, the ball will be placed at the relevant **free ball position (FB)**. One android per team will be placed at locations **25cm** apart from the ball position in the longitude in al direction of the playground. Other androids can be placed freely outside of the quarter where the free ball is being called. The game shall resume when the referee gives the signal and all robots may then move freely. (**Appendix E**)

### 4.3 Free Kick

4.3.1 The referee will call a free kick when

- a) a defender robot intentionally pushes an opponent robot who possesses the ball, or when it affects the game, a free kick will be given to the opposing team. This does not apply to normal fights for the ball.
- b) a robot is ramming an opponent robot in a way that might cause damage to it, no matter if the offending robot is playing the ball or not.
- c) any robot other than the goalkeeper catches (including with hands) the ball but its position is not on its goal line. This is also true if one or more robots of the same team block the ball for more than **10seconds** without the influence of the other team.
- d) a goal keeper fails to kick out the ball from its penalty area within **10 seconds** (unless blocked by the other team, in which case, it is a goal kick, [Rule 4.4](#)).

4.3.2 The ball will be placed at the relevant FK position of the half where the called foul happened but outside of the penalty area (as in case1and case 2 in **AppendixF**.)

Besides, the ball will be placed at the relevant FK-line point parallel to the location where the called foul occurred inside of the penalty area (as in case 3 in [Appendix F](#).)

- 4.3.3 All androids except the android taking the free kick must be placed outside of a 25 cm radius circle around the ball position. When positioning robots, all other game rules still apply. The defending team gets precedence in placing its androids. Upon the restart of the game by the referee, no robot may move into the 25cm circle before the ball has been moved or before the contest has already resumed for 10 seconds.
- 4.3.4 If the free kick cannot be accomplished twice because of illegalities on the part of the defending robots, the referee may call a penalty kick instead of a free kick. ([Appendix F](#))

#### 4.4 Goal Kick

- 4.4.1 The referee will call a goal kick when
- a) a robot is charging the goal keeper by touching or directly or indirectly blocking or pushing (with and without the ball in between) while the goalkeeper is inside its goal area.
  - b) a team is attacking with more than one android in the goal area (including touching the line) of the opposing team for over 10 seconds.
- 4.4.2 During the goal kick, only the goal keeper will be allowed within the goal area, and the ball can be placed any where within the goal area. Other androids on the team shall be placed outside the goal area during the goal kick. The defending team will get preference in positioning its androids within its own side of the playing field. The attacking team (i.e., the team performing the goal kick) can then place its androids anywhere on the playing field. The game shall normally restart with the referee's whistle. ([Appendix G](#))
- 4.4.3 If a goal kick cannot be accomplished twice because of a similar situation as described in [Rule 4.5.1\(b\)](#), the referee may call a free kick at the relevant FK position of the half for the opposite instead of the goal kick.

#### 4.5 Penalty Kick

- 4.5.1 The referee will call a penalty kick when
- a) a team is defending with more than one android on the goal line (touching the line) of the team for over 10 seconds. An exception to this is the situation when the additional android on the goal line is not there for defense or if it does not directly affect the play of the game. The referee shall judge the penalty kick situation.
  - b) someone is repositioning the robots without the referee's permission during the game.

- c) a robot is handling when it is on its goal line. Handling, as judged by the referee, is when a robot other than the goal keeper catches the ball and the robot is on its goalline. It is also considered handling if a robot firmly attaches itself to the ball in such a way that no other robot is able to manipulate the ball.
- e) the goalkeeper is considered to block more than **40 cm** of its goal line for more than **10 seconds**.
- f) During the game, if without any referee's allowance, any operator of the team is prohibited from touching the mouse or sending any control command to the control systems; also, sending or causing disturbance signals to the opposing side is prohibited. If the team has committed such a violation for the first time, the opposing side will be awarded a penalty kick; for the second time or later, the opposing side will be awarded a goal each time.

4.5.2 When the referee calls a penalty kick, the ball will be placed at the relevant penalty kick position (PK) on the playing field (**Appendix H**). The android taking the kick shall be placed behind the penalty kick mark. The defending goal keeper is placed in an upright position at the middle of its goalline, facing the kicker. It must remain upright on the goal line until the ball has been touched. Other androids shall be placed freely within the other side of the half-line and will be able to move over the center line only after the ball has been moved or after **10 seconds** have passed. The android taking the penalty kick may kick or dribble the ball.

4.5.3 If the goalkeeper falls or leaves the goalline before the kicker touches the ball, a penalty-kick is performed within **10 seconds**. If the kicker scores a goal, the penalty kick ends; otherwise, the referee will restart the penalty kick. If the goal keeper falls or leaves the goal line before the kicker touches the ball (within **10 seconds**), again, the kicker will be awarded a technical goal.

4.5.4 If the penalty kick cannot be accomplished twice because of the early entrance of the attacking side in [Rule4.5.2](#), the referee may call a goal kick for the opposing side instead of a penalty kick.

#### **4.6 When It's Not A Foul, However**

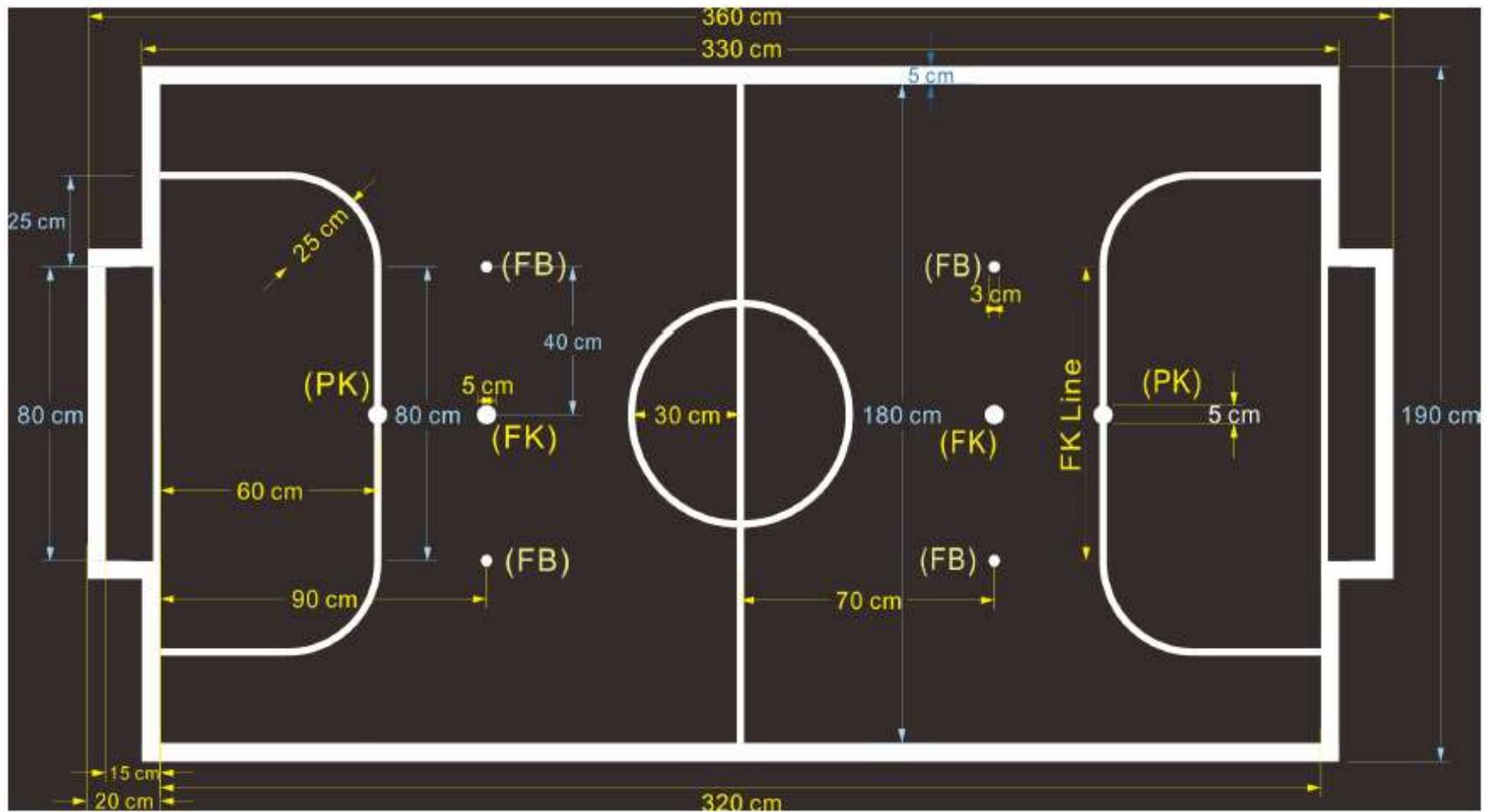
4.6.1 It is permitted to kick the ball and an opponent player backwards provided the pushing player is always in contact with the ball,

4.6.2 when the situation is caused by the opposite team, and

4.6.3 if the situation has no effect on the game whatsoever. It is for the referee to judge such situation



## Appendix A

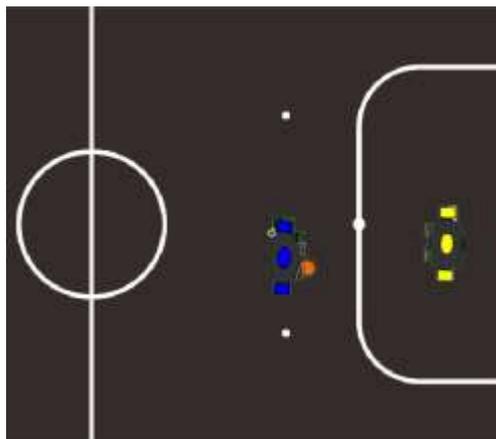
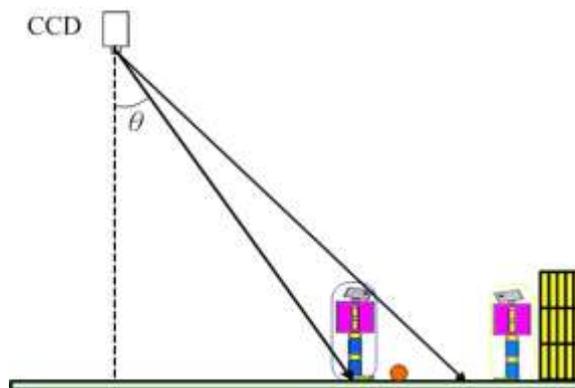


- (1) FB- FreeBall positions    (2) FK -Free Kick positions    (3) PK- Penalty Kick positions  
(4) FK Line –The free ball/kick position will be placed at the respective position in the line when a foul occurs inside the penalty area.

## AppendixB

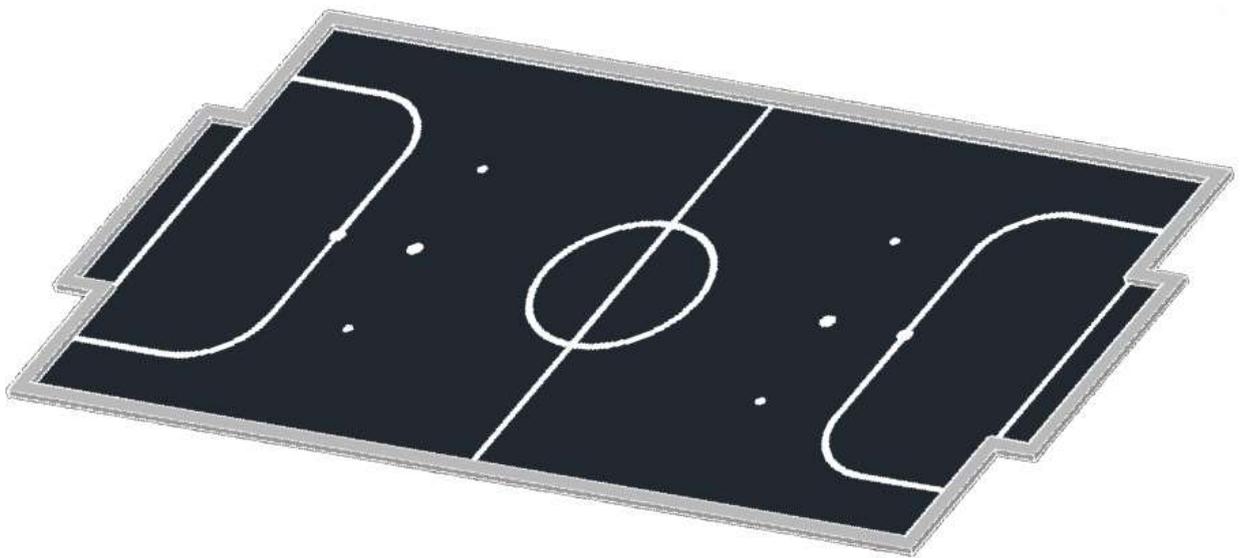
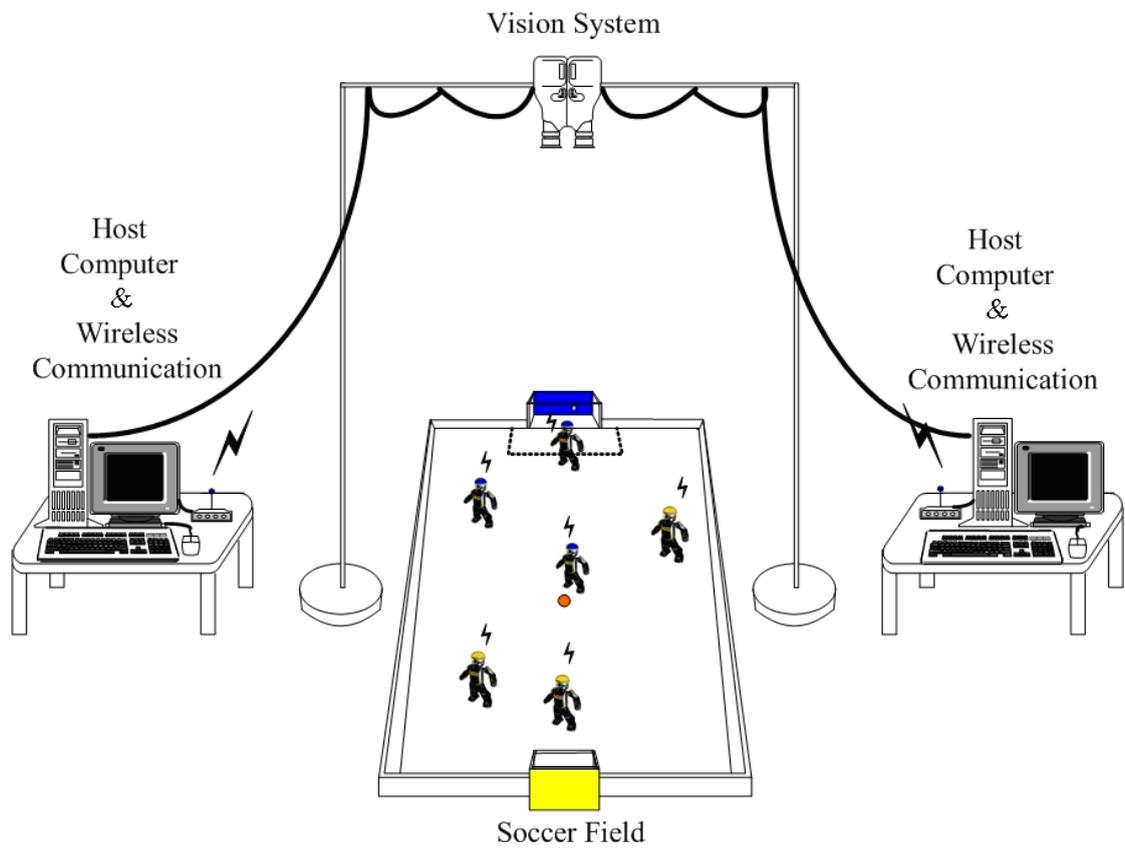


The appearance of the camera Logitech HDProC920



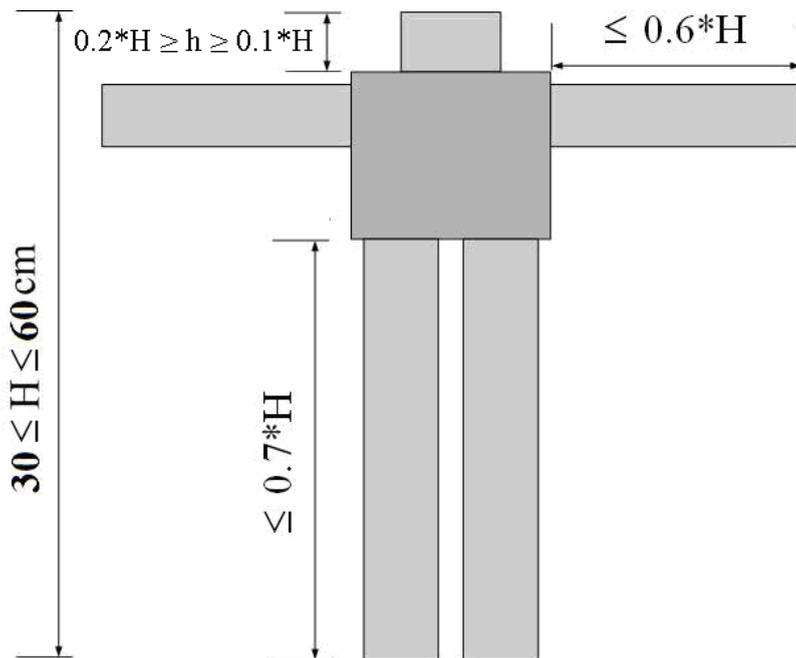
In some cases, the above camera cannot find the ball. The goal keeper of each team may possess its own camera.

## Appendix C



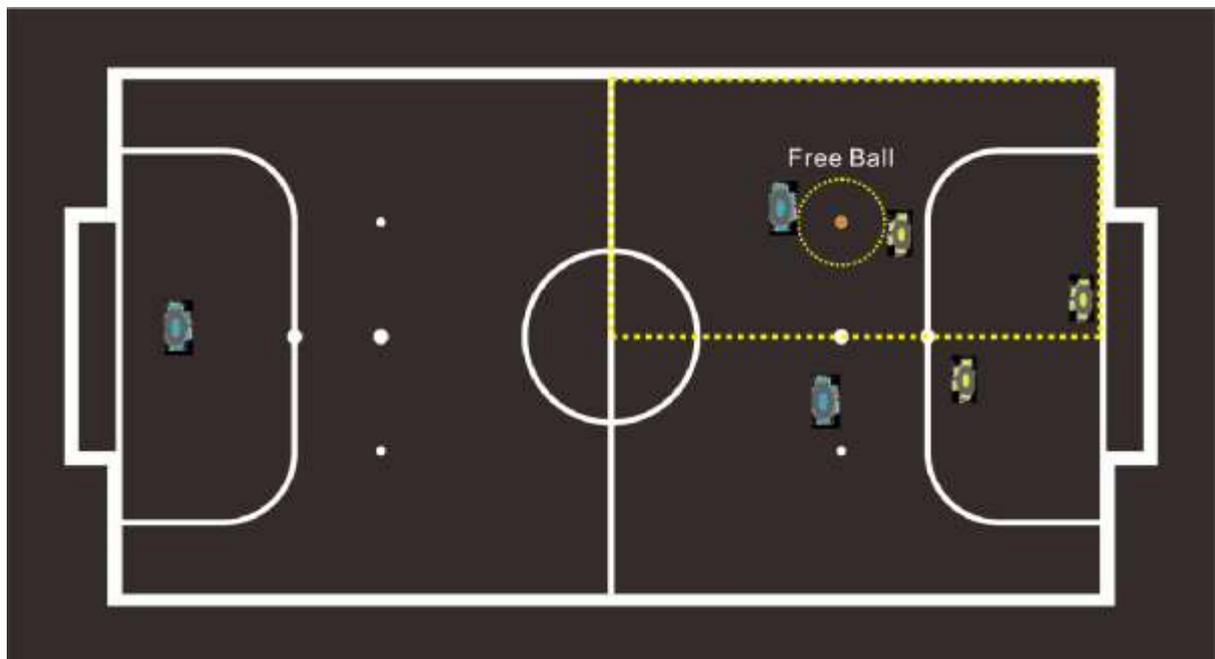
The stereo view of the soccer field

## AppendixD



## AppendixE

### Free Ball



While the free ball is judged, the ball will be assigned at the relevant FB point of the first quarter and both the teams' robots are starting outside the circle of radius 25cm to kick.

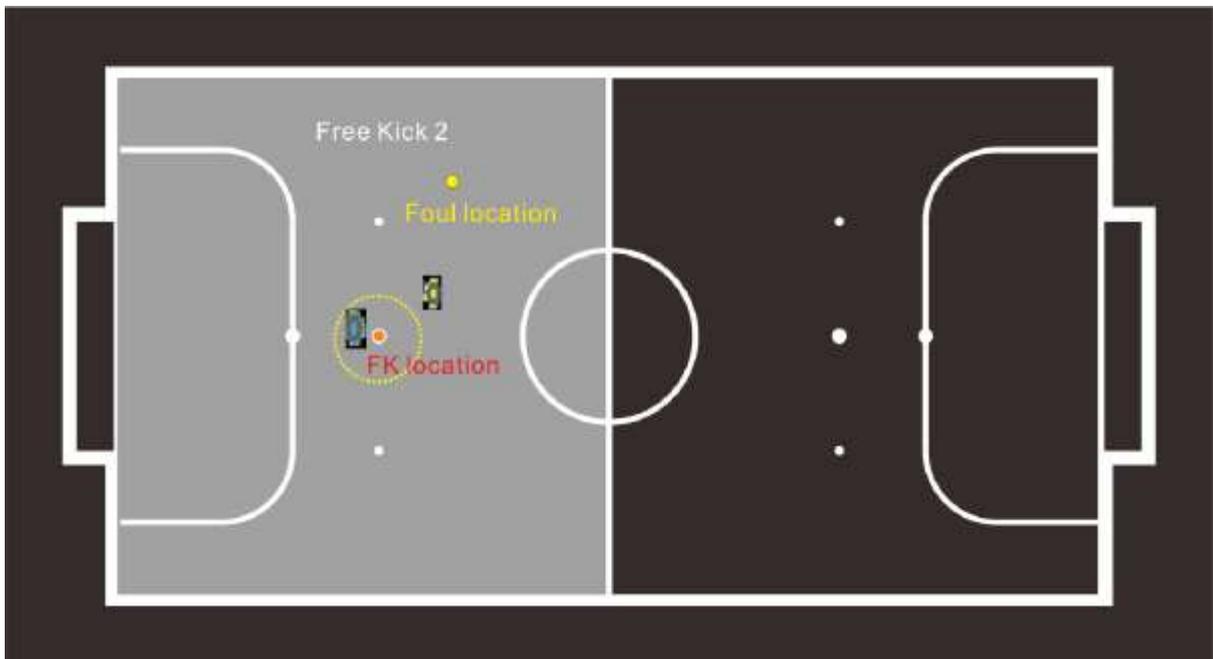
## Appendix F

### Free Kick (1/2)

#### Case 1



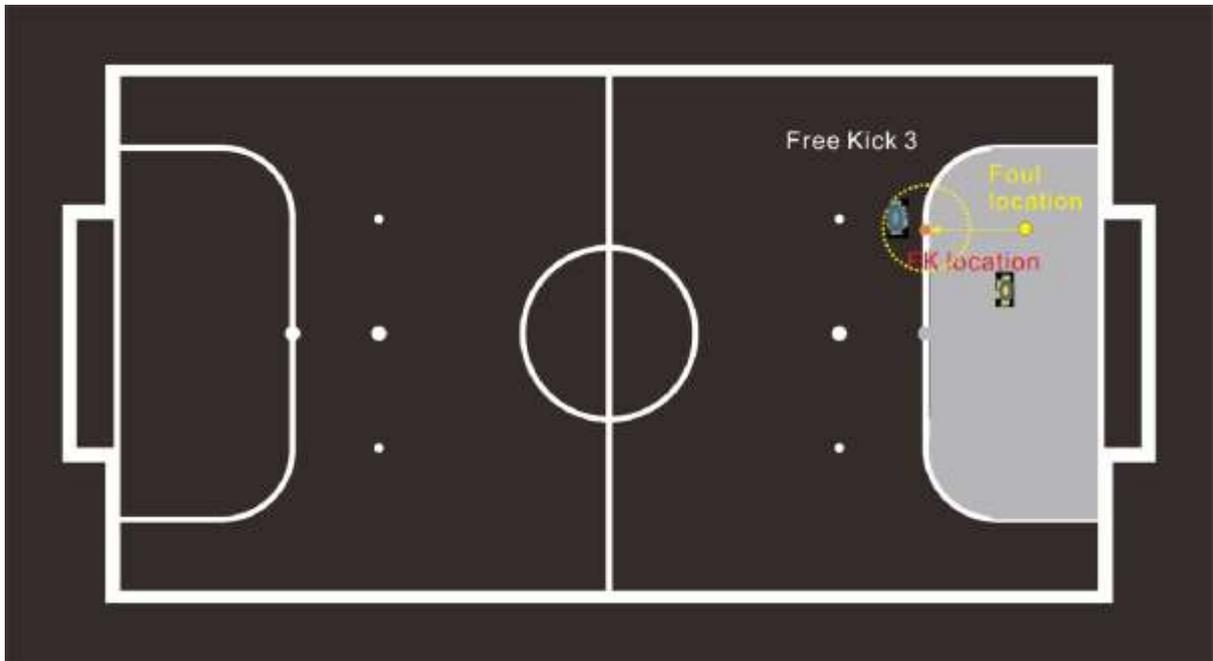
#### Case 2



If the free kick is judged based on a foul location **outside the penalty area**, then the ball will be assigned at the relevant FK point of the first half and the defense team's robots start outside the circle of radius **25cm** to kick.

## Free Kick (2/2)

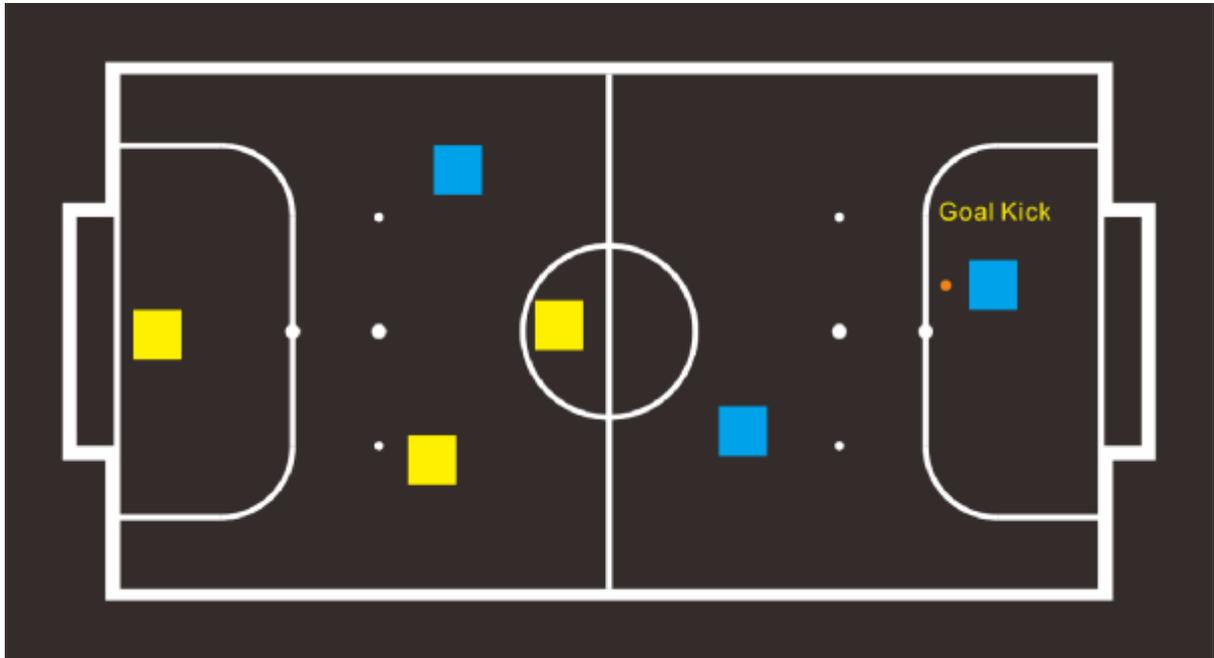
### Case 3



If the free-kick is judged based on a foul location **inside the penalty area**, then the ball will be assigned on the relevant FK-line point parallel to the first location and the defense team's robots start outside the circle of radius **25cm** to kick.

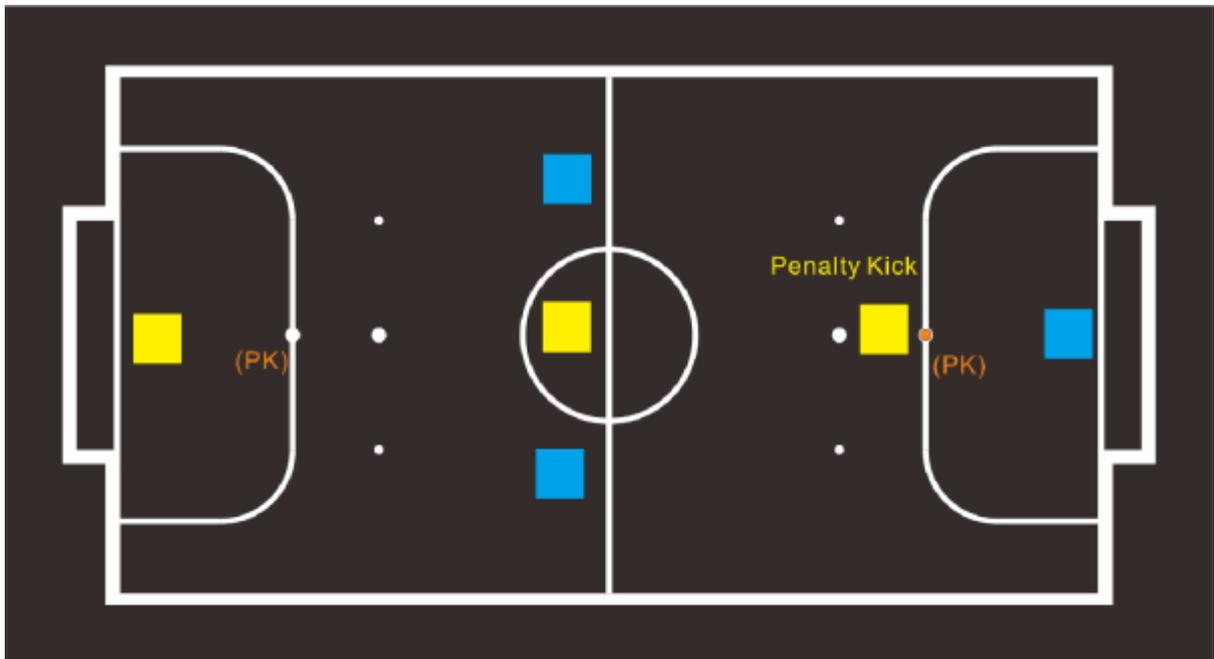
## Appendix G

### Goal Kick



## Appendix H

### Penalty Kick



# **AndroSot Challenge Laws of the Game 2017**

(updated 14/3/2017)

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## **Abstract**

The official version of the rules of the game for AndroSot Challenge is based on the concepts from the HuroCup games. The primary idea came from Professor Tzoo-Hseng Steve Li in 2011. Some comments from Professor Kuo-Yang Tu, the FIRA 2011 General Co-Chair, have also been applied to the rules for AndroSot Challenge. The Challenge games aim to promote the abilities of attack and defense in androids and also consist of several tasks such as dribbling, obstacle avoidance, shooting, trajectory detection, goalkeeping, role arrangement, and positioning control. There are two challenge events in FIRA 2016 which are:

1<sup>st</sup> challenge event–Dribble and Attack

2<sup>nd</sup> challenge event–Free Kick

\*: The laws has been modified subject to Leaders and Referees of FIRA Malaysia Cup 2017 meeting at PTSB Kulim.

# 1. Setting up the Game

## 1.1 The Field ([Appendix A](#))

The challenge events are executed on the same field as the AndroSot game. Please refer to the AndroSot game laws for a description of the field. In addition, please take note of the areas and labels in [Appendices A-1 and A-2](#).

## 1.2 Vision and Lighting

All definitions are the same as those in the AndroSot game. Please refer to the AndroSot game laws for a description of the field. All active distance sensors are disallowed for setting up on the android to measure the relative distances between androids.

# 2 The Overall System and Robots

## 2.1 The Overall System

2.1.1 A challenge is played by a team once, each challenge consisting of two robots/one robot in the first/second challenge event, respectively.

2.1.2 Each team may prepare one more android for substitution.

2.1.3 All robots are controlled by off-board computers. (Exception: The goal keeper used in the [2<sup>nd</sup> challenge](#) can be fully autonomous).

2.1.4 At most, two designated team members are allowed to access the playing field during a game (if so instructed by the referee), except during timeouts and half time.

2.1.5 Each team should make sure that all necessary equipment is close enough to the field.

## 2.2 The Robots

2.2.1 Every robot has to meet the standards of the AndroSot game.

2.2.2 Obstacle Robots:

(a) There are two obstacle robots placed on the dotted line area ([Appendix A-1](#)), where each robot is placed in a different area, respectively, during the [1<sup>st</sup> challenge](#) event. In addition, there is one goal keeper placed on one of three given positions in the goal area ([Appendix A-2](#)) during the [2<sup>nd</sup> challenge](#) event.

(b) The locations of the robots are decided and fixed by the referees for each task. Every team will get the same assignment.

(c) After each task, the referees will reassign the positions of the obstacle robots for the next task.

2.2.3 Playing Android:

(a) Each team can only assign the same androids whenever doing every task. However, it is permitted to replace the bench android [once](#) for the next tasks during a challenge.

(as [Challenge Rule 2.1.2](#))

(b) The android needs to be [controlled by off-board computers](#) and start from the preset position for every task.

## 2.3 Color patches

2.3.1 All androids must have an area (from [3.5x3.5cm](#) upto [7x7cm](#)) on which to place their team color patch, which has to be visible from the top as well.

2.3.2 The team color is always [blue](#) in the AndroSot Challenge games. The color [yellow](#) will be assigned to the obstacle robots during the [1<sup>st</sup> challenge](#) event.

2.3.3 The remaining area of the patch can be any color except [orange, yellow, blue, white, red,](#) or another similar color.

## 3 The Game

### 3.1 Game Duration

3.1.1 Each challenge will have [6 tasks](#) in the [1<sup>st</sup> and the 2<sup>nd</sup> challenge](#) events, respectively.

The total duration of each challenge ([at most 6 tasks](#)) for a team is [10 minutes](#).

3.1.2 During the same task or section for every team's challenge, all the androids and the systems are [disallowed from](#) tuning ,modifying, setting up, debugging, or changing components.

### 3.2 Game Commencement and Progress

3.2.1 [20 minutes](#) before each challenge event, each team will get the same assignment.

3.2.2 At the start of the game, each team must have proper working robots on the playing field as defined in [Challenge Rule 2.1](#).

3.2.3 During every challenge event, [only one bench android](#) can be substituted in by a team.

If the team has no proper android to perform the challenges, the undone tasks will score zero.

3.2.4 At the beginning of each challenge, the referee shall blow the whistle. The robots are disallowed from moving before the whistle. If the task is done incorrectly, the task is regarded as having failed.

3.2.5 When a task has been started and performed, if done without any referee's permission, all operators of the team members are prohibited from touching the mouse or sending any control command into the control systems; besides, sending or causing disturbance signals for the opposing side is also prohibited. If any team has committed such a violation for the first time, the task will be stopped and the score will be zero; for the second time or more, the team will be dropped from the challenge.

### 3.3 The 1<sup>st</sup> Challenge Event – Dribble and Attack task

3.3.1 In the 1<sup>st</sup> challenge event, each team must assign two androids to challenge the tasks.

3.3.2 There are three starting points on the field, as shown in [Appendix A-1](#). The team can start its tasks **twice** at every point. The total duration of all tasks (**at most 6 tasks**) is **10 minutes** for each team.

3.3.3 For each task, **the 1<sup>st</sup> android** is placed **15cm** away from the preset ball and facing the goal; **the 2<sup>nd</sup> android** is placed at one of the other two ball positions by a draw before the task. However, after the draw, the referee will not at first announce the result. At first, the challenge team needs to run the programs in which it shall add enough idle time (**10 seconds or more**) in the beginning section, then the referee will announce the result of the draw to prompt the team to place **the 2<sup>nd</sup> android** at the set position. Ongoing, the androids will go and kick by off-board computers without other inputs, and **the 1<sup>st</sup> android** has to kick the ball after the placement within **20 seconds**.

3.3.4 The team can repair or test the android or the system **but the time still is counted continuously**.

3.3.5 The team members can decide on the order of the **6 tasks** by themselves.

3.3.6 If one of the following cases occurs, the task is finished:

- (a) the ball enters the goal area,
- (b) the duration of the challenge is over,
- (c) the android touches any obstacle robot,
- (d) the ball has passed all the obstacle robots but **the 2<sup>nd</sup> android** still hasn't touched the ball,
- (e) there is no proper android to enter the challenge,
- (f) any prohibited behavior occurs.

3.3.7 **The 1<sup>st</sup> android** has to first kick or dribble the ball away at least **10cm** from the starting point, and then only **the 2<sup>nd</sup> android** is allowed to dribble, pass, kick, and shoot the ball into the goal.

3.3.8 **The 2<sup>nd</sup> android** can kick, dribble, shoot, or perform any action if it does not meet [Challenge Rule 3.3.6](#).

3.3.9 If the team does not prohibit [Challenge Rule 3.3.7](#) or [Challenge Rule 3.3.6 \(c\),\(d\)](#), while the ball passes the obstacle robots and/or enters the goal area, the team scores a goal. The referee or assistant records the accomplished time, which will be rounded off to **the nearest tenth in seconds**.

3.3.9 Scoring:

- (a) After **the 1<sup>st</sup> android** kicks and dribbles the ball away at least **10 cm** from the starting point and **the 2<sup>nd</sup> android** then touches the ball, the team will score **10 points**.
- (b) After the success of (a), while the ball is kicked by **the 2<sup>nd</sup> android (only)** and passes any obstacle robot, it scores **another 10 points for each pass ( 20 points total at most)**. It

can be noted that the passes are only counted from the location where the 2<sup>nd</sup> android has caught the ball.

(c) After the successes of (a) and (b), when the ball enters the goal area successfully, it scores **another 20 points**.

(d) The accomplished time is recorded but for no additional points, just for counting the total duration.

### **3.4 The 2<sup>nd</sup> challenge event – Free Kick task**

3.4.1 In the 2<sup>nd</sup> challenge, each team can only assign one android to do the task.

3.4.2 There is only one starting area, which is inside the center circle. There are **3 freekick points** on the field on which to place the ball, as shown in [Appendix A-2](#).

3.4.3 There is an obstacle robot placed at one of the left, the center, or the right sections in front of the goal.

3.4.3 The android has **2 tasks to shoot the ball from the starting point of the draw** facing the obstacle robot placed at the same section. This means the obstacle robot is fixed and decides on the relevant position of the ball for each task, respectively, by drawing. A draw will result in two selected positions of the ball from **9 possible combinations such as 1 1, 1 2, 1 3, 2 1, 2 2, 2 3, 3 1, 3 2, and 3 3**. If the combination **1 3** is selected, it means the team will free kick the ball at **the 1<sup>st</sup> position** first and then free kick the ball facing the ball at **the 3<sup>rd</sup> position**. However, the result of the draw must be kept by the referee and announced according to [Challenge Rule 3.4.4](#).

3.4.4 Before the start, the team places its android within the center circle and draws the position of the ball (**not yet announced**) first, then runs the program (**the first 10 seconds or enough duration of the program should be designed as idle**). Next, the referee announces the result of the draw to prompt the team to place the ball at **the set position**, then finally the android goes and kicks using **off-board computers without other inputs**. The android has to kick the ball within **20 seconds** after the ball placement. However, in each task, the android is only allowed to **kick the ball once**.

3.4.4 For each task, the off-board program has to wait enough time (**10 seconds or more**) on the ball decision. Each team can perform **6 tasks** mainly, with a total duration of **10 minutes**. With the permission of the referee, the team can repair or test the android or the system, **but the time is still counted continuously**.

3.4.5 The team members can decide on the order of the three obstacle challenges by themselves.

3.4.6 If one of the following cases occurs, a task is finished:

- (a) the ball stops on the field,
- (b) the ball enters the goal area,
- (c) the ball touches the side walls,

- (d) the duration of all the tasks is over,
- (e) the android kicks the ball two or more times,
- (f) there is no proper android to enter the challenge,
- (g) any prohibited behavior occurs.

### 3.4.7 Scoring:

The score for each successful free kick (kicking away the ball) is 20 points, and the score for each goal is 30points. This means the total scores for a task are 50points mainly. An example is tabulated in [Table 3.4.1](#).

Table 3.4.1 The total scores of different cases after 2 tasks facing the left position obstacle Case 1 (the ball pos. are 1,3 by drawing)

Position L(obstacle robot)	Touch ball	Goal	Score
(ball pos. 1) 1 <sup>st</sup> Task	O (20)	X	20
(ball pos. 3) 2 <sup>nd</sup> Task	X	X	0
Total Score of Pos. L			20

Case 2 (the ball pos. are 2,2 by drawing)

Position L(obstacle robot)	Touch ball	Goal	Score
(ball pos. 2) 1 <sup>st</sup> Task	O (20)	X	20
(ball pos. 2) 2 <sup>nd</sup> Task	O (20)	O (30)	50
Total Score of Pos. R			70

### 3.5 Winning

#### 3.5.1 The Winner:

In each challenge event, there are different objectives for scoring. However, the winner of each challenge event shall be decided on by the total score.

#### 3.5.2 In a tie:

In both challenges, if there are two or more teams in a tie, the team that accomplishes all the tasks in the shortest time total will be the winner.

### 3.7 Interruptions

The game is interrupted when ever the referee blows the whistle. The human operator must then stop the communication between the robots and the host computer.

3.7.1 When a robot falls down and is unable to stand up on its own for more than 10 seconds, or a robot takes no action for more than 10 seconds, the referee instructs a team handler to remove the robot(s) and repair it if necessary. A repaired or substituted robot can start the following undone challenges.

3.7.2 The duration of each task consists of the total time of repair and substitution and is limited to the lawful game duration in [Challenge Rule 3.1](#).

3.7.3 Each team can only substitute a robot once during each challenge event.

3.7.4 If the robot restarts from the beginning area because of a team's request, the score in this task will be reset to zero at the moment. However, in the 2<sup>nd</sup> challenge event, it is not allowed to restart a completed task.

3.7.5 Teams can only enter the field with the permission of the judge.

### 3.8 Transmissible Information

The information that is being transmitted has to meet the standards of the AndroSot game.

## 4. Fouls

### 4.1 The 1<sup>st</sup> challenge event – Dribble and Attack tasks

4.1.1 The following actions are disallowed.

- (a) A robot collides with any obstacle robot, either intentionally or otherwise; the referee will call such collisions as fouls and directly end the game.
- (b) A robot starts before the referee blows the whistle.
- (c) The team members enter the field or execute disallowed actions such as touching or remote controlling the androids without the permission of the referees.

4.1.2 The following cases are regarded as failures.

- (a) The 1<sup>st</sup> android scores directly.
- (b) The ball enters the goal area because of the touch of robotic hands.
- (c) A goal occurs after the end of the lawful duration.

### 4.2 The 2<sup>nd</sup> challenge event – Free Kick tasks

4.2.1 The following actions are disallowed.

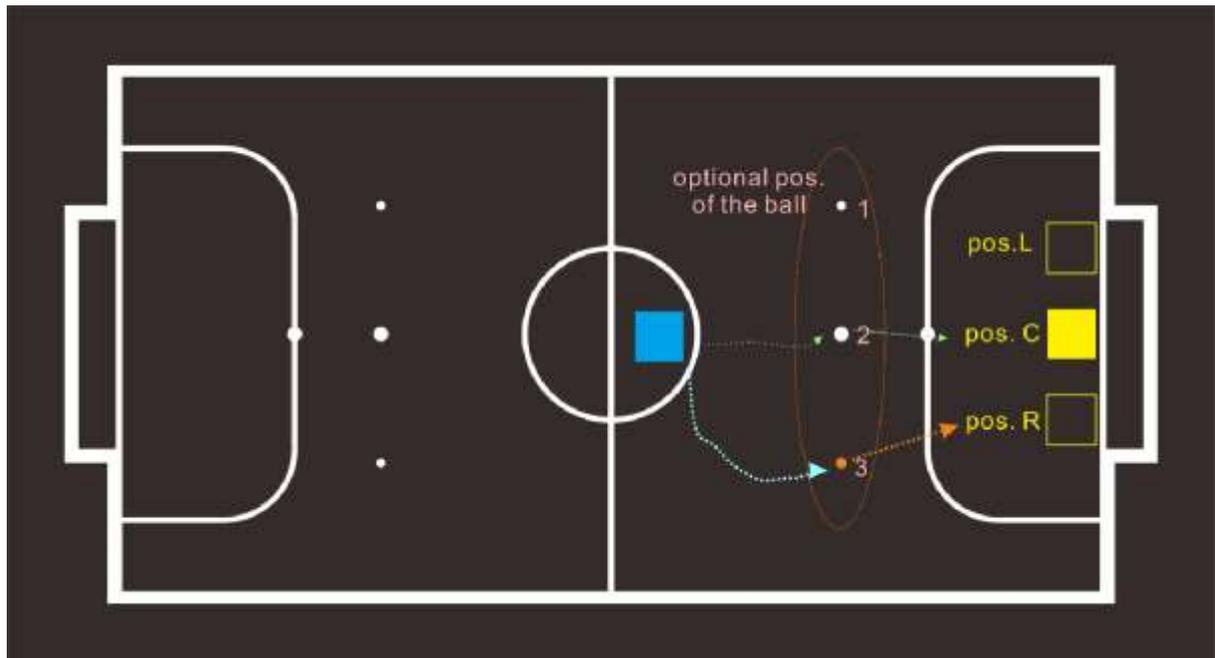
- (a) An android kicks the ball two or more times.
- (b) A robot starts from the outside of the center circle.
- (c) A robot starts before the referee blows the whistle.
- (d) The team members enter the field or executes disallowed actions such as touching or remote controlling the androids without the permission of the referees.

4.2.2 The following cases are regarded as failures.

- (a) A robot cannot go closer to kick or touch the ball.
- (b) The ball enters the goal area because of the touch of robotic hands or being deflected off the side walls.
- (c) A goal occurs after the end of the lawful duration.



## AppendixA-2



This is one of the three possible positions of the ball selected by a draw to free kick facing each position of the obstacle robot.