

AndroSot (**Android Soccer Tournament**)

Laws of the Game 2010

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Abstract

The latest official version of the rules of the game for AndroSot is modified by the rules of the game for MiroSot initiated by FIRA President, Professor Jong-Hwan Kim, and by the rules of the game for 2008 AndroSot proposed by Professor Bing-Rong Hong. Some comments from Professor Jacky Baltes, the HuroCup Chair, have also been adapted to the rules for AndroSot. After the game in FIRA 2009, the most important change in this year is the size dimension of the android is much more proportional to that of a human being. In order to promote the game, a ten-year milestone for AndroSot is proposed as follows:

2010~2013: 3-vs-3. Each team has three fully autonomous Androids.

2014~2018: 5-vs-5. Each team has five fully autonomous Androids.

2019~2025: 11-vs-11. Each team has eleven fully autonomous Androids.

1. Setting up the Game

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

1.1.1 Playground Surface and Dimension

- (a) A black (non-reflective) flat and hard rectangular playground 220 cm x 180 cm in size with 2.5cm thick and 5cm high white side-walls will be used. The topsides of the side-walls should be black in color with the interior walls painted in white (side view). Solid 10cm x 10cm isosceles triangles shall be fixed at the four corners of the playground to avoid the ball getting stuck in a corner.
- (b) The playground is considered flat if a ball placed anywhere on the field does not start to roll. The surface texture of the board should be like a ping pong table. It should provide sufficient grip.

1.1.2 Markings on the Playground

- (a) All lines and marks should be white in color and 2cm thick.
- (b) The center circle will have a radius of 25 cm.
- (c) The penalty kick arc will be with radius 20 cm and center 35 cm away from the center of the goal line.

1.1.3 The Goal

- (a) The goal is 80 cm wide.
- (b) There are no posts or nets at the goal.

1.1.4 The Goal Line and Goal Area

The goal line is the line just in front of the goal. The goal areas ([Region A of Appendix A](#)) are comprised of the area contained by a 90 cm x 15 cm rectangle in front of the goal and the goal itself.

1.1.5 The Penalty Area

The penalty areas ([Region B of Appendix A](#)) are comprised of the area contained by a 110 cm x 35 cm rectangle in front of the goal. The penalty area contains the goal area. The penalty kick arc is not part of the penalty area.

1.1.6 The Ball

An orange golf ball will be used as the ball, with 42~44 mm diameter and 40~50g 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 anywhere on the playground. The lighting should be diffuse and evenly distributed. A flicker free lighting is

recommended.

- 1.2.2 The location of a team's camera should be restricted to over and above their own half of the field including the center line, so that the camera need not to be moved after the side change at halftime. If both teams wish to keep their cameras over and above the center circle of the playground, they shall be placed side by side, equidistant from the centerline and as close to each other as possible. The location of the overhead camera or sensor system should be at a height of 2.5 m~3 m.
- 1.2.3 Besides the cameras above the playground, the goalkeeper of each team may possess its own camera (the field of view of the camera must be limited to less than 180 deg), as shown in Appendix B. The image of the camera may be sent via a wireless communication channel as described in 3.5.3 to an off-board computer for processing.
- 1.2.4 All active distance sensors are disallowed to set 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 more Android for substitution.
- 2.1.3 All robots are controlled by off-board computers. (The goalkeeper with own camera could be fully autonomous).
- 2.1.4 At most two designated team members are allowed to access the playground during a game (if instructed so by the referee), except during timeouts and halftime.
- 2.15 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 arms length of each robot also 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 cm x 3.5 cm solid region of their team color

patch, blue or yellow, **visible from the top**. The maximum area of color patch set on the top side of each android is **7 cm x 7 cm**.

2.3.2 The **team color** either blue or yellow, as assigned by the organizers, will identify the robots in 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 colored in any color except orange, yellow, blue, white or other 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 the half time, 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, kickoff and side must be decided by the toss of a coin. The winning team should choose either kickoff 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 playground 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 will be allowed to position their robots freely in their own area and within the center circle. Then the defending team can place their robots freely in their own area 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 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 with the kick off.** If the kick-off is done incorrectly again, a free-kick will called in favor of the other team.

3.2.5 After the half time, the teams have to change sides unless **both teams agree that** not to change sides.

3.3 Winning

3.3.1 The Winner: A goal shall be scored when the whole of the ball passes over the goal line.

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 minutes** break for a maximum period of **3 minutes**. The team managing to score the first goal will be declared as the winner.
 - 2) If the tie persists even after the extra **3 minutes** game, the winner shall be decided through penalty-kicks.
- (b) Each team takes three penalty-kicks, which are carried out as per [Rule 4.5](#). The only differences to that rule are that
 - 1) Only a kicker and a goalkeeper are allowed on the playground.
 - 2) The attacking robot may not touch the ball again after the goalkeeper has touched it.
 - 3) The kicker can try to score within 30 seconds, until the ball is touched by the goalkeeper or **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** Rule 4. All Androids must be relocated within **10 seconds** after whistling.
- b) **When a robot falls down and is unable to stand up on its own for more than 15 seconds, or the robots does not move for more than 12 seconds, the referee instructs a team handler to remove the robot and repair it if necessary. A repaired or substituted robot can reenter 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 timeouts with a maximum combined duration of **8 minutes** shall be permitted 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 and the referee will stop the game at an appropriate moment. The game will restart with a free-ball on the side of the calling team if the time-out 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 they wish. Upon the 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, the humans must not interact in any way with their 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 the frequency interfere 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 other of the opposite team, either intentionally or otherwise: the referee will call such fouls that directly affect the play of the game.
- b) a stalemate occurs for 12 seconds outside the goal 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

4.2.2 When a free-ball is called within any quarter of the playground, the ball will be placed at the relevant free ball position. One Android per team will be placed at locations [25cm](#) apart from the ball position in the longitudinal direction of the playground. Other Androids can be placed freely outside 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 opposite 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 the ball. This is also true if one or more robots of one team block the ball for more than 12 seconds without the influence of the other team (outside of the goal area).

4.3.2 The ball will be placed at the position where the called foul happened, but outside of the penalty area. All Androids – except the Android taking the free-kick – must be placed outside of a circle with 25 cm radius around the ball position. When positioning robots, all other game rules still apply. The defending team gets precedence in placing their 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 the competition has already resumed for 10 seconds. (Appendix F)

4.4 Goal-Kick

4.4.1 The referee will call a goal-kick when

- a) a robot is charging the goalkeeper 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 touch of the line) of the opposite team for over 8 seconds.

4.4.2 During goal kick only the goalkeeper will be allowed within the goal area and the ball can be placed anywhere within the goal area. Other Androids of the team shall be placed outside the goal area during the goal kick. The defending team will get preference in positioning their Androids within their own side of the playground. The attacking team (i.e. the team performing the goal kick) can then place its Androids anywhere on the playground. The game shall restart normally with the referee's whistle. (Appendix G)

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 in the goal area (including touch of the line) of the team for over 8 seconds. An exception to this is the situation when the additional Android in the goal area 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) a goalkeeper is fail to kick out the ball from his goal area within 15 seconds (unless blocked by the other team, in that case it is a goal kick, Rule 4.4).
- c) someone is repositioning the robots without the referee's permission during the game.
- d) a robot is handling. It is referred to as handling, as judged by the referee, when a robot other than the goalkeeper catches the ball. It is also considered as handling, if a robot firmly attaches itself to the ball such a way that no other robot is allowed to manipulate the ball.
- e) the goalkeeper is considered to block more than 40 cm of its goal line for more

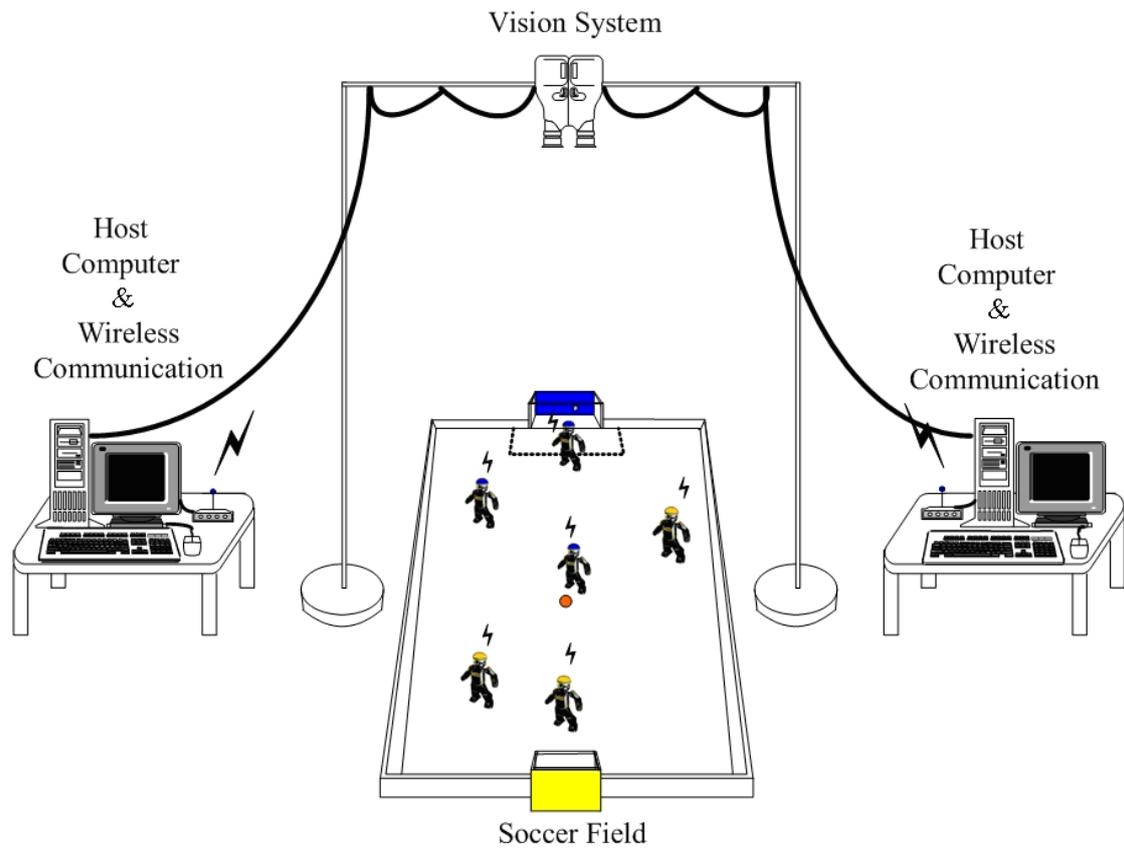
than 12 seconds.

- 4.5.2 When the referee calls a penalty-kick, the ball will be placed at the relevant penalty kick position (PK) on the playground (**Appendix H**). The Android taking the kick shall be placed behind the penalty-kick arc mark (15cm away from the ball). The defending goalkeeper is placed in upright position on the middle of his goal line, 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 able to move over the center line only after the ball has been moved or 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 goal line before the kicker touches the ball, the penalty-kick continues for 15 seconds. If the kicker scores a goal, penalty-kick ends, otherwise, referee will restart the penalty-kick. If the goalkeeper falls or leaves the goal line before the kicker touches the ball again, the kicker will be award a technical goal.

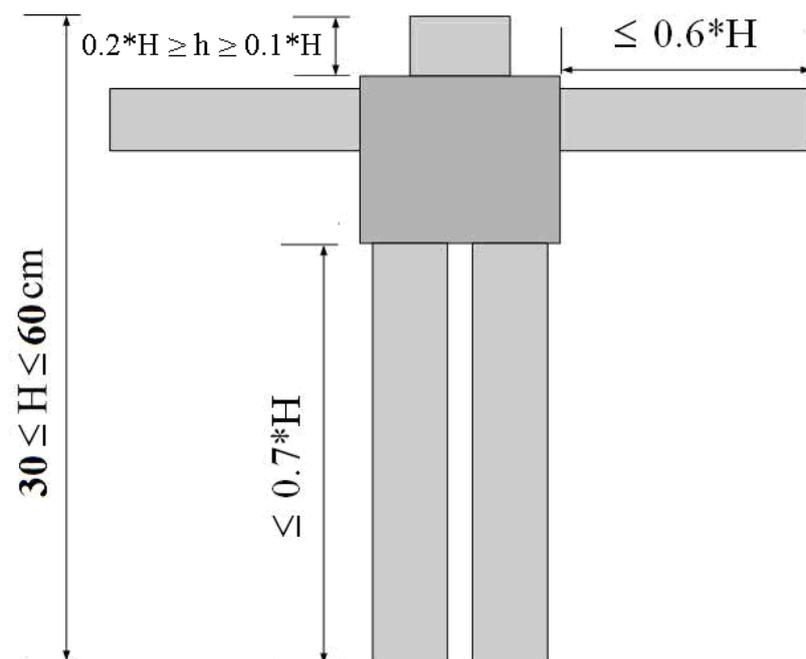
4.6 When It's Not A Foul However

- 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.
- 4.6.3 If the situation has no effect on the game whatsoever. It is upon the referee to judge such situations.

Appendix C

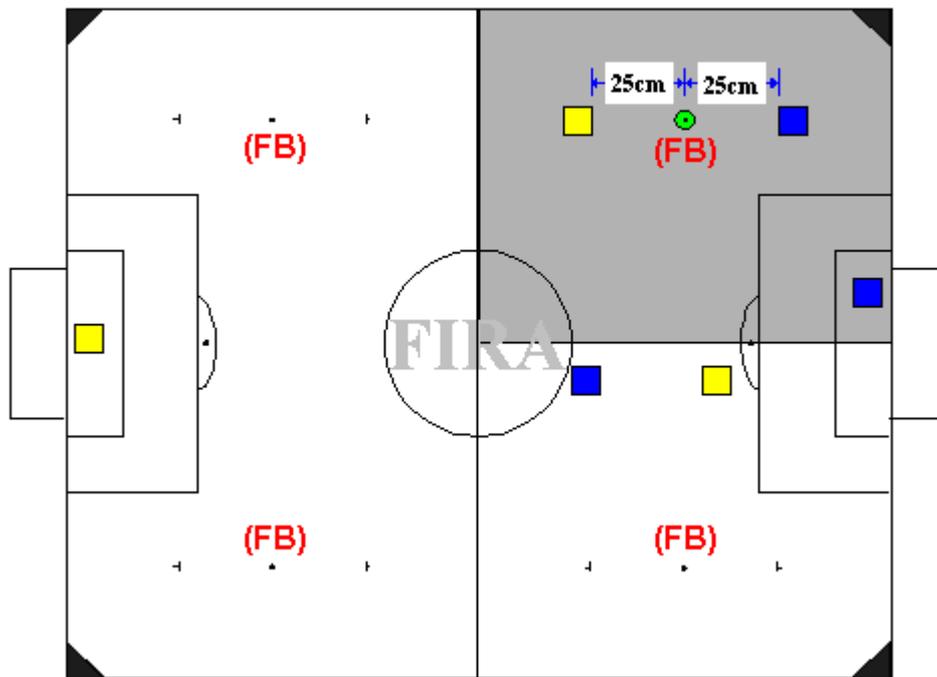


Appendix D



Appendix E

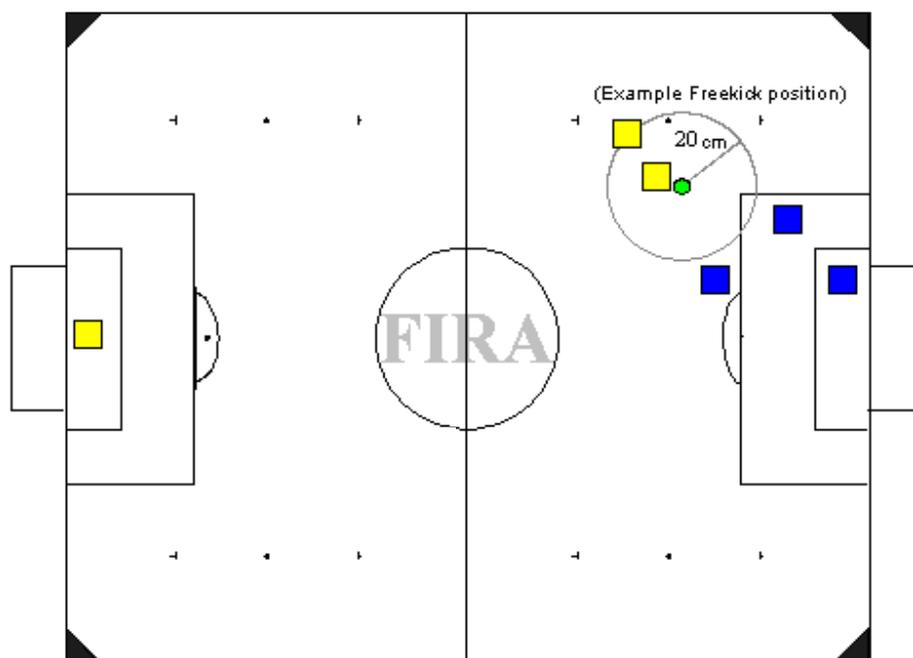
Free-Ball



Picture shows Middle League, similar in Large League

Appendix F

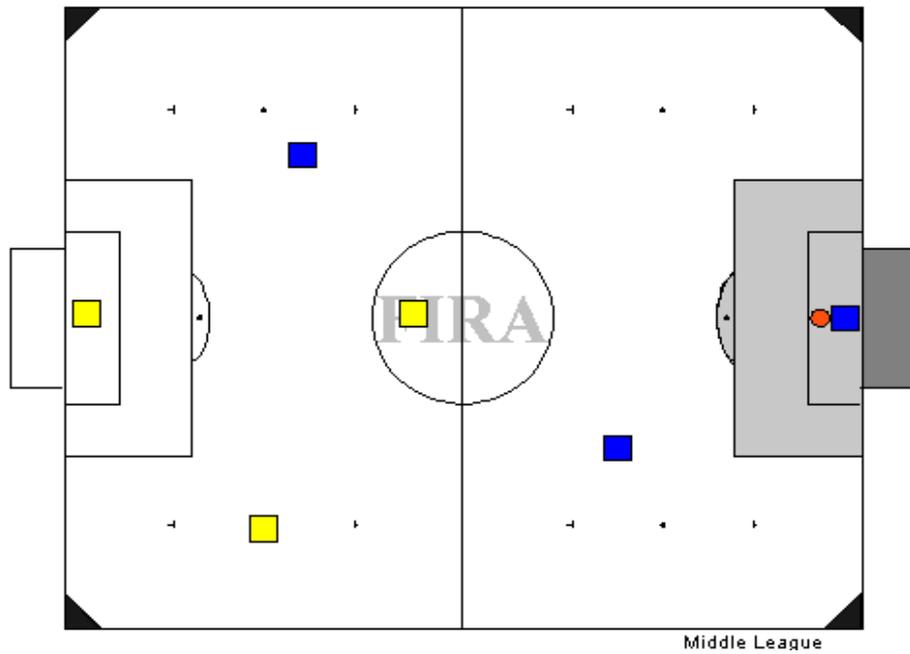
Free-Kick



Picture shows Middle League, similar in Large league.
Circle radius in Large League: 30 cm

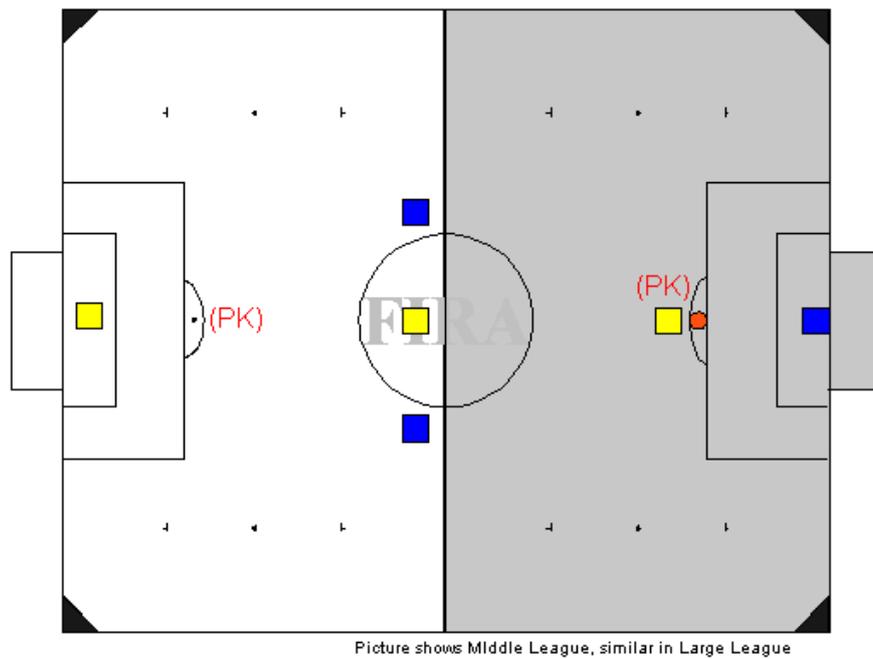
Appendix G

Goal-Kick



Appendix H

Penalty-Kick



Penalty Kick situations: