SegwayRMP Robot Football League Rules

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1 Introduction

Segway Soccer is a game between two teams playing on a grass field in an outdoor environment with an orange, size 4 soccer ball. Teams can consist of humans, robots, or a mix of humans and robots. Moreover, robots need not necessarily be from the same development group thereby encouraging dynamically formed pickup teams

2 Environment

The field consists of a grass surface in an outdoor environment. White tubular markers are placed around the field to indicate the field boundary. Each goal is uniquely colored and is delimited by two posts.

The field dimensions follow a scale law as a function of the number of players on the field. For n players on each team the field dimensions can be calculated as:

$$\text{length} = \frac{n}{11}100\text{m}, \text{width} = \frac{n}{11}??\text{m}$$

3 Robot Players

3.1 Hardware

Teams are allowed to put any sensor modality and computational hardware that they want on their Segway.

3.1.1 Ball Manipulation

Segways must be equipped with a method of manipulating the ball in a way that they will not be in danger of falling over. They must be equipped with some method that will keep them upright in the event that the controller fails and the robot tips forward or backwards uncontrollably. Because the Segways must kick the ball to move it down the field, some sort of an actuated kicking device is required because otherwise, just batting the ball with the forward motion of the Segway would constitute dribbling or moving with the ball and this is not allowed.

3.2 Communications

SegwayRMPs must be equipped an RF device that allows them to be remotely started and stopped by the referees. In addition, the RMP may communicate directly with other members of its team (robot and human).

4 Human Players

4.1 Hardware

4.1.1 Ball Manipulation

The same rules for ball manipulation apply to human segway players that apply to their robotic counterparts. See section3.1.1 for details.

4.2 Communications

Human players will have some method of communicating with the RMP on their team. Some measures will need to be taken to keep human players from teleoperating their RMPs. In the spirit of Robocup, the robots must be autonomous and should communicate with players only to receive updates as to where things are in the field. Some level of commands could be given to the RMP (such as waypoints, or general directions on the field as to where to play or go), but directly joysticking the robot should probably not be allowed.

5 Teams

Teams sizes range from 2 to 11 players. If the human players on a team may not exceed the number of robot players by more than one. The number of robot players can be no more than one fewer than the number of human players.

5.1 Team Markers

Team markers will be provided to each team. The provided team markers must be attached to each robot and human playing in a game.

5.2 Communications

There is no restriction on audible (speakers and microphones) communications between team members (humans or robots). Wireless communication is allowed only on condition that it observes radio use regulations. The wireless communication shall follow legal regulations of the country where the tournament is held.

5.3 Goalies

Unlike other more traditional Football (Soccer) games, there is no specific goalie (unless the team is large enough?)

6 Game Process

SegwayRMPs are not allowed to come any closer than one meter to any other player. This includes the robotic RMPs and human-operated HTs. Any player that violates this rule will have a penalty assigned to it of some kind (not specified yet).

6.1 Structure of the Game

A game consists of three parts, a first half, a break, and a second half. Each half is 20 minutes. The clock stops during stoppages of play (such as kick-offs after goals). The extra time over 20 minutes total that results is referred to as "lost time". The half-time break is 10 minutes. If the game is a draw, there will be a penalty kick shoot-out employing sudden death (see section **??**).

Teams will change the defended goal and uniform color during the half time break.

6.2 Ball Handling

Segway soccer follows a flow more familiar to Ultimate Frisbee[1] rather than traditional Football (Soccer). When play begins, ball possession is decided with a coin toss. Afterwards, players gain possession based on proximity to the ball when it is "free". Once a player obtains possession, opponents are not allowed to contest the ball thereby preventing any unnecessary contact. Players are also not allowed to move with the ball (dribble), and instead must pass the ball to one another for the team to maintain possession. A time limit will be enforced on how long possession can be maintained by a single player before the ball must be passed on to a teammate before possession is overturned. When the ball is passed, there are two options for deciding on the possession rules:

1. When the ball is passed, if it does not touch another player on the same team before it stops rolling, then the possession will change to the other team.

2. The first player on any team to come within a specific distance of the ball will gain possession.

When the ball is passed or a goal attempt is made, the robots and humans must for the referee to decide on who has possession of the ball. When this information is given to the players, the nearest player will pick up the ball and continue the game.

The same player cannot re-aquire possession of the ball until after another player has obtained possession. Possession is also changed if the ball is kicked out of bounds or if a goal is scored.

When a player has possession of the ball, they are not allowed to dribble with the ball past one meter. The segway with possession is allowed to move 1 meter in any direction in order to execute a kick This is similar to several childhood games in which a person with

[1]Rules for Ultimate Frisbee can be found at: http://www.upa.org

possession is allowed 3 steps to execute a pass. This distance allows a more powerful body kick not using a kicking mechanism.or translate with it in any fashion. The kicking player can touch the ball as soon as another player comes into contact with it. Segways are only allowed to kick the ball with either their bodies or with a ball manipulation device of some kind.

Only one defender is allowed to approach the player currently in possession of the ball. The other defenders must remain a respectable distance (how far...4m?) from the attacker until the ball is released.

6.3 Goal

Players score when they move the ball through the opposing goalposts. As soon as the ball passes between the goalposts, a point is scored. No player on the attacking team needs to be on the other side of the goalposts to "receive" the ball, as is the case in ultimate frisbee.

6.4 Game Starts/Restarts

Robots must be in legal positions before the game will be allowed to start/restart. Robots may be teleoperated for a game start. Robots are not allowed to locomote in any fashion before the game starts. THe referee will signal the game start/restart either verbally or by a whistle. At the referees signal, robots will be started either manually or using wireless. All teams must implement a manual starting procedure in case of problems with wireless.

6.5 Stopping Robots

All robot must be equipped with a wireless mechanism that will let the referee start and stop their translational and rotational velocity, allowing them to return to a stationary balance mode.

6.6 Righting a Fallen Robot

Due to the dynamic-balancing aspect of the Segways, there is currently no way to guarantee that a player (human or robot) will not lose traction and be in danger of falling. It is possible to equip RMP players with roll-cages, landing gear, or even actuated self-righting mechanisms which will allow them to stand up after falling. However, in the event that an RMP falls and is unable to right itself, the game will running as long as the RMP was not moving in such a way to be a hazard or obstacle to others. Human segways can right themselves immediately.

6.7 Kick-Off

6.8 Free Kick

6.9 Penalty Kick

6.10 Penalty Kick Shoot-Out

6.11 Throw-In

When the ball goes out of bounds, possession will change to the other team and they will have possession inside the field where it goes out.

6.12 Game Stuck

If no robot touches the ball for 30 seconds, the referee shall stop the game and restart the game from the kick-off formation. The kick-off will be awarded to the team defending the side of the field the ball is on when the game stuck is called.

6.13 Robot Problems

6.14 Winer and Rankings

7 Safety

First and foremost, the safety of the human players and robotic equipment must be maintained. Because of the speed and weight of the SegwayRMP, certain safety standards must be met before a team will be allowed to enter the competition. In particular, a team must pass several tests before they will be allowed to compete.

7.1 Qualification Trials

Segways (RMPs and HTs) must be able to demonstrate that a collision with the ball will not cause them to tip over. This generally occurs when the Segway rides up on the ball with either its body or a wheel. Typically, this will be accomplished through the use of a kicker and/or a shaped ball shield. The Segways must demonstrate the ability of not being caught up under the ball when going forwards, backwards, or turning in place.

7.2 Padding

SegwayRMPs will be equipped with a set of pads around their tops which will minimize the impact caused by a collision or a fall. The exact details of such padding will have to be determined.

Humans riding HTs should be equipped with safety gear similar to what is used by rollerbladers and/or professional skateboarders. This would include a helmet, kneepads, elbow pads, wrist hyperextension guards, etc...

8 Forbidden Actions and Penalties

There are two classes of penalties, the first, called the Game Penalty, awards the other team with possession of the ball, and the other which is classified as a Safety Hazard Penalty and results in the guilty party being ejected from the game.

8.1 Game Penalty

If a robot comes too close to another player (such as closer than 1 meter), they will be penalized (how?)

8.2 Safety Hazard Penalty

If any players touch or collide with each other, they will immediately be removed from play for the duration of the game. If this reduces a team to a single player, then the team forfeits the match.

8.3 Kick-Off Shot

A "kick-off shot" can never score a goal. A "kick-off shot" is a shot taken after a kick-off before the entire ball out of the center circle, including the boundary line. The ball must touch a player from the kick-off team after leaving the center circle before a goal can be scored by the team taking the kick-off. If a kick-off shot enters the goal (either directly or via contact with an opposing robot), no goal will be scored and a kick-off will be awarded to the defending team.

8.4 Ball Holding

A player is not allowed to hold the ball for longer than 30 seconds. At this time, the player must kick the ball away or possession will change to the other team.

8.5 Obstruction

8.6 Jamming

During the match any robot shall never jam communication and sensor system of opponents. The usage of equipments which may cause interference of communication or sensors should be negotiated between two teams before the match.

9 Judgement

9.1 Selection of Referee

Every team participating in a tournament must name at least two team members to server as referes for matches. The names persons must have good knowledge of the rules as applied in the tournament. The persons should be selected among the more senior members of a team, and prefereably have prior experience with games in the Segway Soccer League.

9.2 Referees During the Match

The referee and assistant referees should wear black or white clothing/shoes and avoid reserved colors for the ball, the goals, and player markings in their clothing. The referee and his/her assistants will be close to but off the field during play. The referee and the assistants may enter the field in particular situations, e.g. to reposition the robot when applying a penalty or stuck. The referee and his/her assistants should avoid interfering with the robots as much as possible.

10 Questions/Comments

Questions or comments on these rules should be mailed to either:

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