

## **Assignment 3: Goalie and Penalty Kick Tournament**

### **CS 393R: Robotics**

**Due Date: Thursday, October 6, 2011**

**Your task:** Compete in the Penalty Kick Tournament. Each game will involve two robots. One robot will take on the role of goalkeeper and the other robot the role of attacker. Robot behaviors must follow the Aibo RoboCup rules, found at: <http://www.tzi.de/spl/pub/Website/Downloads/AiboRules2008.pdf>.

First, develop a goalie. Implement a Kalman filter to track the ball and its velocity.

The attacker will try to score a goal by taking a penalty kick. The goalkeeper will try to prevent a goal by stopping the ball. The game will be divided into two halves of three attempts each with the robots' roles reversed after the first half. The team that scores the highest number of goals wins.

The goalkeeper's movement will be restricted by a penalty box, with the goalkeeper required to stay within the goal or the penalty box. Similarly, the attacker's movement will also be restricted to be outside of the penalty box. The attacker is in a legal position as long as it does not have 3 legs inside the penalty box. Similarly, the keeper is in a legal position as long as it does not have 3 legs outside the penalty box. Therefore there is some space along the edge of the penalty box where both players can make a play for the ball.

The goalkeeper can use any of its body parts to stop a goal. However, the goalkeeper's body must block less than 50% of the goal, except for brief periods (< 3 seconds), while blocking a shot. The ball must be completely over the line to be a score.

The attacker will take a penalty kick with the ball at a specified position with respect to the goal. The attacker may shoot from that spot or may choose to "dribble" the ball closer to the goal and then shoot into the goal. Note that we will be enforcing the 3 second holding rule (section 4.5 of the Robocup rules) during the competition. The attacker will be allowed to shoot the ball again if it rebounds out of the penalty box. The penalty kick ends after 1 minute, or if the ball is stuck in the penalty box (where the attacker is not allowed to touch it) or past the goal line.

In addition, the attacking team is allowed to attach something to the opponent's goalie to help with detecting it. However, if this disturbs the goalie's movement or function, it will be removed. Nothing may be attached to the attacker.

In each half of the game the attacker will get three tries. A tie in the semi-finals or finals will be followed by a "sudden death" round wherein the teams will alternate taking penalty kicks until one of the robots wins (after an equal number of tries).

Do not forget to write a short but professional memo (one memo from each team, co-authored by all team members), concisely but clearly describing what you did, what problems you encountered, how you overcame them, and how successful you were in the end. Also be sure to briefly describe the contributions that each team member made to the final outcome.

**Setup:** The goal, the penalty box, and penalty shoot location (the ball's position is marked by an x, the robot's starting position is marked by a square) are set up in the lab. The keeper will start in the middle of the goal. All overhead lights in the lab will be on.

**Tournament:** The first round of the tournament will proceed with one pool of 5 teams and one pool of 6 teams playing in a round robin format. The division of teams into pools will happen randomly. The two top teams in each pool will move on to compete in a single elimination tournament. All games will take place during class on October 6, and any remaining games will be played the following class period. Due to time restrictions, each team will be allowed one reboot in the tournament with the clock stopped. If additional reboots are needed or crashes occur, the clock will not stop. As such, make sure your code does not crash!

**Checklist:**

Grades will be out of 12 points. All teams in the 5 team pool will get 0.5 free points in compensation for having the opportunity to play one less game each.

[\_\_\_\_] (0.5 point) Demonstrate goalie's ability to move and stay inside the goal or penalty box.

[\_\_\_\_] (4 points) Demonstrate goalie's ability to stop the ball when shot from a variety of locations and speeds, by using a Kalman filter to track the ball and its velocity.

[\_\_\_\_] (0.5 point) Demonstrate attacker's ability to move and stay outside the penalty box.

[\_\_\_\_] (1 points) Demonstrate attacker's ability to take a penalty kick and a rebound.

[\_\_\_\_] (1 points) Demonstrate attacker's ability to dribble and shoot the ball in the goal.

[\_\_\_\_] (2 points) Clarity and quality of your memo. Email it (along with a compressed folder of your behaviors and motion files) to Peter and Katie by class on Oct 6.

[\_\_\_\_] (0-7 points) Tournament performance: 1 point will be awarded for each game won, 0.5 pts for a draw, and 0 pts in case of a loss.