LAB 7: COZMO SOCCER

Due: Tuesday, April 25th 5:30pm

In the final lab, you will integrate all of the components you have developed over the course of the semester to enable your robot to play soccer.

Objective: Your objective is to enable Cozmo to score on a goal using the black ball we used earlier in the semester.

Setup: We will make one final modification to the arena, adding a goal to one side, as shown below. The goal consists of a red paper rectangle 4" x 6" in size mounted in the middle of the right side of the arena. The six localization markers will remain in their previous positions.

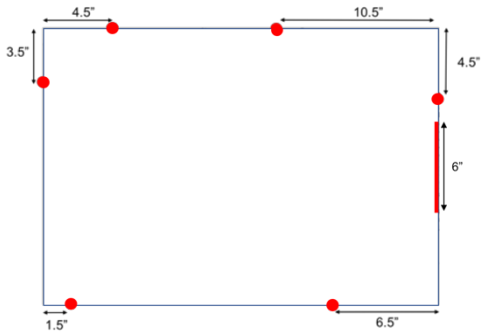

Figure 1. Arena layout

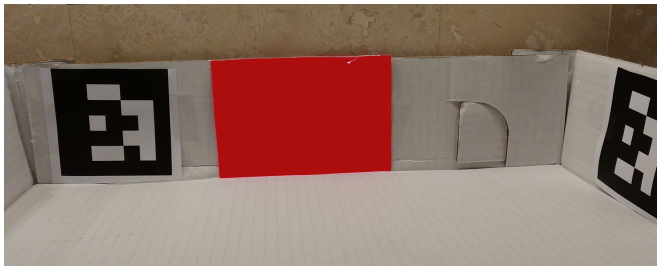

Figure 2. Goal

Implementation details: We are not providing any new code for this assignment. You may solve the lab in any way, add new functionality if you wish, and change any parameters you want. You may use third-party libraries if you desire, but make sure you cite your sources. If you are unsure about using something, just ask us first.

On the perception side, you may choose to add goal detection to your code if you wish. Note that Anki has added support for color images in SDK 0.12.0 (see release notes). Pay careful attention to their documentation if planning to use this feature. In particular, they state: "Color images have half the horizontal resolution when compared to grayscale images. For better use in computer vision-related tasks, color images are not auto white balanced. We've updated the example program 03_vision/04_exposure.py to show usage on both grayscale and color images."

Ball: You may use any ball of your choice for this lab that is less than 50mm in diameter. By default, we will use the black ping pong ball used in previous labs, but you may replace that ball with a different one if you wish. For example, we have experimented with golf balls, and they typically result in a more predictable trajectory. Your ball can be any color; you may spray paint your ping

pong ball if you wish.

Evaluation: We will use a "penalty shot" scenario for evaluation, in which your robot will attempt to score on the goal as many times as it can without any interference.

Your robot will have 5 minutes to score as many goals as it can, the final grade will be determined based on the final score.

The robot will begin somewhere along the vertical starting line shown in Figure 3. The robot will always be initially aligned with $\theta = 0$, facing the direction of the goal. The ball will initially be located directly in front of the goal, as shown. The robot may manipulate the ball in any way (pushing, hitting, etc). A goal will be counted as soon as the ball touches any part of the red paper.

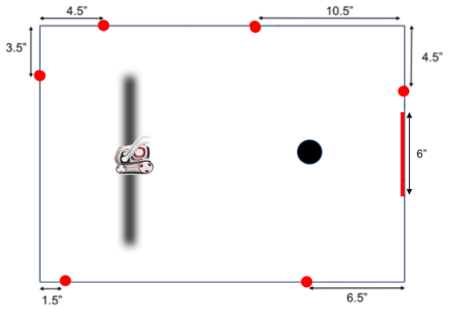

Figure 3. Initial configuration with the robot on the starting line and the ball at the starting position.

When the robot scores, the ball will be picked up and moved to one of the five locations marked in the image on the right. The robot will not be touched or reset. The robot should attempt to find the ball again and attempt to score as many goals as it can within the 5-minute time limit.

If needed, you may ask for your robot to be **reset**, in which case we will pick it up and place it back along the starting line as shown in Figure 3. Each reset causes an 8-point penalty to be taken from the final lab grade.

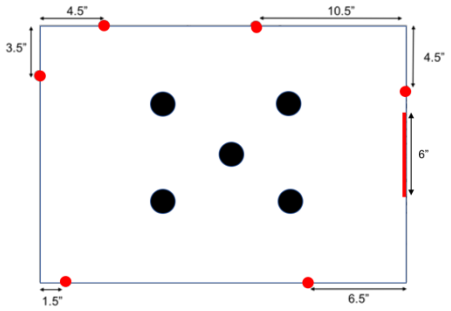

Figure 4. Locations where the ball may be placed after a goal.

Grading: Your grade will be determined by the number of goals scored, as follows:

1 goal: 40 points
2 goals: 60 points
3 goals: 80 points
4 goals or more: 100 points

Submission: Submit all your code for this lab in a single zip file named `Last1First1_Last2First2.zip` (the first and last names of partner 1 and 2, respectively). Only one partner should upload the file to T-Square. If you relied significantly on any external resources to complete the lab, please reference these in the submission comments.