Assignment 2: Control: Walk and Kick
CS 393R: Autonomous Robotics

Assignment due: Thursday, September 24, 2008

Your task: Score! Walk up and kick a ball using PID control (12 pt)

The first task is to program your Aibo to walk towards a ball (up to 8-10 body lengths away) using PID control.

You may want to use as the error signal, the angle of the direction toward the ball, in the body frame of reference. If the head moves around, this could be difficult to determine. But it is easy to bring the head facing forward in its default position

Try various variants of the PID control (P, PI, and PD) to see which works best.

Leave plenty of time to experiment with tuning, since this is always a big issue.

Second, on getting close enough to the ball, locate the goal, and position the robot so that it can kick the ball toward the goal. Note that the ball and goal can be anywhere with respect to the robot's starting position.

Third, design your own kick. Take a look at the Tekkotsu toturial on postures and motion sequences: http://www.cs.cmu.edu/~dst/Tekkotsu/Tutorial/postures.shtml. Build a kick by making a number of keyframes using the posture editor. Then put these key frames together in a motion sequence to build a kick.

Fourth, kick the ball toward the goal (with any kick). Ideally, score.

Compare your PID controller against what you've done for Assignment 1.

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. Briefly describe the contributions that each team member made to the final outcome.

Checklist:

[_____] (1 point) PID formulation (specify error signal and how it is obtained)

[_____] (1 point) Find the ball

[_____] (1 point) Walk successfully towards ball using PID control

[_____] (1 point) Stop/slow down when close to the ball

[_____] (1 point) Find the goal

[_____] (1 point) Position robot so that the ball and goal line up

[_____] (2 points) Design your own kick

[_____] (1 point) Kick ball towards goal

[_____] (1-2 points) Kicking success: (four tries, 0.5 points for each goal)

[_____] (2 points) Clarity and quality of your memo. Turn it in at the time your assignment is graded.

More Extra Credit:

[_____] (1 point) If the ball is at a very skewed angle with respect to the goal, then get the robot to kick the ball into a better position and score.