

Robotics (CPS 1/296) : Homework 3

Due March 27, 2007

1 Robot Control

Write a program that allows you to control the robot using the arrow keys on the keyboard. You should be able to move forward and back, and rotate right and left.

2 Robot Sensing

Augment your program to read the recorded motion from the robot's sensors. Move the robot along some path and have it return to its starting position. Plot the recorded motion. Report difference between the recorded starting and ending positions.

3 Robot Motion Model

Try to estimate the variance between the robot's reported position and its true position for both lateral movement and rotation. Note that the variance will scale with the size of the movement, so you may want to make your estimate a function of the magnitude of the total movement.

4 Camera Usage

Try some of the webcams in the lab (more will be coming over spring break). Figure out how to manually 640×480 stills with these cameras on your laptop and report on your results. It would be ideal if you could control this through your own software, but if you need to install the manufacturer's software and click some buttons in the manufacturer's software, that's OK too.

5 Observation Error Model

Suppose that you are using the cameras to observe objects of known size, and that you wish to estimate the range and angle of these objects. Also assume that your estimate of the object's size on the sensor is normally distributed around the mean with a standard deviation of 1 pixel. Develop a reasonable model for your error in your range and angle as a function of pixel size and focal length.