CMRoboBits (15-491) Fall 2008

Homework 2

Part 1 - Due Wednesday, September 24th 2008 at the beginning of lab (12:30pm)
Part 2 - Due Wednesday, October 1st 2008 at the beginning of lab (12:30pm)
http://www.andrew.cmu.edu/course/15-491/

Submission

Your entire homework should be submitted by copying it into the "**dropbox/lab02**" folder on your personal AFS space before the due time. Please read the website for more information about your AFS dropbox. If there is anything in particular that you would like us to know about your submission, please place a README.txt in the same directory.

Part 1. Custom Activities in VPL

a) Create a new VPL activity

In part 2 of your first homework you created a VPL diagram to implement a custom turning behavior. To make this code more re-usable, you will now encapsulate it in a VPL "Activity". Your VPL activity should contain a single action named "Turn". This action should have the same three Input values as your program in part 2 of the last homework:

DriveSpeed (type double, range 0.0-1.0): the speed of the robot.
TurnRadius (type double, in centimeters): the turning radius of the robot.
TurnRange (type double, in degrees): how far to turn.
Your action should have **a single output value named "Success" of type bool.**

When calling the "Turn" action, your activity should perform the turn as implemented in your last homework. It will then wait until the turn is completed (until the drive is stopped) and finally return the boolean "Success" output. Generally this output should be true, unless e.g. the DiffDrive returned false for some reason.

This part should be fairly straightforward and you should be able to simply cut and paste most parts of your last homework into the VPL activity.

b) Turn in Figure-8's

Now that you have encapsulated your turn-behavior into a re-usable VPL activity, it is time to actually make use of it. In this part of the assignment you should make your robot draw a "Figure 8". A figure-8 is composed of 1 270-degree turn, followed by a straight light of length equal to the diameter of the circle, then another 270-degree turn (in the opposite direction), followed by another straight line, etc.

AT LAB-TIME: Your robots will all demo their figure-8s in class on Wednesday. We will define the turn radius at lab day to make the turn radii big enough that we can all tell that your robot is making a figure -8. You robot will have to perform 3 figure-8s before stopping.

Please save your project (including the activity) in the dropbox/lab02/part1 folder on AFS.

Part 2. Sensors + Closed Loop Control: Building a wall-follower
To be demonstrated at lab-time!

This will be your first implementation of a closed-loop controlled robot. You will use a iRobot Create to create a simple wall-follower. In particular, your robot should do two things:

1. It should follow a wall (without hitting it as much as possible) using the iRobot Create's IR distance sensor on the side of the robot and the bump sensor.
2. If it detects a hole in the wall (a doorway) it should stop moving.

It will be your job to figure out how to make the wall-following the most reliable. Depending on what data the sensor returns (which is also for you to figure out), you might want to correct the robot's path depending on how far you are away from the wall. We would like to see reliability (maintaining a constant distance from the wall) over speed, so if you need to reduce the DriveSpeed of the robot to deal with latency issues, that's ok.

Please save your project in the dropbox/lab02/part2 folder on AFS.

Please create a write-up describing the approach you took, and place it in a README.txt file to be placed in the "dropbox/lab02/" folder.

IMPORTANT: Be ready to demo your solutions at lab-time on Wednesday, September 24th and October 1st!

Good Luck!