CSCE 236 Embedded Systems, Spring 2012
Project 2 Overview
Making Robots Draw

Started: Tuesday, March 27, 2012
Groups Formed: Thursday, March 29, 2012
Compass Checkpoint: Tuesday, April 17, 2012
Wheel Encoder Checkpoint: Thursday, April 19, 2012
Specified Art: Tuesday, April 24th, 2012 (last Tuesday of classes)
Selected Art: Thursday, April 26th, 2012 (last Thursday of classes)
Written Report: Friday, April 27th, 2012 (11am)

1 Overview

The final project will be a group project (2-3 people) that will involve using your robot to draw two different types of pictures. The first work of art your robot will create will be specified by the instructor through a text file that you will upload to your robot. The second piece will be a selected artwork that your group will design (along with your robot).

This is an overview of the project and is subject to change. Additional details on the specific requirements and procedures will be forthcoming in class and lab. See Section 4 for an overview of the project timeline.

2 Specified Art

On Tuesday, April 24th, 2012 (last Tuesday of classes) we will hold a competition to evaluate the ability of your robot to follow a set of instructions to draw a particular picture (unknown beforehand). The instructions will be in the format:

```
angle, distance, draw
```

Where angle is the angle that should be turned in degrees (from -360 to 360), distance is how far to travel in centimeters (0 to a max of 1000), and draw is either 1 if the pen should be down or 0 if it should be up. For instance, it may look something like:

```
0, 20, 1
90, 20, 1
90, 20, 1
90, 20, 1
-225, 14, 0
```

to draw a square and then end up in the middle of it. The order for a particular command is to turn, put pen up/down, and then move the specified distance. Note that one challenge is that while rotating, you should not draw a curve. Rather, you should lift the pen, rotate, and then put it back down in the same location you left off at.

We will work on some of the components needed to achieve this ability in the next few weeks of class and lab, however, you will also need to spend a significant amount of time outside of class to put all of the pieces together. For this part of the project you will make use of:

- **Serial Input**: You must parse the drawing commands, as given over the serial port to perform the proper actions. All of the commands must be sent before you start drawing.
- **Compass**: You will make use of a compass we will work with in lab to more precisely turn a specified number of degrees than is possible with just the wheels.

- **Wheel Encoders**: You will make use of sensors on the wheels to more accurately estimate how far your robot has traveled.

Part of your final grade will be based on the following:

- **Time**: How quick you can complete the drawing compared to the other teams.
- **Accuracy**: How accurate your rendition of the drawing is.
- **Style**: Your robot's drawing "style," which will be judged by your classmates.

3 Selected Art

The second part of the project will take place on Thursday, April 26th, 2012 (last Thursday of classes). Your team and robot will come up with a drawing of your choosing that can be preprogrammed on your robot. The only constrains are:

- Limited canvas size.
- Limited allowed time.
- At least two curves are required in the final artwork.
- The pen must be lifted at least twice (to create gaps in the lines).

Part of your final grade will come from satisfying the above constraints and also based on the creativity and style of your artwork, as judged by your classmates. A final vote will also be held to produce a final ranking of each picture.

4 Timeline and Due Dates

There are a number of intermediate due dates for this project that will contribute to your final grade. Details on the particular checkpoints will be discussed in class and lab and are subject to change.

Note that in the prior project I was somewhat tolerant in accepting late checkoffs. This will not be the case for this project. If you have not completed the checkpoint when it is due, your team will not receive these points.

- **Started: Tuesday, March 27, 2012**
- **Groups Formed: Thursday, March 29, 2012**: You must declare your groups by this date. Groups can be 2-3 people.
- **Compass Checkpoint: Tuesday, April 17, 2012**: (10pts) For this checkpoint, you must demonstrate turning a particular angle using the compass based on a serial command input. This also requires interfacing and calibrating the compass.
- **Wheel Encoder Checkpoint: Thursday, April 19, 2012**: (10pts) For this checkpoint, you must demonstrate traveling a distance specified by a serial command.
- **Specified Art: Tuesday, April 24th, 2012 (last Tuesday of classes)**: (10pts) These points are based on completion and performance of the specified art described in Section 2.
- **Selected Art: Thursday, April 26th, 2012 (last Thursday of classes)**: (10pts) These points are based on completion and evaluation of your artwork described in Section 3.
- **Written Report: Friday, April 27th, 2012 (11am)**: (60pts) There will be a number of questions that you must answer in a final written report. Details will be given soon.

You are encouraged to start working on this project early. This week our lab will involve the compass and next week we will start using the wheel encoders. Right now you can work on parsing serial input into an array of commands. And don't forget to get started early thinking about the picture you will make your robot draw!