Lab 1: Introduction to GoPiGo

Due electronically 9/28/17, 11:30AM – PLUS YOU WILL NEED TO SCHEDULE A ta DEMO TIME

In this lab you'll be introduced to the basic concepts of the GoPiGo's APIs and how to do basic control. The point of this lab is to familiarize yourself with how to program your GoPiGo for future labs. You are required to submit all code samples and schedule a demo with the TAs to show that your code functions as advertised. **We will NOT be running your code.** If you do not participate in a demo you will not receive a grade for the assignment. There are no exceptions. Demo should last no longer than 5 minutes so please come prepared.

1. Basic Motion (5 points)

Using the GoPiGo script found in the following directory 'Desktop/GoPiGo/Software/Python/control_panel_gui.py', run the script and affirm that the following sequence of commands work:

a. Navigate forward
b. Stop
c. Navigate Backward
d. Stop
e. Turn left
f. Stop
g. Turn right
h. Stop

Use the trim slider to calibrate your wheels to affirm that the robot operates in a straight line.

What to turn in: Affirm you ran this portion of the assignment and that it worked. This does not need to be demonstrated.

2. Dancing Protocol (10 points)

Write a program that makes the GoPiGo "dance" for 20 seconds. You'll need to use some form of random function (hint: the random module in Python). Ensure that this is runnable on your GoPiGo with the command 'python dancing.py' inside of your homework directory.

What to turn in: Turn in the source of this program with the file named **dancing.py.** You will need to demo this.

3. Sensory Accuracy (10 points)

Develop a program to show the distance the GoPiGo is from a wall using the Ultrasonic sensor. Position your GoPiGo with the sensor facing a wall and run your program. Run your program with the GoPiGo 5cm, 30cm, and 60cm from the wall. In your README note the actual distance and the reported distance.

What to turn in: Turn in the source code of this program with the file named **sensor_accuracy.py** and report the recorded distance for 5cm, 30cm, and 60cm from the wall in your README. You will need to demo this.

4. Sensor Footprint (30 points)

The signal emitted by the ultrasonic sensor is a "conical" beam shape. Write and hand in a program that determines the width of this beam in degrees. Record the beam determined by your program in your README.

What to turn in: The width of the ultrasonic beam as a line in your README as well as the source of the program with the file named **beam_width.py**. You will need to demo this.

5. Locate and Approach (45 points)

Write a program that allows your GoPiGo to locate an object in a scene and approach it. To test your program (and subsequently demonstrate it) place a single object 1m away from your robot. Make sure there are no other objects in a circle of radius 250cm around the robot other than your test object. Change the orientation of your robot to face away from the test object direction. The robot should then locate the object and navigate toward it, and stop 20cm away from it.

What to turn in: A file named **locate_object.py** with the source for locating an object in a setting. You will need to demo this.

Instructions for submission

All assignments must be submitted with working code and a README that states that a section was completed and/or answers the questions listed in the section for the section of this assignment. All code must be written in Python, specifically python 2.7.

Your submitted code should be in a tarball (see here for how to tarball) and should be stored in a directory of the format 'hw1_<uni1>_<uni2>_<uni3>.tar.gz', where <uniX> is replaced with the uni of each teammate (i.e. hw1_djw2146_djw2156_djw2166.tar.gz). The directory of this folder should match the following:

hw1_djw2146_djw256_djw2166

-- README.md

-- dancing.py

-- sensor_accuracy.py

-- beam_width.py

-- locate_object.py

Your README should follow the following format:

""""

This is a Lab 1 submission for group **XXX**
Team Members: *member_1*(*UNI_1*), *member_2*(*UNI_2*), *member_3*(*UNI_3*)

Question 1: Done. Any other comments, if applicable
Question 2: Code implementation is found in *dancing.py*. Any other comments, if applicable
Question 3: Code implementation is found in *sensor_accuracy.py*. Any other comments, if applicable
Question 4: Code implementation is found in *beam_width.py*. Any other comments, if applicable
Question 5: Code implementation is found in *locate_object.py*. Any other comments, if applicable
“””

You should also include descriptions of any novel methodologies you used to implement the solutions for this assignment.

Any deviations from this will not be considered for grading.

Instructions for uploading to courseworks

As this is the first assignment, go to courseworks, click on "People" tab on the left and then choose the "Groups" tab on top left. Check the names corresponding to your group number and confirm that you belong to the right group on Courseworks. This is a once and for all step this semester to make sure you are in the right group. Grading is done based on this grouping.

To submit **Lab #X**, take the following steps:
1. Put your homework directory into a tarball (noted above).
2. Upload your submission to canvas. Click on the Assignments tab (on the left). Select the homework and upload the file.
3. Add a comment that says “successfully submitted assignment 1” and check the box that says "Send Comment to the Whole Group". Since your submissions are going to be registered for the entire group, it is a good practice to notify your group mates that a submission has been made.