CS245 – Robotics and Machine Learning
Lab 1
Introductory Lab Exercise – Movement and Measurements

1. In this part of the lab, you will experiment with motors. You will also record your findings.

a) Write a program that moves your robot straight forward and measure the distance travelled, as well as the deviation from the straight-line trajectory, for the following:
    -   Number of rotations, from 1 rotation to 5 rotations (in increments of 1 rotation)
    -   Number of seconds, from 1 second to 5 seconds (in increments of 1 second)
    -   Number of degrees, from 100 degrees to 500 degrees (in increments of 100 degrees)

b) Write a program that rotates your robot (either left or right) in place and measure the angle traversed for the following:
    -   Number of rotations, from 1 rotation to 5 rotations (in increments of 1 rotation)
    -   Number of seconds, from 1 second to 5 seconds (in increments of 1 second)
    -   Number of degrees, from 100 degrees to 500 degrees (in increments of 100 degrees)

c) For each of the five tasks above, collect your data in a table, indicating the duration of you measure and the results of your experiment. Plot your findings on a graph, where the x-axis indicates the appropriate duration and the y-axis indicates distance/angle traversed.

d) Write a discussion about your measurements and their results. In particular, what can you say about performance of the motors and their accuracy?

2. Write a program that plays 4 short beeps (each less than 1 second), with short pauses in between the beeps.

3. (Multiple Tasks) Write a program with 4 tasks. The first task should play 4 beeps. The second task should turn on motors and move your robot in the forward direction for 4 seconds, then stop. The third task should turn on motors and move your robot in the reverse direction for 5 seconds, then stop. The fourth task should make your robot turn in place (either to the left or to the right) and complete a full circle (i.e., your robot should turn in place and finish at the same position where it started).

Lab Report

In addition to parts 1.c) and 1.d) of this lab exercise, each student should describe, in detail, the process of designing the programs for parts 2 and 3 in plain language. In particular, include comments about performance of your robot's sensors and effectors. Your report should be between 1 and 2 pages long, single-spaced, in Times New Roman 12 point font.

The grade for this lab will be determined according to the following:
    - Part 1 (40%)
    - Part 2 (20%)
    - Part 3 (20%)
    - Lab report (20%)

Demonstrations and evaluations of your work for this lab will take place by Sept 7th. Lab reports are due on Sept 10th, before the beginning of the class period.