Assignment #3   Due date: _____

Navigating the BOE-BOT

Reading Assignment:

1. Refer to the following section in Robotics Version 2.2 student manual
    a. Chapter 3 – Assemble and Test Your BOE-BOT
    b. Chapter 4- BOE-BOT Navigation
2. Refer to various sections of BASIC Stamp Syntax and Reference Manual, Version 2.1 for information of PBASIC commands
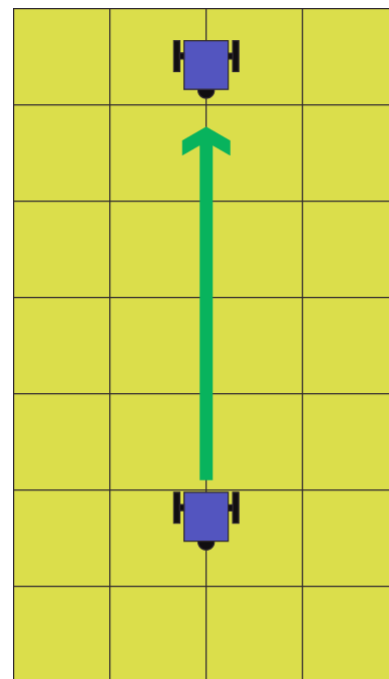3. BOE-BOT Presentation #3 – Navigating the BOE-BOT

Work Assignment:

Ensure that you have good servos that have a smooth curve showing you can access multiple speeds for minor speed adjustment needed for this project assignment. Ensure programs have the usual comments at the beginning and detail explanation comments on program code lines.

1. Navigating the BOE-BOT in a straight line (program 3a)
    a. Write and test a program to run the BOEBOT in a straight line for four feet (four tiles).
    b. The BOE-BOT should:
        i. Start behind the starting line.
        ii. Stop after the finish line within 2"
        iii. Keep wheels within the line following
        iv. Demonstrate proper operation to your instructor
        v. Determine the exact distance traveled by the BOE-BOT and record the value of N used and calculate the distance traveled per count. Your program might look something like the following example:

```
Counter VAR WORD
FOR Counter = 1 TO N
        PULSOUT 12, DURATION1
        PULSOUT 13, DURATION2
        PAUSE 20
NEXT
```

    c. Your task goal is to experimentally determine the appropriate values of DURATION1, DURATION2, and the COUNT. Use your data gathered from the last project to make good initial estimates.
2. Navigating the BOE-BOT in a straight line and returning to the start position (program 3b)
    a. Write and test a program to run the BOE-BOT in a straight line on the track, cross the finish line, and return to cross the starting position.
    b. The BOE-BOT should:
        i. Start behind the starting line.
        ii. Proceed in a straight line until crossing the finish line.
        iii. Turn the BOE-BOT around.
   iv. Proceed in a straight line back toward the original starting line.

    v.   Cross the starting line within 2 inches

    vi.   Keep the wheels within the line you are following.

    vii.   Demonstrate proper operation to your instructor.

3. Navigating the BOE-BOT with wide turns (program 3c)
   a. Write and test a program to run the BOE-BOT in two wide turns opposite of each other forming a "S" pattern
   b. First wide turn uses a 2 foot travel distance with a radius of 1 foot while the second curve uses a 3 foot travel distance with a radius of 1.5 foot radius
   c. The BOE-BOT should:
      i. Start behind the starting line facing straight.
      ii. Rotate turn for optimal curve angel for first curve.
      iii. Proceed on first curve to the left.
      iv. Bot should pass through the 2 foot distance mark and continue through second curve to the right
      v. Cross the finish X line within 3 inches
      vi. Demonstrate proper operation to your instructor.

4. Navigating the BOE-BOT on a custom course (program 3d)
   a. Review custom grid-course assigned (see below chart) and use previous programs for resource
   b. Draw a **<u>full page relative</u>** XY graph as needed , show the Boe-bots custom course indicating:
      i. Course directions given
      ii. Address point/locations.
      iii. Path of bot
      iv. Bot turning angles
      v. Bot direction/facing
   c. Write and test, through trial and error, a program to drive the BOE-BOT along your individual custom floor grid course. **<u>Tip:</u>** *program each movement separately, one at a time to ensure accuracy and organization of program code and Boe-bot operation.*
   d. The BOE-BOT should:
      i. Start behind the starting line X grid facing indicated direction
      ii. Have a Piezo sound (Page 107 of student manual) and message indicating start and finish of custom course
      iii. Proceed through the custom course accurately until all course points have been completed
      iv. Demonstrate proper operation to your instructor.
      v. Consistent accuracy will earn higher marks (as observed by the instructor).
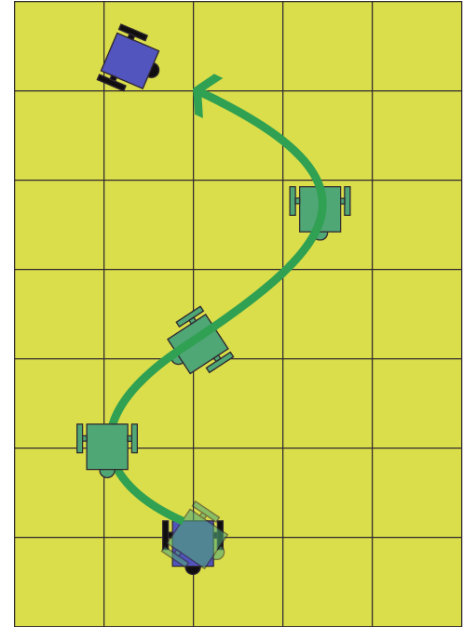
Kit #	Student	Boe-Bot Floor Pattern Lab
1		START N (0,0); ARC S (2,0); DRV S (2,2); ROT-CW W (2,2); DRV W (0,2); ROT-CW N (0,2); DRV N (0,0); ROT-CCW N (0,0)
2		START N (0,0); ROT-CW NW (0,0); DRV NW (-2,2); ROT-CW N (-2,2); DRV N (-2,1); ROT-CCW S (-2,1); ARC N (0,0)
3		START N (0,0); ROT-CW NE (0,0); DRV NE (2,2); ROT-CCW N (2,2); DRV N (2,1); ROT-CW S (2,1); ARC N (0,0)
4		START N (0,0); ROT-CW NW (0,0); DRV NW (-2,2); ROT-CW N (-2,2); DRV N (-2,1); ROT-CCW S (-2,1); ARC N (0,0)
5		START N (0,0); ARC E (2,2); DRV E (0,2); ROT-CCW SE (0,2); DRV SE (2,0); ROT-CCW E (2,0); DRV E (0,0); ROT-CCW N (0,0)
6		START N (0,0); ARC W (-2,2); DRV W (0,2); ROT-CW SW (0,2); DRV SE (-2,0); ROT-CW W (-2,0); DRV W (0,0); ROT-CCW N (0,0)
7		START N (0,0); ARC S (1,0); ROT-CW NE (1,0); DRV NE (2,1); ROT-CW E (2,1); DRV E (0,1); ROT-CCW N (0,2); DRV N (0,0); ROT-CW N (0,0)
8		START N (0,0); ARC E (2,2); DRV E (0,2); ROT-CCW SE (0,2); DRV SE (2,0); ROT-CCW E (2,0); DRV E (0,0); ROT-CCW N (0,0)
9		START S (0,0); ARC E (2,-2); DRV E (0,-2); ROT-CCW NE (0,-2); DRV NE (2,0); ROT-CW W (2,0); DRV W (0,0); ROT-CCW N (0,0)
10		START N (0,0); ARC S (2,0); DRV S (2,2); ROT-CW W (2,2); DRV W (0,2); ROT-CW N (0,2); DRV N (0,0); ROT-CCW N (0,0)
11		START N (0,0); ARC S (-2,0); DRV S (-2,2); ROT-CCW E (-2,2); DRV E (0,2); ROT-CCW N (0,2); DRV N (0,0); ROT-CW N (0,0)
12		START S (0,0); ARC E (-1,-1); ROT-CW E (-1,-1); DRV E (-3,-1); ROT-CW NNE (-3,-1); ARC E (-2,0); DRV E (0,0); ROT-CW S (0,0)
13		START N (0,0); ARC W (-1,1); ROT-CCW E (-1,1); DRV E (-3,1); ROT-CCW SSE (-3,1); ARC E (-2,0); DRV E (0,0); ROT-CCW N (0,0)
14		START N (0,0); ARC E (1,1); ROT-CCW W(1,1); DRV W (3,1); ROT-CCW SSW (3,1); ARC W (2,0); DRV W (0,0); ROT-CW N (0,0)
15		START N (0,0); ROT-CW NW (0,0); DRV NW (-2,2); ROT-CW N (-2,2); DRV N (-2,1); ROT-CCW S (-2,1); ARC N (0,0)
16		START N (0,0); ROT-CW NE (0,0); DRV NE (2,2); ROT-CCW N (2,2); DRV N (2,1); ROT-CW S (2,1); ARC N (0,0)
17		START N (0,0); ROT-CCW NE (0,0); DRV NE (2,3); ROT-CW N (2,3); DRV N (2,1); ROT-CCW S (2,1); ARC N (0,0)
18		START N (0,0); ARC S (2,0); ROT-CW NE (2,0); DRV NE (3,1); ROT-CW E (3,1); DRV E (0,1); ROT-CW N (0,2); DRV N (0,0); ROT-CW N (0,0)
19		START S (0,0); ARC E (-2,-2); ROT-CW E (-2,-2); DRV E (-3,-2); ROT-CW NNE (-3,-2); ARC E (-2,0); DRV E (0,0); ROT-CCW S (0,0)
20		START N (0,0); ROT-CCW NW (0,0); DRV NW (-3,3); ROT-CW N (-3,3); DRV N (-3,2); ROT-CW S (-3,2); ARC N (0,0)

Report

Organize your results into a report and submit digital report to the instructor by the assigned due date using MS Word version 2003. The report should look similar to the following:

Boe-Bot Navigation Report

Date Due: _____
Date Handed in: _____
Group #____
Partners: _____, _____,_____,

Demonstration of Projects Check list:

Program	Successfully Demonstrated	Worst accuracy with-in 1, 2, 3"	Date
Straight 3a			
Straight and Return 3b			
Two Curves 3c			
Custom Navigation 3d			

Program Code Assignments

Straight 3a Program Code
Put full programing code here

Straight and Return 3b Program Code
Put full programing code here

Two Curves 3c Program Code
Put full programing code here

Custom Navigation 3d Program Code
Put full programing code here

Analysis

Distance travelled per count _____ (show how you got your answers)

The number of counts required to travel
6" _____
1' _____
2' _____
3' _____