ECE 110L Spring 2024

IDC Week 3 Laboratory:

Receiving and Displaying

Contents

1 Abstract

Now that your 'bot can successfully complete its sensing task and transmit data, it is time to get it to display data it receives. The main task for this week will be to integrate code for receiving data from other 'bots and displaying all necessary data/information (see IDC document) on a LCD.

Note that this week the work is once again focused on the IDC Checkpoint. As noted previously, the IDC Checkpoint will specifically support the integrated design challenge and will give you the opportunity to test a particular system or systems multiple times until your group is successful. This lab has brief pre- and post-laboratory deliverables, but does not contain any deliverables for the experiments or explorations.

2 Objectives

After performing this laboratory exercise, students should be able to build a 'bot that:

- Navigates the IDC track they have been assigned,
- Stops at hash mark(s) along the track,
- Uses the sensor they have been assigned to locate a target object and reject other objects,
- Transmit the target object's information to all other 'bots,
- Receive the other 'bots' transmitted data, and
- Display all necessary information on a LCD.

3 Pre-Laboratory Exercises

Have a conversation with your lab partner(s) about the possible discrepancies and places for error with the sensor you have been assigned, how labs 4 through IDC Week 2 Lab went, and anything about those that you are not sure about. Also talk about the XBee communication lab and specifics of LCD code. If there are questions that the instructional team can answer that will make this lab more efficient for you post them on the Ed page. This week's lab is all about system integration.

Pre-lab Deliverable (1): Write a brief paragraph detailing any ideas or notes that came up in your communication with your partners.

4 Pre-Laboratory Assignment

Your assignment responses should be uploaded to the ECE 110L Laboratory Gradescope site by the assignment deadline.

EACH STUDENT must submit their own INDIVIDUAL assignment responses!

You will respond to the following:

1. Type the Duke Honor Code:
    - *"I have adhered to the Duke Community standard in completing this assignment."*

2. **Pre-lab Deliverable 1:** Brief Paragraph

    - Write a brief paragraph describing your conversation with your group and any important notes you may have. **This can contain information about your group's transmission code and XBee, sensing code and sensor, navigation code and QTIs, or anything else you find useful for the coming IDC Checkpoint.**

Your assignment responses should be uploaded to the ECE 110L Laboratory Gradescope site by the assignment deadline.

EACH STUDENT must submit their own INDIVIDUAL assignment responses!

5 Experimental Exercise

Get together with your whole lab team to talk about communication. Remember that four or five 'bots will be, potentially simultaneously, sending information about where their target object is located. Work together as a section team and with your TAs to determine the most appropriate method for sending and receiving data. You should also discuss and determine an agreed upon method for showing the required information, and any other information needed for troubleshooting, on every 'bot's LCD.

6 Exploration

Build a 'bot that accomplishes your navigation, your group's sensing task, and the remaining parts of your communication tasks. You are allowed to test it on the actual track. **When writing code or adjusting hardware, be sure your battery pack is charging so you have plenty of stored energy for attempting the IDC Checkpoint.**

7 IDC Checkpoint

Before attempting the following IDC Checkpoint, ensure that your team has completed IDC Checkpoint 2 – Navigation, Sensing, and Transmission Integration. See the IDC document for details. Your lab team should now attempt to complete IDC Checkpoint 3 by the end of lab, but can complete it during next week's lab if necessary.

IDC Checkpoint (3): Show your TA that your 'bot can navigate as it did for IDC Checkpoint 1 and 2 while also using it's sensor to look for the object your group is expected to identify. It must use an XBee module to transmit the correct data (see IDC document) similar to how it did in IDC Checkpoint 2, but this time you must also receive data from it and display the IDC appropriate data on your LCD (see IDC document).

IDC Deliverable (1): Integrate your code for sensing, navigating, and transmitting with your code for receiving. Save this as a separate file. **Be sure your code is thoroughly commented.** This *does not mean every line needs a comment*, but there should be enough comments to make it clear what your code does.

IDC Deliverable (2): To show your progress, you should now integrate your current code with your code for displaying data on a LCD (see IDC document). Save this as a separate file. **Be sure your code is thoroughly commented.** This *does not mean every line needs a comment*, but there

should be enough comments to make it clear what your code does.

8 Assignment

Your assignment responses should be uploaded to the ECE 110L Laboratory Gradescope site by the assignment deadline.

EACH STUDENT must submit their own INDIVIDUAL assignment responses!

You will respond to the following:

1. Type the Duke Honor Code:
    - *"I have adhered to the Duke Community standard in completing this assignment."*
2. **IDC Deliverable 1: Code for Navigation, Sensing, Transmitting and Receiving** 7
    - Your group's code for navigation and sensing, transmitting to and receiving from all team 'bots.
    - Be sure your code is thoroughly commented. This does not mean every line needs a comment, but there should be enough comments to make it clear what your code does.
3. **IDC Deliverable 2: Code for Navigation, Sensing, Transmitting, Receiving, and Displaying** 7
    - Your group's code for navigation and sensing, transmitting to and receiving from all team 'bots, and displaying the required information on a LCD.
    - Be sure your code is thoroughly commented. This does not mean every line needs a comment, but there should be enough comments to make it clear what your code does.