Lab 2 Prelab

**Name**: Chimzim Ogbondah

**Lab Partner Name (if you worked together and are submitting the same document or mostly the same answers):**

**Lab Section**: 1

**Submit your prelab document as a PDF file in Canvas under the corresponding prelab assignment. Every student submits their own prelab. Lab partners are allowed to work on the prelab together and submit the same document (if there is actual collaboration on the document). For full credit, the prelab must be submitted prior to the start of lab. Text responses should be typed or printed neatly. You can draw a sketch by hand, or you can use a drawing tool. Try to have started a rough draft of the prelab when you come to class on Tuesday.**

1. Read about structured pairing (see documents posted with the lab). During lab, you and your lab partner will exchange roles, such as for each part of the lab. The roles you will switch between are “Driver” and “Navigator.”
2. Do you think one of the structured pairing roles will be easier or more natural for you? Briefly explain.

* I feel like I would be better at navigating because I enjoy working with “data” or understanding what should happen when faced with a problem.

1. Describe one way you think using structured pairing might benefit you in the lab.
   1. I feel like structured pairing would benefit in this lab because we can divide and conquer, understanding our strengths and weaknesses and then helping each other out towards a common goal without having to do all the work by ourselves
2. Skim through the iRobot Roomba Open Interface Specification document (posted with the lab). Notice the information about commands that can be sent to the iRobot and the sensor packets it returns to the TM4C microcontroller. A commands quick reference table is shown on page 33. A sensors quick reference starts on page 37.
3. Name one of the OI commands used in this lab and give its opcode.
   1. Drive Wheels is the command with the opcode being 145
4. Name one of the sensors used in this lab and give the number of data bytes used for the sensor value.
   1. Wall Signal Sensor and it uses 2 bytes of data for the value range (0-1023)
5. Read about the iRobot company and Roomba Robot vacuums. For example, start here: <https://www.irobot.com/about-irobot/company-information> . Browse through the Roomba 600 family of products, <https://www.irobot.com/for-the-home/vacuuming/roomba> . Try to match up a particular sensor with a product feature that it supports (just one sensor and one feature). Briefly explain.
   1. I believe the wall sensor lines up with the feature of staying in bounds. Ideally you wouldn’t want to hit a wall so mapping out where walls or “objects” are would need the help of a wall sensor.

p.s. You might find other online resources informative or interesting (e.g., <https://electronics.howstuffworks.com/gadgets/home/robotic-vacuum2.htm> , <https://www.explainthatstuff.com/how-roomba-works.html> , <https://spectrum.ieee.org/automaton/robotics/home-robots/new-roomba-i7-features-persistent-maps-room-cleaning> , <https://www.technologyreview.com/s/541326/the-roomba-now-sees-and-maps-a-home/> )

System sketch

In this lab, you will be running a program on the microcontroller that communicates with the iRobot. The program sends commands to the iRobot and receives status information from the iRobot. This communication uses a standard peripheral interface called a UART (Universal Asynchronous Receiver Transmitter) for sending and receiving bytes (physically, it transmits a bit at a time over a wire, but you’ll learn more about the UART later). In this lab, the low-level UART communication functions are provided, and you will call higher-level functions from the open\_interface library. The open\_interface specification defines the requirements for the software library.

A close up of text on a white background

Description automatically generatedSketch a block diagram that illustrates the main components in the system in some way that makes sense to you. There is no single right sketch. Show hardware and/or software components. Show some connectivity between components. Show structure and/or operation of the system. Whereas the system sketch specified for Lab 1 involved schematics and pins, this system sketch does not need to include pin-level information. Suggestion: refer to slides 2 and 3 in the “lab2-intro-slides” (in Canvas), and use elements of those as a starting point for your sketch.