Lab 2 Prelab

Name: Riley Lawson

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

Lab Section: 9

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."**

a) **Do you think one of the structured pairing roles will be easier or more natural for you? Briefly explain.**

I think the navigator role will be slightly easier because I am better about thinking outside the box and really good at analyzing the current situation rather than writing code on demand.

b) **Describe one way you think using structured pairing might benefit you in the lab.**

I thinking this will benefit us by increasing our productivity and collaboration efforts. This could also increase our workflow instead of both being the navigator and driver.

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.**

a) **Name one of the OI commands used in this lab and give its opcode.**

Drive Wheels - 145

b) **Name one of the sensors used in this lab and give the number of data bytes used for the sensor value.**

Bumb Wheeldrops - 1 byte (0-15) Packet (7)

3. **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.**

The dirt sensors with the hard brushes. They both work together to clean the carpet in a very neat fashion. The more dirt the sensors detect, the faster the brushes spin.

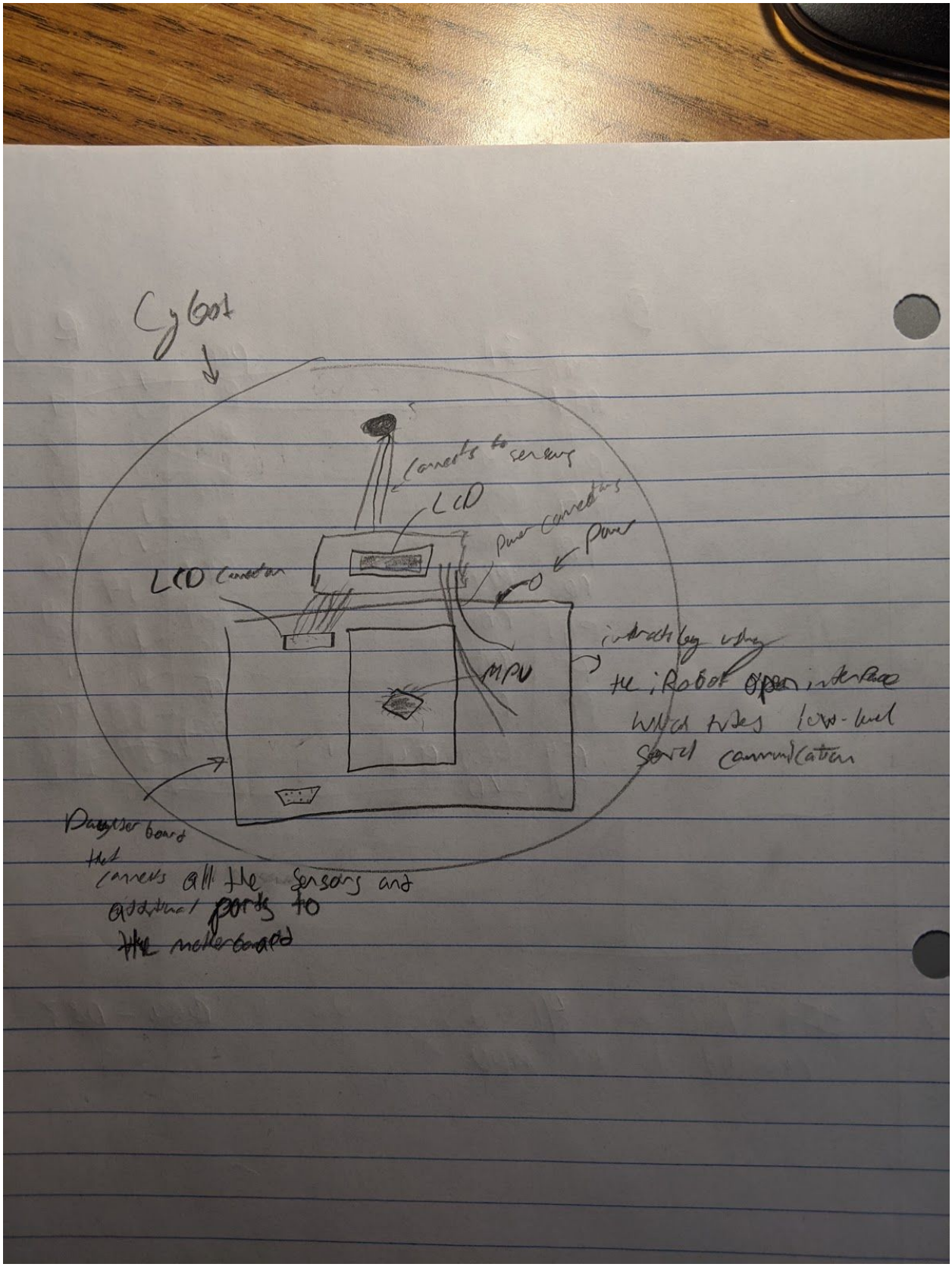
p.s. You might find other online resources informative or interesting (e.g., https://electronics.howstuffworks.com/gadgets/home/robotic-vacuum2.htm , https://www.explainthatstuff.com/how-roomba-works.html , https://spectrum.ieee.org/automaton/robotics/home-robots/new-roomba-i7-features-persistent-maps-room-cleaning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

4. **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.

Sketch 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.


Cybot
Connects to sensors
LCD
Power connector
Power
LCD Connector
MPU
interacting using
the iRobot open interface
which uses low-level
Serial communication
Daughter board
that connects all the sensors and
additional ports to
the motherboard