CMPE 460 Laboratory Exercise 4

Bluetooth & I2C

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Your Signature: _____

Description

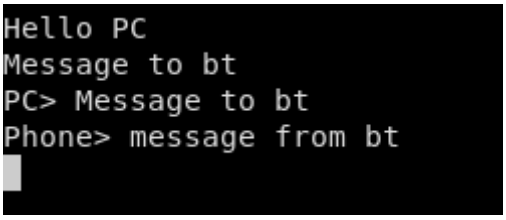
This exercise consisted of two parts, configuring a bluetooth peripheral to work over external UART pin and configuring I2C to drive an OLED display. The bluetooth portion of the lab worked by connecting a smart phone to the bluetooth device and creating simple communication link between the phone and the UART displayed over USB. The purpose in this exercise was to create a simple method of wireless communication and control so that we may debug/control our boards without need to be directly linked to USB. The second portion of the exercise involved writing a driver to control on OLED display. The OLED display is to be used later to view the camera data, however it can also display text and arbitrary imagery.

Code description

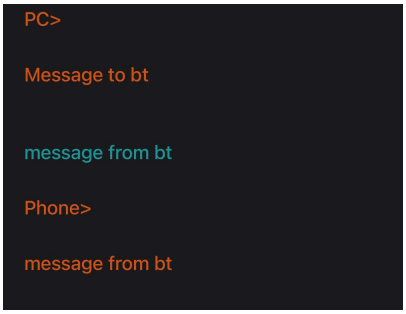
Bluetooth

The design of the bluetooth UART device had identical initialization to that of the USB UART. A library was written to provide a generic init/read/write interface between any of the UART compatible devices. The same set of functions is used and simply passing a certain ID will select which device to read, write or initialize. This allowed the same code to be used from lab2 for both the bluetooth and USB UART peripherals which sped up the development process.

The implementation for the chatroom was simple. Both the bluetooth and the USB devices were polled for input data. When data from one of the devices was received, it was then transmitted to the other device. The public facing interface to UART for both devices is completely abstracted from the specific features of the MSP432 board and therefore allows for adaptation to other boards if the future need arises.



(a) Screenshot of chatroom from PC end.



(b) Screenshot of chatroom from phone/bluetooth end.

Figure 1: Screen captures of chatroom in operation on both sides of the comm-link

Figure 1 shows the operation of the chatroom from both sides of the comm-link. We can see the correct operation of the bluetooth-usb chatroom.

I2C OLED

The OLED display is a simple display that communicates with a master device over an I2C link. The I2C initialization was fairly straight forward. The UART code was similar in that same polling model was used to operate the I2C peripheral. The next layer above the I2C driver involved abstracting out the canvas that was used to draw on the OLED screen. The public facing interface of the OLED driver allowed the user to print text on a canvas or to manually draw directly to this canvas. The canvas could then be written via I2C to the OLED display. This design allows for high amounts of flexibility in the future as well as hiding the inner workings of the OLED and I2C drivers in lower levels of the program.

An image was taken of the OLED displaying text where each line is written separately to the display.

Figure 2: OLED screen with text.

We can see in Figure 2 the correct operation of the text rendering operated by the OLED driver. A total of five lines were printed to the OLED display. We can see from the figure that the first line is no longer shown as the text canvas scrolled up when the display was filled.

Bluetooth question

Simultaneous input is handled in the main loop by polling each UART device in a non-blocking manner. This means that we simply check if data is available and if not, we check the next UART device.

Exercise 4: UART over Bluetooth

Student's Name: Andrei Tumbar Section: 2

Prelab		Point Value	Points Earned	Comment s
Prelab	Renamed Board	10	10	dy 2/4/22
	Register Configs	5	5	dy 2/4/22

Demo		Point Value	Points Earned	Date
Demo	BLE-controlled LEDs	15	15	CP 2/4
	BLE Chatroom	25	25	

To receive any grading credit students must earn points for both the demonstration and the report.

Exercise 4: UART over Bluetooth

Report	Point Value	Points Earned	Comments
Lab Description	5		
Code Description	10		
Question	10		

Exercise 4: I2C

Student's Name: Andrei Tunbar Section: 2

Prelab		Point Value	Points Earned	Comment s
Prelab	Register Configs	5	5	dgy 2/4/22

Demo		Point Value	Points Earned	Date
Demo	Display text message	20	26	CP 2/4
	Display line graphic	20	20	

To receive any grading credit students must earn points for both the demonstration and the report.

Exercise 4: I2C

Report	Point Value	Points Earned	Comments
Lab Description	10		
Code Description	15		