School of Electrical Engineering and Computer Science

CptS466: Embedded Systems

Fall 2021

Project 4 (P4)

Code & Report Due: 10/22/2021 @ 11:59pm (Canvas)

Demo Due: 10/22/2021 in Class

1. Preparation

You will need the Launchpad, Bluetooth module, Breadboard, and some wires. You will use the terminal application CoolTerm, which can perform serial port communication on the PC.

2. Project Description

In this project you will learn how to write software that converts numbers into ASCII strings and sends the string to a computer via Bluetooth. Please read the entire lab before starting. You may use the two demo projects to find out about UART settings. The first project is a network of two Launchpad and the second one is the starter project for this lab. Look at the comments and the way the UART connection has been set up. Try to run the code. You may also observe the serial terminal after burning the code into the Launchpad The starter project connects to your computer directly and it will not work with Bluetooth model. When running on the real board you will run the terminal program CoolTerm.

Part (a) You will write an I/O driver routine that outputs strings to the UART device. See the comments in the UART.h and UART.c (starter project) for more detailed descriptions of how this UART_OutString function is to work.

Part (b) You will write an I/O driver routine that outputs an unsigned decimal number to the UART device. See the comments in the UART.h and UART.c for more detailed descriptions of how these UART_ConvertUDec and UART_OutUDec functions are to work.

Parameter	UART display
0	" 0 "
10	" 10 "
999	" 999 "
1000	"1000 "
9999	"9999 "
10000 or more	"**** "

Part (c) Assume the system stores the integers 0 to 9999, but the values mean 0.000 to 9.999 cm. For example, in the software a variable might contain 1234, but that value actually means 1.234 cm. You will write an I/O driver routine that outputs the value of the distance to the UART device. See the comments in the UART.h and UART.c for more detailed descriptions (starter project) of how these UART_ConvertDistance and UART_OutDistance functions are to work.

Parameter	UART display
0	"0.000 cm"
1	"0.001 cm"
999	"0.999 cm"
1000	"1.000 cm"
9999	"9.999 cm"
10000 or more	"*.*** cm"

Here are some additional requirements.

- We will use the default settings of the Bluetooth module. The baud rate is 9600, 8-bit word length, no parity bits, one stop bit, FIFOs enabled. The password of the module is 1234.
- Use 80 MHz as system clock.

2. What to submit?

Submit a .zip file with the following content:

- Your well commented C source code implementing the application described above.
- A report that documents the development process includes state machine, your observations, and a discussion of your design decisions.

Show a demo of your application in the class on the due date.

3. Report

In a separate written document (in Word or PDF), compile sections A through C as follows:

A: Requirements document. Treat this section as a requirements document and outline various requirements of the project in separate categories including (1) overview; (2) Function description; and (3) Deliverables. The overview section should contain, at least, information about objective, process, and interaction with existing systems. The function description section should contain, as a minimum, information about prototype, performance, and usability. The deliverables section should list or discuss any deliverables such as the built prototype, and report.

B: Discussions. In this section discuss how you implemented delay in your program. Discuss any specific observations that you had, any difficulties that you ran into while designing or testing the system. Discuss limitations of your developed system and potential ways that those limitations can be addressed in a future revision of your design.

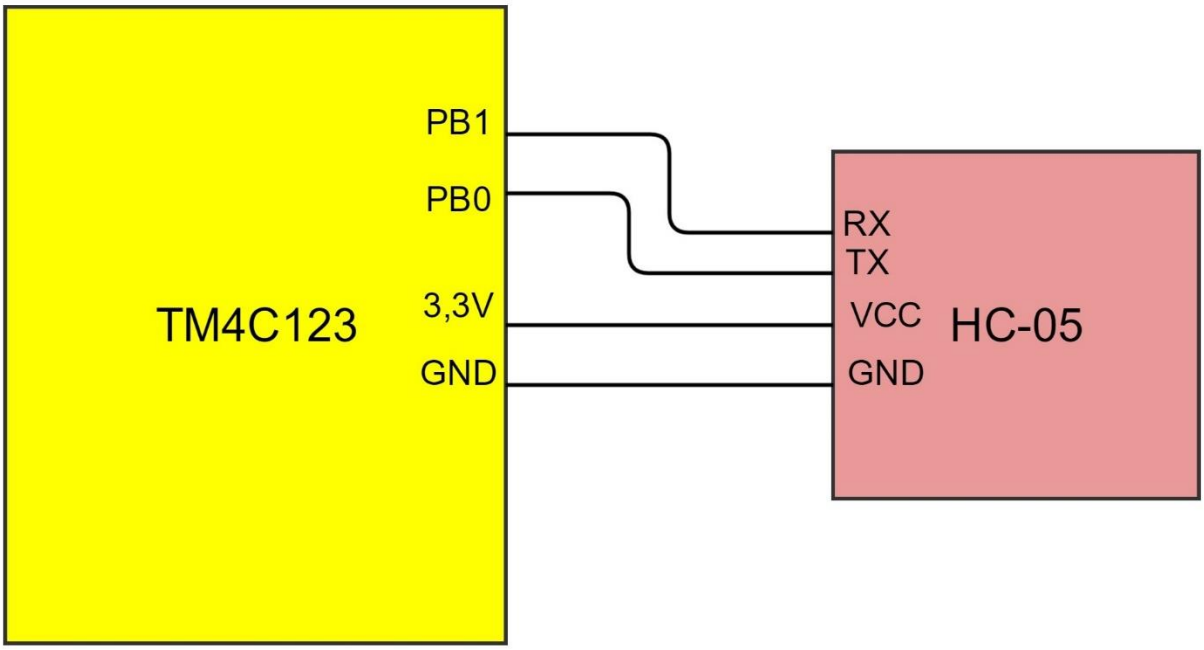
4. Grading

Assume that the whole assignment is worth 100 points.

- 35 pts for well commented and correct C source code satisfying the project requirements.
- 35 pts for report.
- 30 pts for demo.

5. Appendix A – Example System Schematic

A potential schematic of a system for Bluetooth connection is shown below. This could be used as a basis for your design. Note that the example discussed here does not necessary incorporates all requirements of the project that you will be building in this assignment. Use the information in this appendix as an example of **how** to begin designing and implementing a system of traffic light controller. The figure below shows a circuit diagram connecting the Launchpad to Bluetooth module. In this example we used UART1 which belongs to port B. However, you are free to use other UARTs.



When using CoolTerm serial terminal, go to options and change the com port and set the desired baud rate. Therefore, you can observe the output.