CECS 447 Project 3: Bluetooth Controlled Robot Car

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Total: 15 points

Preparation

You will need one LaunchPad, a Robot car driven by two DC motors, one L298N Motor Drive Controller, at least 4 AA batteries to power the car and the Launchpad, and one HC-05 Bluetooth module. You will use a terminal application, such as tera term, Putty, realterm, etc., which can perform serial port communication on the PC. A smartphone/Laptop is required to send commands to the Robot car through a Bluetooth terminal.

Project Description:

In this project, you will build a Robot car and use a cell phone Bluetooth terminal to control the movement of the car. You will also use the onboard LEDs to indicate the status of the car: moving forward, moving backward, stop, etc. The goal of this project is to learn how to interface an HC-05 Bluetooth module through UART, including setting up a HC-05 Bluetooth module and using the module to receive information sent from a smartphone Bluetooth terminal to control a robot car.

Project Requirements:

You will write two C programs: the first one is used to setup your HC-05 Bluetooth module, and the second program will use this Bluetooth module to receive control code from a smartphone and control a robot car movement based on the control code received. Your DC motors should be controlled by hardware PWM signals.

Part 1: Setup Bluetooth Module (5 points: setup with no UI: 2 points, setup with UI: 5 points):

Use UART1 to communicate with HC-05 Bluetooth module. Set Bluetooth Module to Command Mode: connect the HC-05 Bluetooth module to your Microcontroller with the following connections:

HC-05 Bluetooth Module	Launchpad
State: leave unconnected	
RX	UART1 TX
TX	UART1 RX
GND	GND
VCC	5v (VBUS)
EN/KEY:	3.3v or 5v

Notice that we need to connect EN/KEY pin to 3.3-5V before powering chip to get into Command Mode. If there is a button on your board connect EN/KEY to 3.3-5V press and hold button before applying power to get into Command Mode.

Then write a program to change your HC-05 Bluetooth module setting to the following

configurations:

    a. Bluetooth name to your name

    b. UART Configuration: 57600, 8 Data bits, 1 stop, odd parity

    c. Passcode: you define this, should not be 1234

    d. Set to Slave mode

The default baud rate of the HC-05 Bluetooth module is 38400 for command mode and 9600 for communication mode. Your setup program should run in the following way: After putting Bluetooth in AT command mode and send the first command: AT, your program will stay in super loop waiting for user input for AT command. User can enter AT command from Tera term or any other serial communication software. Record your serial terminal input and output data while you are configuring the device in command mode and put it in the "Operation" section in your project report. Below is an example of the serial terminal display: Green texts are program prompt to user; purple texts are user inputs, blue texts are responses received from the Bluetooth module.

```
>>> Welcome to Serial Terminal <<<
>>> This is the setup program for HC-05 Bluetooth module <<<
>>> You are at 'AT' Command Mode.<<<
>>> Type 'AT' and follow with a command <<<
AT+NAME=Min He
OK
AT+NAME?
+NAME Min He
OK
AT+UART=57600,1,0
OK
AT+UART?
+UART=57600,1,0
OK
AT+PSWD=4321
OK
AT+PSWD?
+PSWD : 4321
OK
AT+ROLE=0
OK
AT+ROLE?
+ROLE : 0
OK
```

Part 2: A Bluetooth Controlled Robot Car
(10 points: 5 points for LED functionalities, 5 points for robot car functionalities):
Set Bluetooth Module to Data Mode (disconnect the EN/KEY pin) and write a program for your Robot car to serially communicate with a smartphone/PC Bluetooth APP through the HC-05 Bluetooth module. You can either download or write your own Bluetooth terminal application on your smartphone, and pair your phone with your Bluetooth module.

Use buttons as an event to send the following characters to your microcontroller to control your robot car movement and the onboard LED indicators:

- 'W': Forward, green LED on
- 'S': Reverse, blue LED on
- 'A': Left Turn, yellow LED on
- 'D': Right Turn, purpose LED on
- 'T': Stop, all LEDs off
- 'U': Speed Up, keep the current direction LED on
- 'L': Slow down, keep the current direction LED on