CMPE 443 PRINCIPLES OF EMBEDDED SYSTEMS DESIGN

LAB #004

"Motor Controller"

Motivation

In this experiment, you will work with the DC Motor and Motor Controller. With Motor Controller and PWM module on the LPC4088 board, you will be able to change the speed and direction of the DC Motor. The Motor Controller has two H-Bridges. Therefore, you will be able to connect a separate DC power supply to the motor to increase its power. Hence, in this lab, you will learn to:

- use PWM in the motor control
- change the speed of DC motor
- change the direction of the DC motor's rotation

1) Problem Description

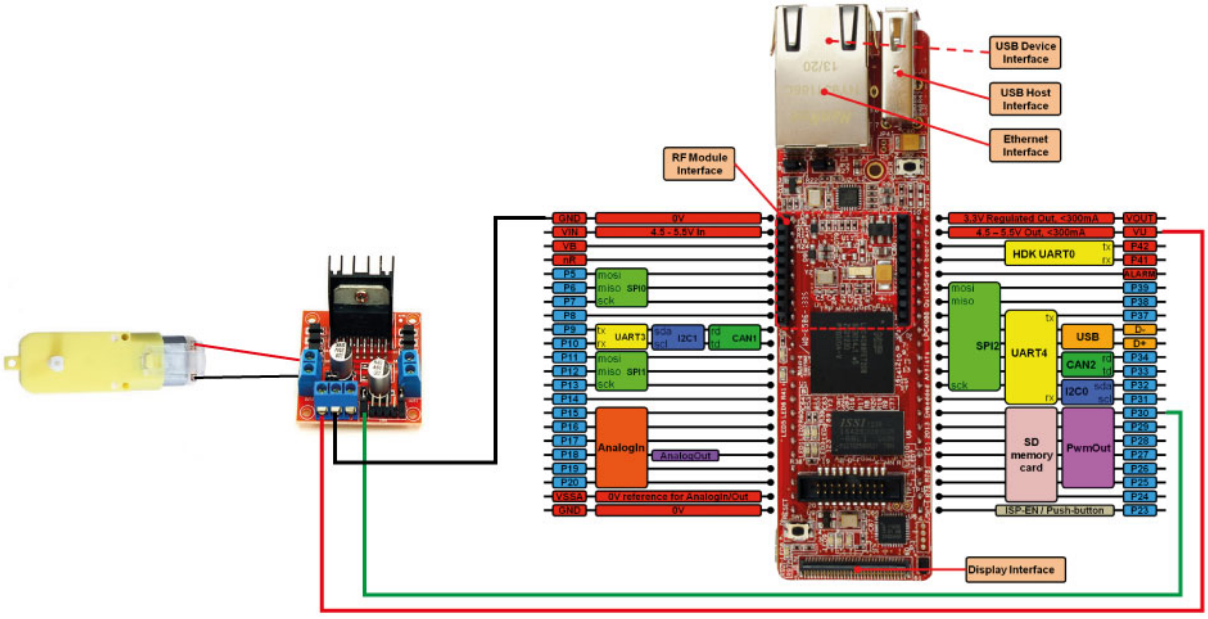
In this lab, you will use DC Motor, Motor Controller and Joystick. The speed of the motor and direction of the motor rotation will be changed according to the pressed Joystick button.

- When Joystick Left button is pressed, Motor Speed will be decreased.
- When Joystick Up button is pressed, Motor rotation direction will be changed to forward.
- When Joystick Down button is pressed, Motor rotation direction will be changed to backward.
- When Joystick Center button is pressed, Motor will stop .
- When Joystick Right button is pressed, Motor Speed will be increased.
- When Joystick no button is pressed, Motor will continue to perform the last action.

*Note: When a question ends with **(*)** notation, that means write on the code. When a question ends with **(?)** notation, that means write on the paper. When you see **(*?)**, the answer of this question should be written on the paper and code.*

2) Connecting Motor to Motor Controller and Motor Controller to Board

5 pts



Motor Terminals	Motor Controller Pins
Red Wire	OUT1
Black Wire	OUT2

Motor Driver should take the commands from the board. On L298N Motor Driver, there are 2 Enable pin and 4 Logic pin. In order to use Motor Controller with Board, there should be 5 pin connections:

- Two pin connections for giving power to motor controller and motor,
- One pin connection for changing the speed of the motor
- Two pin connections for changing the direction of the motor.

Motor Controller Pins	LPC4088 Pins
+12V	Vu
GND	GND
ENA	P30 (P1_2)

In this lab, you can use the code of your last LAB and in that LAB, P30 pin is used for PWM. Therefore, you can use the same pin in this LAB too. However, you can change that pin too.

You should determine the **2 pins** for the direction control. In your Term Project, these pins are determined and you will use the pins. For this case:

- Write Pin Name of pins which will be used for changing motor rotation direction. **(?)**

  _____ _____
  1 pt
- Write the Ports of these pins. **(?)**

  _____ _____
  1 pt
- Write the MASK of these pins. (1 << Y) **(?)**

  _____ _____
  1 pt

- You should connect these 2 pins to IN1 and IN2 pins of the Motor Controller.

  _____
  1 pt

3) Changing Speed and Direction of Motor with Joystick *5 pts*

In this section, you will write a code for performing these task:

- When Joystick Left button is pressed, Motor Speed will be decreased.
- When Joystick Up button is pressed, Motor rotation direction will be changed to forward.
- When Joystick Down button is pressed, Motor rotation direction will be changed to backward.
- When Joystick Center button is pressed, Motor will stop .
- When Joystick Right button is pressed, Motor Speed will be increased.
- When Joystick no button is pressed, Motor will continue to perform the last action.

Hint: For decreasing and increasing the speed, if you do not use any control mechanism, the speed will be decreased or increased quickly and this causes not being able to see the middle speed values. However, we should see the middle speed values in DEMO. You do not know how to use Timer. Therefore, you can make an empty For Loops for adding delay in your code. (You can look the LAB1 document.)