Lab 3 – Prototype Phase 1

ECE 298 – S2021

|  |  |  |  |
| --- | --- | --- | --- |
| Lab Section: | N/A | Group: | 90 |

# Part 1 – Pin Mapping

|  |  |  |
| --- | --- | --- |
| MCU Pin | Pin Mode | Functional Description |
| PA0 | TIM2\_CH1 | Outputs a PWM signal to the left DC Motor |
| PA1 | TIM5\_CH2 | Outputs a PWM signal to the right DC motor. |
| PA4 | GPIO\_Output | Outputs the first bit of 4 that is sent to the LCD in 4-bit mode. |
| PA5 | GPIO\_Output | Outputs the second bit of 4 that is sent to the LCD in 4-bit mode. |
| PA6 | GPIO\_Output | Outputs the third bit of 4 that is sent to the LCD in 4-bit mode. |
| PA7 | GPIO\_Output | Outputs the fourth bit of 4 that is sent to the LCD in 4-bit mode. |
| PB0 | GPIO\_Output | Outputs the E (enable) bit that is sent to the LCD in 4-bit mode. |
| PB1 | GPIO\_Output | Outputs the RS bit that is sent to the LCD in 4-bit mode. |
| PB2 | GPIO\_Output | Outputs the R/W (read/write) bit that is sent to the LCD in 4-bit mode. |
| PB3 | GPIO\_Output | Controls the red LED indicating battery voltage. |
| PB4 | GPIO\_Output | Controls the orange LED indicating battery voltage. |
| PB5 | GPIO\_Output | Controls the yellow LED indicating battery voltage. |
| PB6 | GPIO\_Output | Controls the green LED indicating battery voltage. |
| PB7 | GPIO\_Output | Controls the green LED indicating controller mode. |
| PB15 | GPIO\_Output | Selects the mux output controlling forward and backward rotation of the DC motors. |
| PC0 | ADC1\_IN10 | Analog to digital converter input of battery voltage. |
| PC1 | ADC1\_IN11 | Analog to digital converter input of speed control potentiometer. |
| PC2 | ADC1\_IN12 | Analog to digital converter input of steer control potentiometer. |
| PC6 | GPIO\_EXTI6 | Input of the left motor encoders’s Q1 output to sense rotation speed. |
| PC7 | GPIO\_Input | Input of the left motor encoders’s Q2 output to sense rotation direction. |
| PC8 | GPIO\_EXTI8 | Input of the right motor encoders’s Q1 output to sense rotation speed. |
| PC9 | GPIO\_Input | Input of the right motor encoders’s Q2 output to sense rotation direction. |

# Part 2 – MCU Resources

|  |  |
| --- | --- |
| MCU Resource | Functional Description |
| TIM1 | Counts time until the last 1/24-th of a rotation occurred when sensing the Q1 voltage of the left DC motor encoder. |
| TIM2 | Generate PWM signal that is sent to control the left DC motor controller. |
| TIM4 | Counts time until the last 1/24-th of a rotation occurred when sensing the Q1 voltage of the right DC motor encoder. |
| TIM5 | Generate PWM signal that is sent to control the right DC motor controller. |
| ADC | Measures the analog voltage of the DC battery and potentiometer voltage division circuits on a scale of 0-3.3 V. |
| GPIO | Outputs digital signals to the LEDs, multiplexers, LED NFETs and LCD interfaces and receives input from the DC motor encoder’s outputs. |
| NVIC | Receives voltage from the DC motor encoder’s Q1 output to determine the rotation speed and direction of the motor. |

# Part 3 – Test Cases

## DC Motor control and interface

### Test Summary

### Schematics and Simulations

## Battery sense and LED indicators

### Test Summary

### Schematics and Simulations

## Button Indication and response

### Test Summary

### Schematics and Simulations

## Button Indication and response

### Test Summary

### Schematics and Simulations