CS/ECE 5780
Spring 2019
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Project Documentation

➢ Section I: Introduction

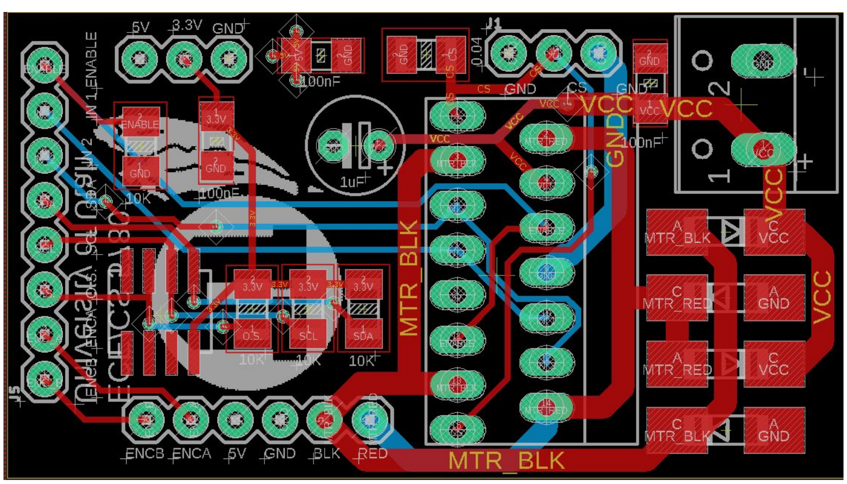
The purpose of this document is to provide a description of the Gyro-Motor Controller project. Our project utilizes the gyroscope on the STM32 and two ESP8266 WiFi chips to wirelessly control a motor. The WiFi chip transmits data via UDP to the other WiFi chip that is connected to a motor driver. The motor driver powers a DC Motor and it will spin clockwise, counterclockwise, or remain still depending on the provided signal.

➢ Section 2: Hardware Description

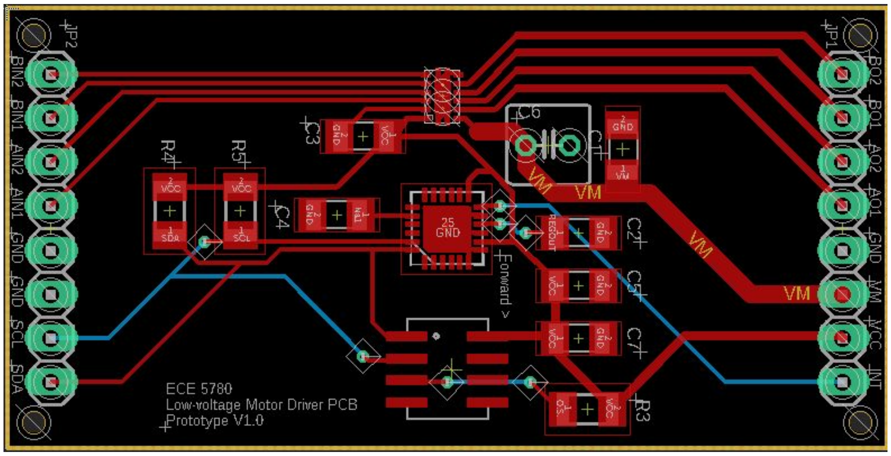
- STM32F072: This board contains the gyroscope we are using and the architecture required for us to communicate to it via I2C. UART is used to transmit data to the server ESP8266. Also has LEDs to show when we reach threshold angles.

- Two ESP8266 Huzzah Feathers: One acts as a server and the other acts as a client. The server chip continuously receives angular position data from the STM32 through UART. Then the client chip periodically requests this data through UDP.

- DC Motor Driver: The DC Motor Driver included an L298 Dual Full H-Bridge and an LM75A Digital Temperature Sensor as well as additional resistors and capacitors to ensure both chips functioned as intended. Pinouts are also used on the board to connect the device to a DC motor and the ESP8266.



- Custom Low-Voltage Motor Driver: We were unable to finish the custom PCB due to a unforeseen error with our motor driver footprint. This custom board would have allowed us to drive our DC motor with significantly higher voltage than what the ESP8266 is able to provide. A layout of the board is shown below :

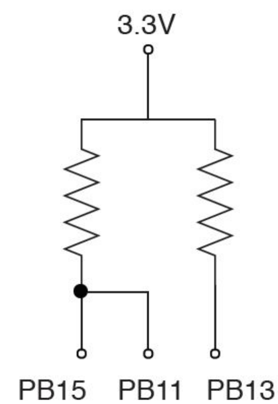


➢ Section 3: Required Software

The required software for the project can be found at:

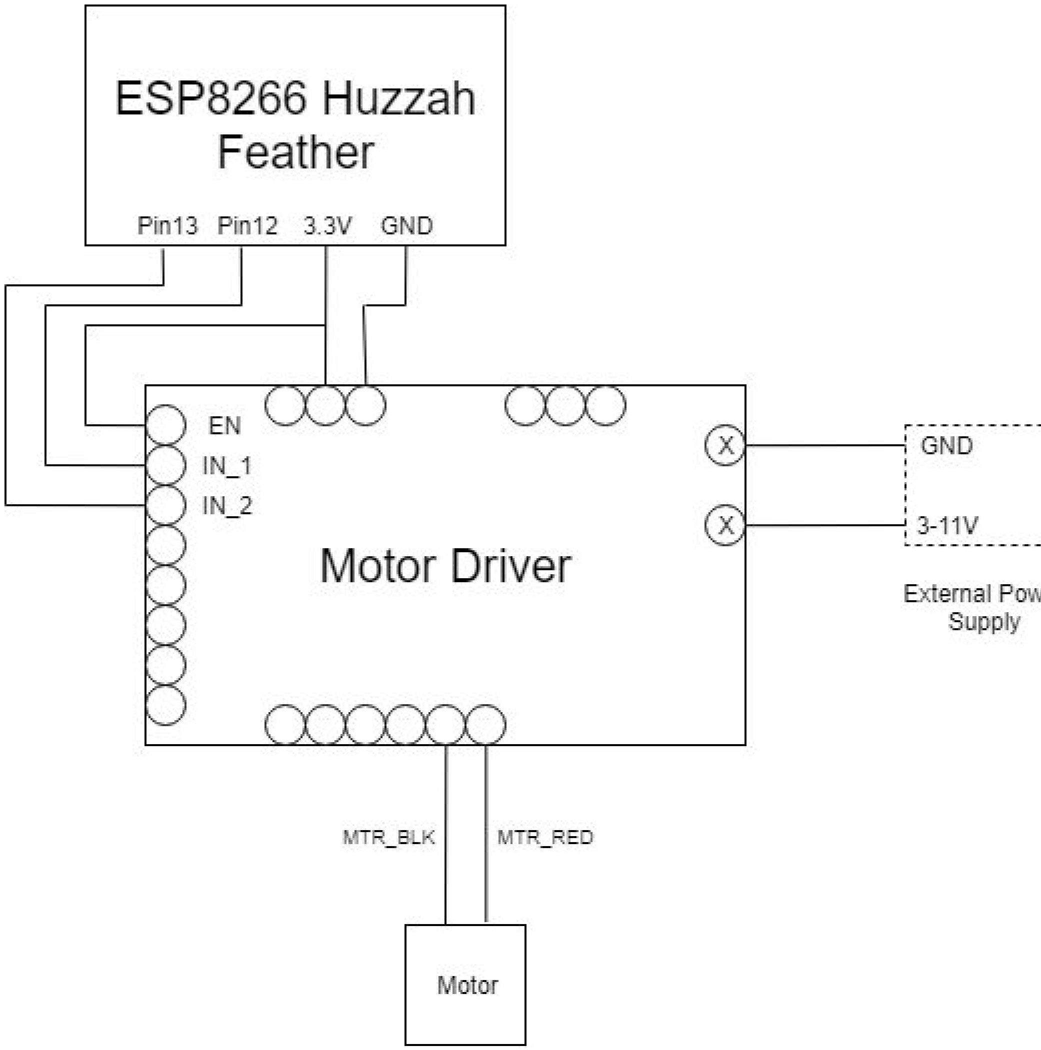
https://github.com/danhumeniuk/ECE5780_Project

➢ Section 4: Wiring



To enable I2C, the pins being used must utilize pull up resistors. Because the project is using I2C Channel 2, the pins chosen are PB11, PB13, and PB15. PB11 and PB15 will be connected to the same pull-up resistor that is connected in parallel to a pull-up resistor and PB13, as seen in the figure to the left. The voltage will be set to 3.3V. The resistor values chosen by the group are 10kΩ. Any deviation from this is to be done at the user's own risk.

The UART is enabled on UART channel 1 on the STM. PA10 is used to transmit the signals to the ESP8266. A wire is used to connect PA10 on the STM to the RX pin on the ESP8266. The client ESP8266, motor driver board, and motor are connected as follows:



Note that the motor driver is being used with significantly less voltage required for normal operation. This results in the motor not being driven quite as strongly as we hoped for. Our custom PCB would have solved this issue, but in any case we were still able to wirelessly control a motor with a gyroscope.