# Mars Rover

## Motor Drive Module

This module aims to control the movement of the Mars Rover and measure the distance travelled in x and y directions. This information can be transmitted to other modules to estimate the exact location of the Rover and to control its movement to achieve various objectives. This module consists of two main parts: 1) a motor drive PCB and 2) an optical sensor PCB.

A block diagram of this module is shown in Figure 1. The power connections are shown as thick solid wires. In contrast (one or more) communication and control lines between different blocks are shown as dotted lines with arrows pointing in the direction of the information flow. The ESP32 controls the motor control IC and the optical flow sensor. A battery bank powers the ESP32 board through a USB cable.

The motor drive module is powered through the ESP32 board 5V power rail. The motor drive board has a motor control IC (TB6612FNG). There are two H-bridge circuits built in the motor control IC. Each H-bridge control one motor. Depending on different control signals from the microcontroller, a motor can be turned on /off, and the direction of rotation can be controlled. More details about the motor control IC can be seen in the datasheet. You can also see how an H-bridge circuit works to understand this control better. A sample motor control code for ESP32 and a motor drive PCB connection layout are provided.

The optical flow sensor PCB communicates with the ESP32 board (using the SPI port) to measure the distance travelled in x and y directions. The measured distance can be used to implement a closed-loop distance control and speed control where the motors are controlled based on feedback from the flow sensor. A pin layout showing the connections between the optical flow sensor PCB and ESP32 board is provided. A sample code for ESP32 for measuring the distance travelled in x and y directions is also provided.



Figure Block diagram of the motor drive module