Micro-ROS Serial Communication

Publisher + Subscriber Activity

{Learn, Create, Innovate};

Manchester Robotics

Micro-ROS Activity

- This activity is focused on integrating the previous concepts into a bigger project.
- Verify the correct wiring and connections before powering up the system.

Micro-ROS Activity

- Create a node called *micro_ros_esp32_node*
- Implement two timers
  - Timer_1 – 10ms
  - Timer_2 – 100ms
- Read the value of the potentiometer.
  - Use ADC in the pin 36.
  - Read the ADC in Timer_1
- Publish the following data in Timer_2
  - Raw value of the potentiometer in */micro_ros_esp32/raw_pot*
  - The raw data from the potentiometer mapped into a 0-3.3V range in */micro_ros_esp32/voltage*

Micro-ROS Activity

- Configure a PWM such that:
  - The output is in pin 15.
  - It has a 5000Hz frequency.
  - It has an 8-bit resolution.
  - It uses channel 0.
- Subscribe to the */micro_ros_esp32/pwm_duty_cycle* topic.
  - You will receive a floating-point value corresponding to the duty cycle of the PWM.
  - Transform the duty cycle into a value corresponding to the selected PWM resolution .

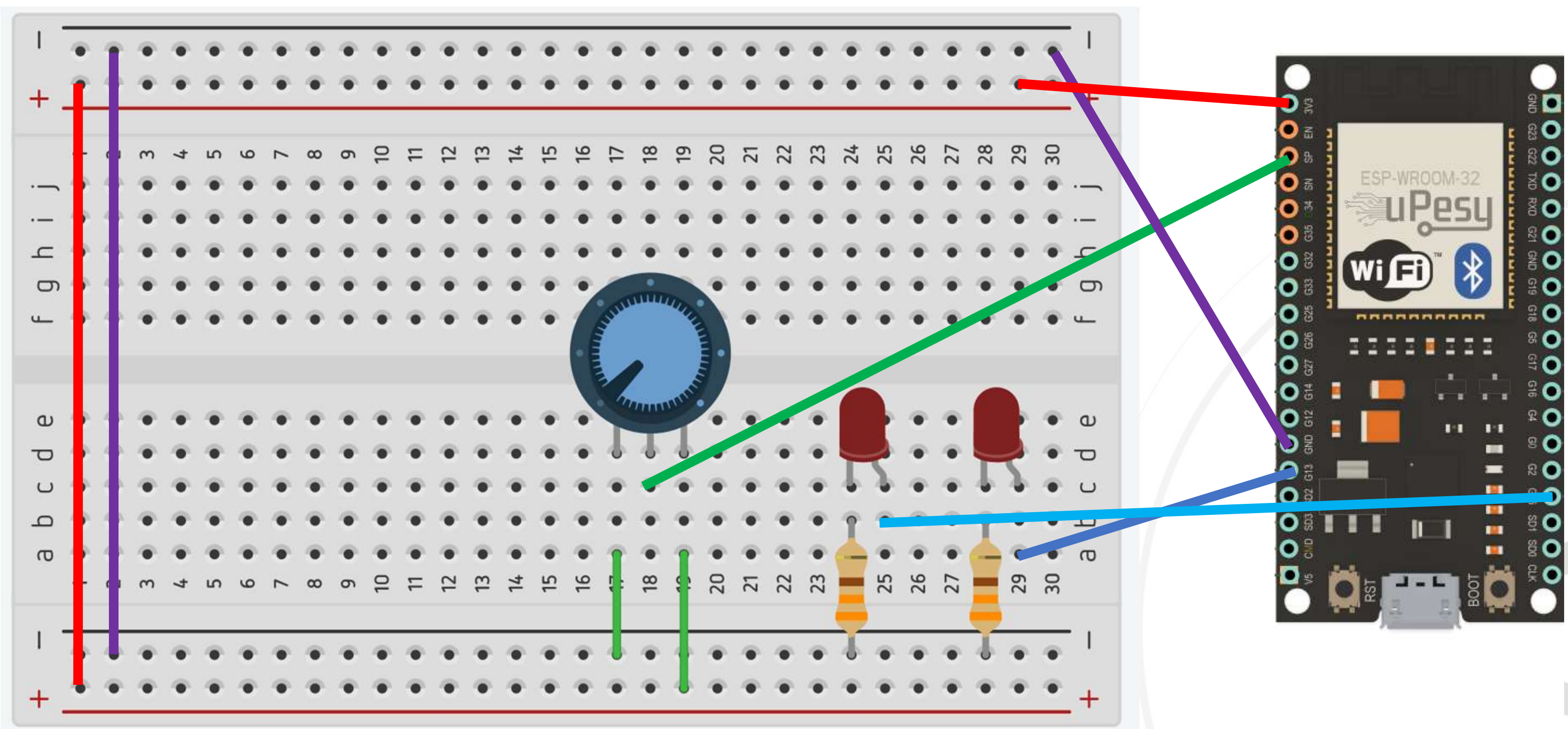
Considerations

- Use appropriate data types.
- Check that the GPIO pins are properly set.
- Double check the micro-ROS syntax and functions.
- Use a LED to debug potential errors.

Resources

- Publishers and subscribers | micro-ROS
- microcontroller - Is there an ideal PWM frequency for DC brush motors? - Electrical Engineering Stack Exchange
- Random Nerd Tutorials | Learn ESP32, ESP8266, Arduino, and Raspberry Pi

Circuit



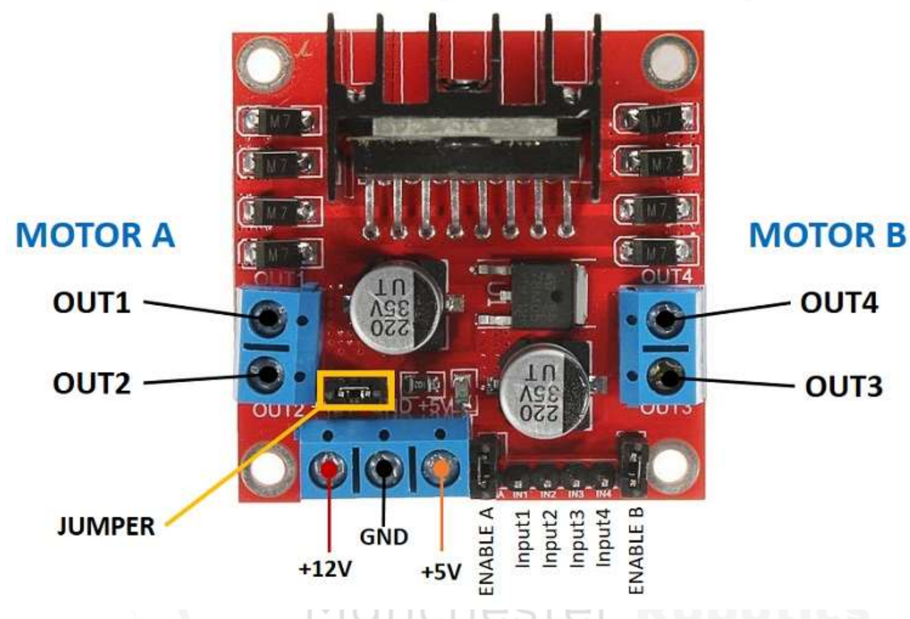
Useful commands

- Open serial port
  - ros2 run micro_ros_agent micro_ros_agent serial --dev /dev/ttyUSB0
- Subscribe to pot and voltage data
  - ros2 topic echo /micro_ros_esp32/raw_pot
  - ros2 topic echo /micro_ros_esp32/voltage
- Publish PWM duty cycle
  - ros2 topic pub /micro_ros_esp32/pwm_duty_cycle --once std_msgs/msg/Float32 "data: 15“
- View the values of the pot and voltage data
  - ros2 run rqt_plot rqt_plot

Micro-ROS Activity

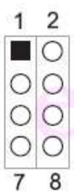
- Connect a H-bridge (L298) and a DC motor to the previous activity. The behavior of the motor should mimic the LED.
- Check the proper connections of the H-Bridge and the motor

- OUT1: DC motor A + terminal
- OUT2: DC motor A – terminal
- OUT3: DC motor B + terminal
- OUT4: DC motor B – termina
- IN1: Input 1 for Motor A
- IN2: Input 2 for Motor A
- IN3: Input 1 for Motor B
- IN4: Input 2 for Motor B
- EN1: Enable pin for Motor A (PWM)
- EN2: Enable pin for Motor B (PWM)



Micro-ROS Activity - Extra

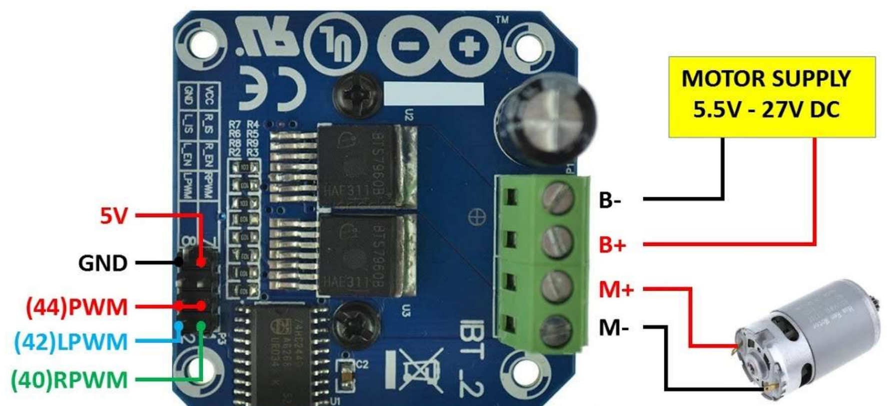
Input port



1、RPWM : Forward level or PWM signal input, active high
2、LPWM :Inversion level or PWM signal input, active high
3、R_EN :Forward drive enable input , high enable , low close
4、L_EN :Reverse drive enable input , high enable , low close
5、R_IS : Forward drive -side current alarm output
6、L_IS : Reverse drive -side current alarm output
7、VCC : +5 V power input,connected to the microcontroller 5V power supply
8、GND : Signal common ground terminal

Usage one:
VCC pick MCU 5V power supply, GND connected microcontroller GND
R_EN and L_EN shorted and connected to 5V level, the drive to work.
L_PWM, input PWM signal or high motor forward
R_PWM, input PWM signal or high motor reversal

Usage two:
VCC pick MCU 5V power supply , GND connected microcontroller GND
R_EN and L_EN short circuit and PWM signal input connected to high-speed
L_PWM, pin input 5V level motor is transferred
R_PWM, pin input 5V level motor reversal



PWM	1-255	1-255	1-255	1-255
RPWM	HIGH	LOW	LOW	HIGH
LPWM	LOW	HIGH	LOW	HIGH
	CW	CCW	STOP	BURN