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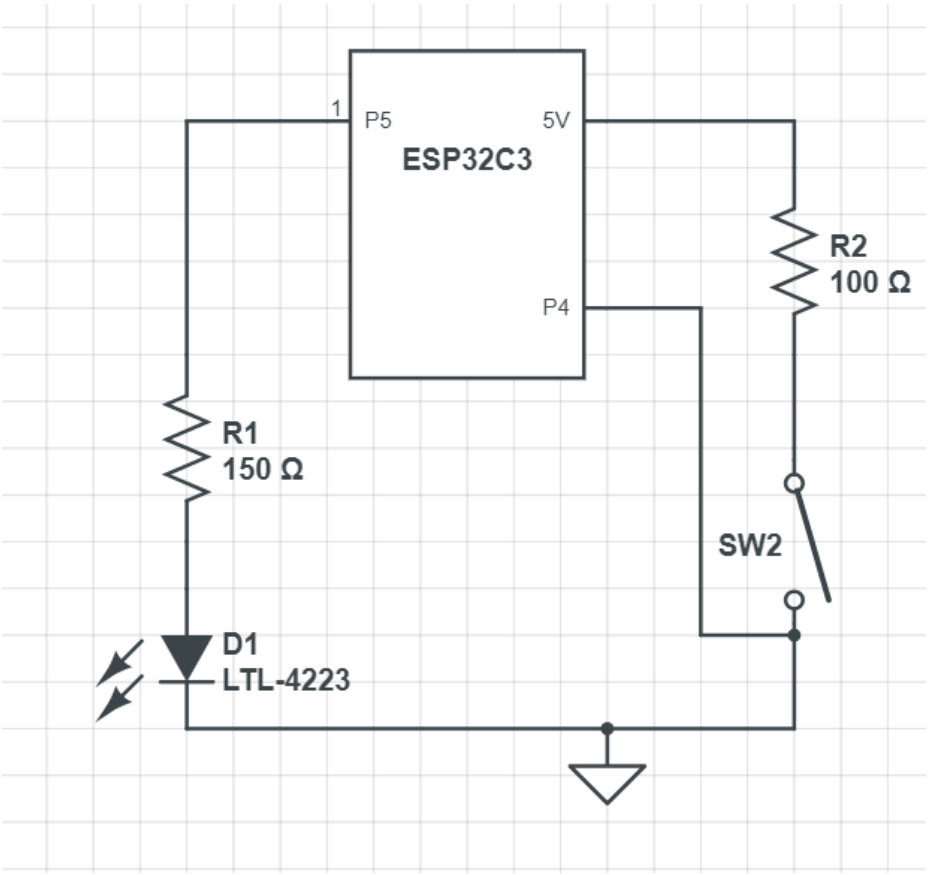
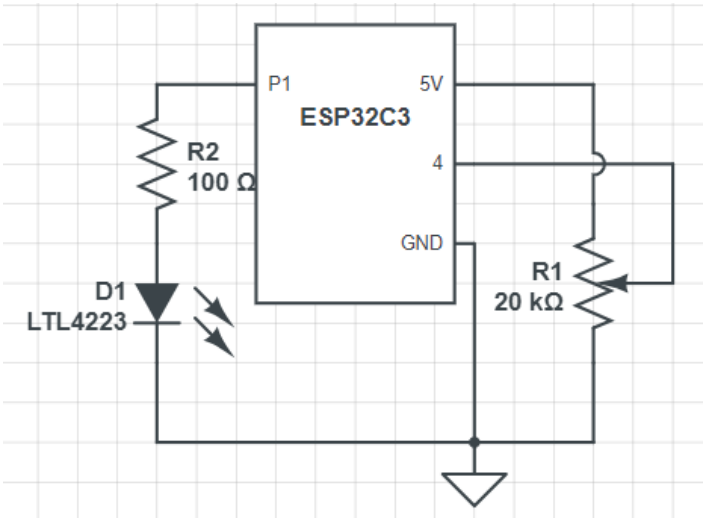
Subject: Design of Mechatronic Systems (MEAM 5100)
05, November 2023

4.1.1. Use ESP32 GPIO pins, a switch, an LED, and resistors to read the state of a switch and light an off board LED when the button is pressed. Submit your code (the .ino file and any other files if you have created any) in the code submission section titled: lab 4.1 code on gradescope. Separately in your report, submit a schematic of your setup to lab 4.1 Report on gradescope.
Answer:



We have used 2 resistance and a Red Led LTL 4223. The above schematic shows the circuit diagram for the question.

4.1.2 Add a potentiometer in a voltage divider circuit to be read as an analog signal into an ADC port on the ESP32 and control the duty cycle of a blinking external LED using the ledc commands based on the reading. The LED should switch from off to 100% duty cycle depending on pot position, at a frequency you choose ranging from 3.0Hz to 30Hz. Submit your code to gradescope assignment: lab 4.1 code. Separately in your report, submit a drawing of your circuit, and a video link showing the LED change duty cycle as you turn the pot to lab 4.1 Report on gradescope.

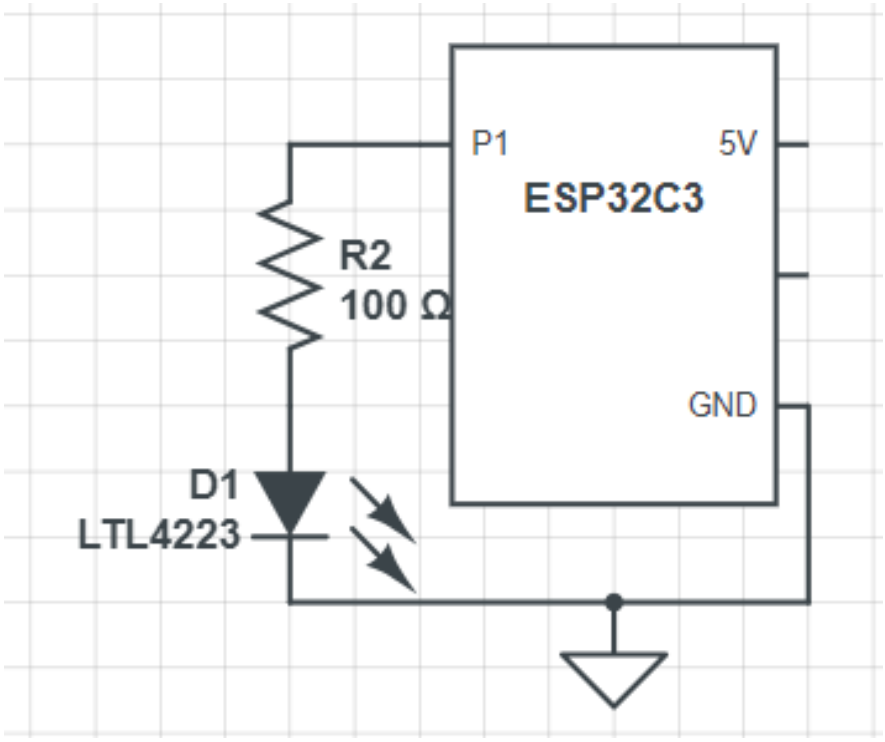


Youtube Link: https://youtu.be/tpAvVcoWh9s

4.1.3a Find another person in the class to work with you. Use your class-assigned IP addresses to communicate back and forth using UDP packets. Using 4.1.2 have your potentiometer control the LED of the other person and vice versa. You should be able to send and receive with the same code. **Submit your code for both sides (or state if it's identical), and a video link of both people showing the control of each.**

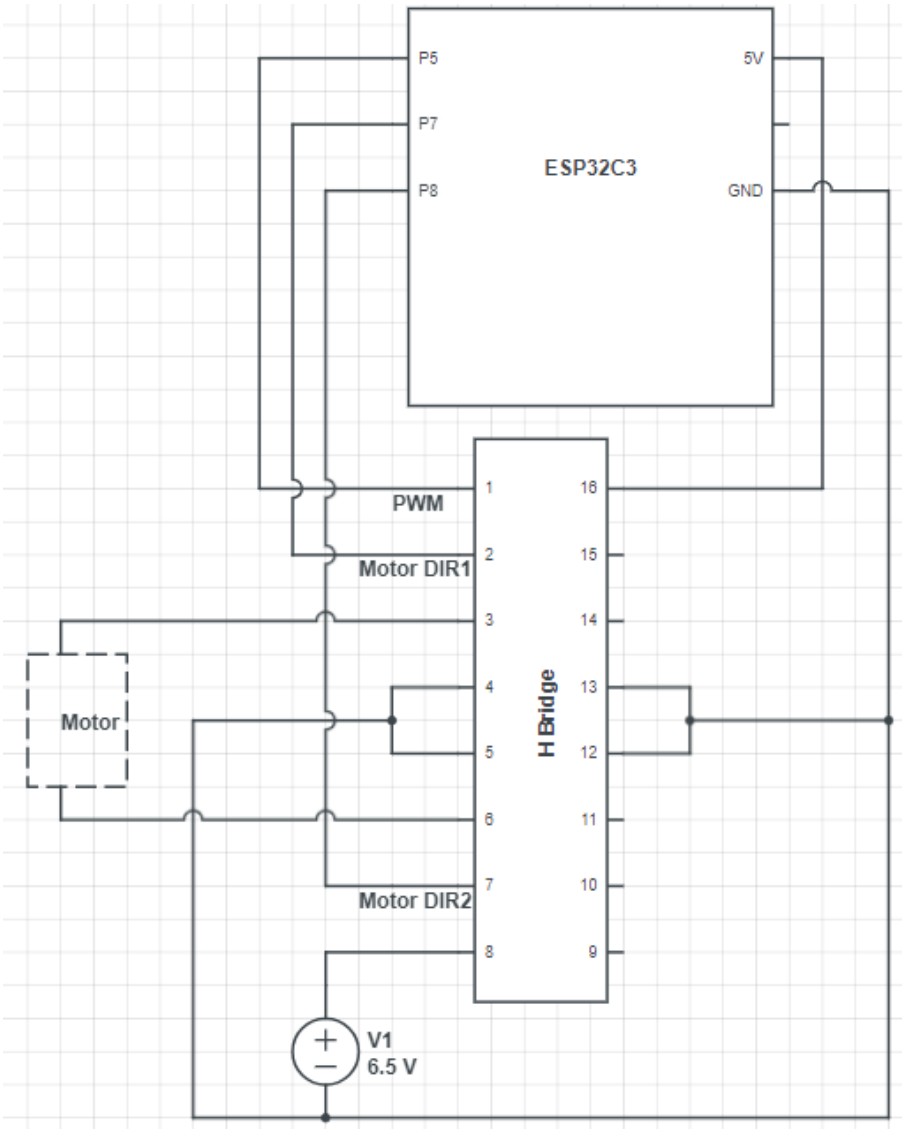
Answer: Code Submitted in grade scope
I have worked with Haitham Alshehri for this part of the video. Our codes were different but had the same concepts. Both our codes accomplish controlling both ours as well as the other person's LED using the opposite person's potentiometer via our class-assigned IPs (mine is 192.168.1.101 and Haitham's is 192.168.1.102) using UDP.I also worked with Kevin Paulose.
Youtube Link: https://youtu.be/hzOhKhRNHt8

4.1.3b. Building on 4.1.2, add code that will replace the potentiometer input and use a website that will input both the frequency (3.0 to 30Hz) and duty cycle with HTML slider bars or buttons and display the frequency and duty cycle. You may use either AP or STA mode. If using STA mode use the router in the GMLab and your individually assigned IP address. Submit your code to gradescope assignment: lab 4.1 code. Separately, in your report submit a drawing of your circuit, and a link to a video showing your LED and the webpage as you control it at the same time showing full range for both duty cycle and frequency to lab 4.1 Report on gradescope.



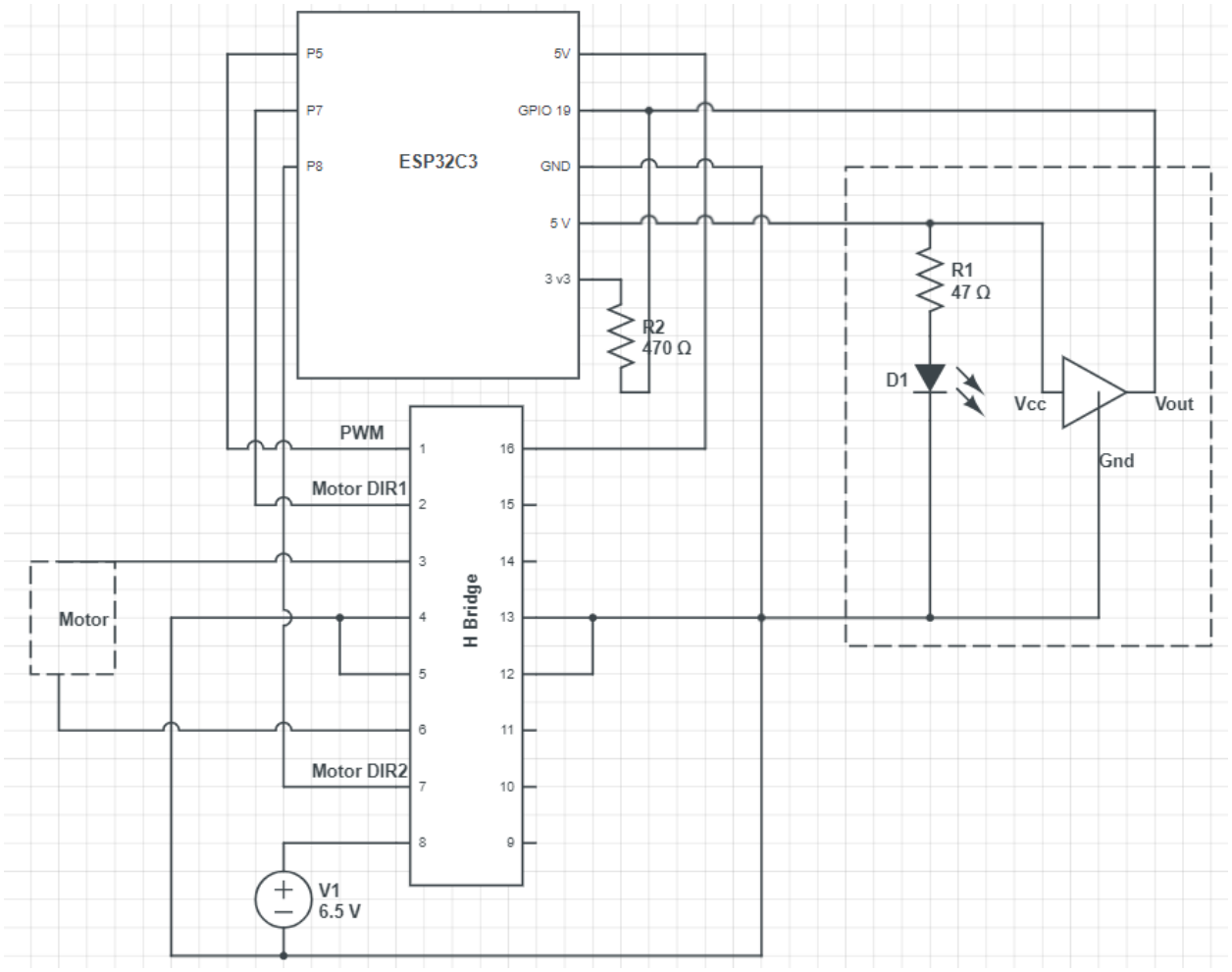
Youtube Video: https://youtu.be/Ptc0GG-kBp8

4.1.4 Setup the H-Bridge motor driver SN754410 (or optionally the other H-Bridge motor drivers in of Lecture 13, but not the L298) as Lecture 13 so that you can drive one of the supplied yellow motors https://www.adafruit.com/product/3777. Generate PWM from the ESP32 using the LEDC timer functions and control the speed and direction of a motor from a webpage on the ESP32. Note that the motor power compared to driving directly with a power supply is reduced going through the H-Bridge. Submit your code to gradescope assignment: lab 4.1 code. Separately in your report, submit a drawing of your circuit. Submit a video demonstrating the motor changing speed and direction (showing the webpage at the same time), with variable speeds in both directions.



YouTube Video: https://youtu.be/0KxxGNlx3kg

4.1.EC2 Use the encoder and photointerrupter to measure the rotations of a motor. Since these encoders don't have quadrature assume the counts are in the direction that the motor has been last commanded to go. Submit code separately and a schematic on Gradescope. Demonstrate the motor changing speed and direction, and the counts printing out corresponding to the motion. Submit a video.



YouTube Video: https://youtube.com/shorts/tWa_v7QPZZM?feature=share

I have collaborated with Kevin Paulose and Haitham Alshehri for my work in this assignment.