ENPM 809T – Autonomous Robotics

Assignment – 5

Problem #3:

Figure 1 shows the circuit diagram for the motor driver

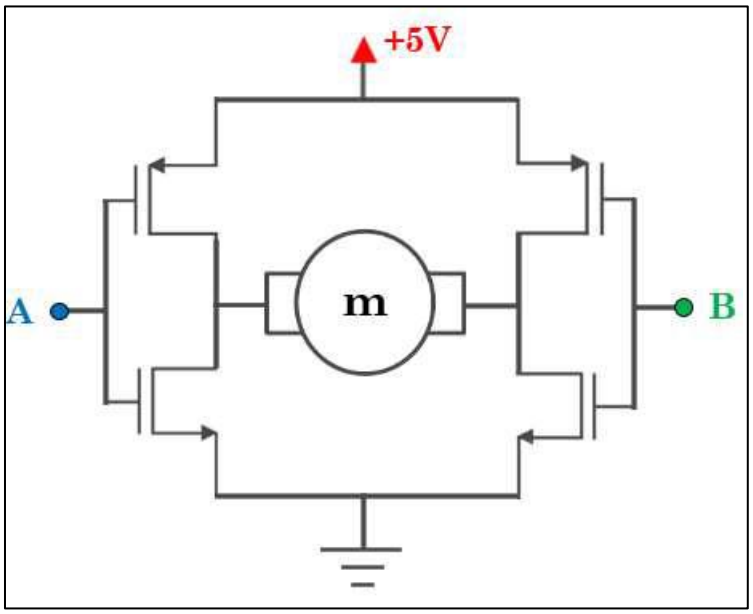

Figure 1: Motor driver circuit

Given information:

1. Threshold voltage, $V_{th} = 3V$
2. Motor Voltage, $V_{motor} = 5V$
3. Time period of the PWM signal is, $t_{PWM} = 1ms$
4. When High Voltage is sent to:
    a. PMOS – OFF
    b. NMOS – ON
5. When low voltage is sent to:
    a. PMOS – ON
    b. NMOS – OFF

Scenario – 1: Motor turning forward in 30% speed

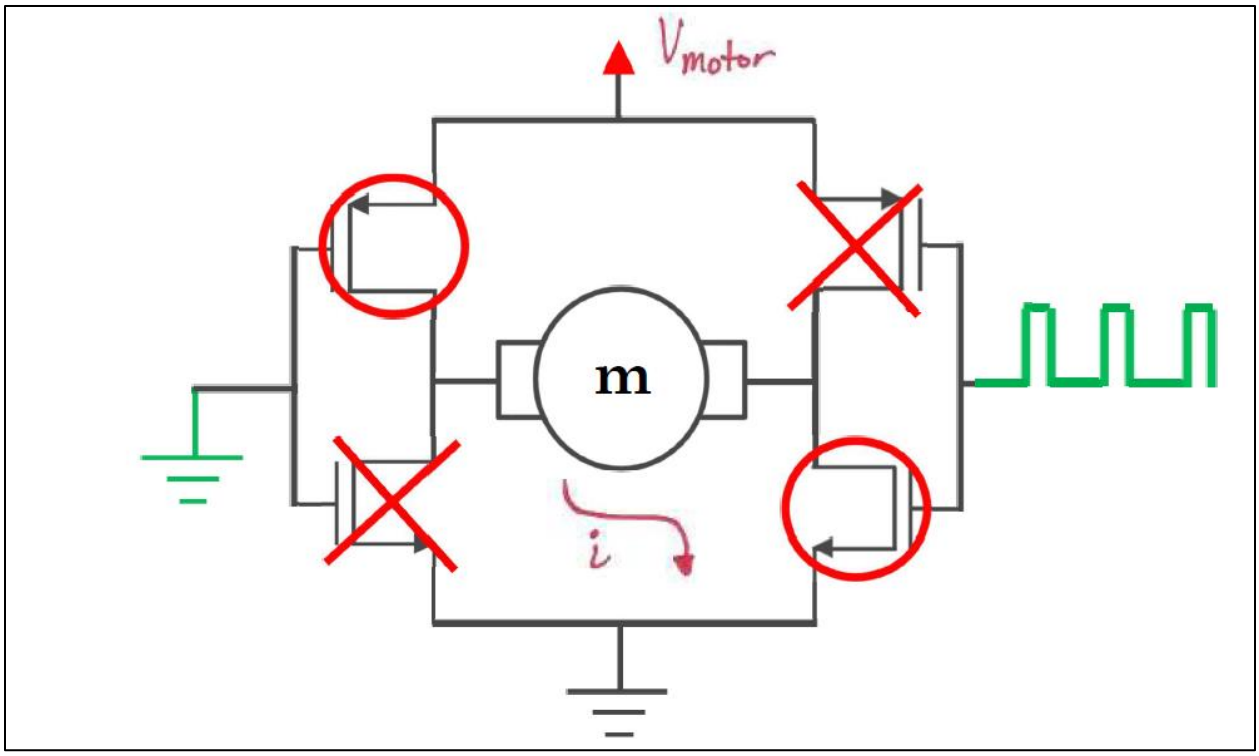

Figure 2: Motor turning forward

At duty cycle =30%, we need the V_{PWM} to be ON at point A for 0.3ms and OFF at point B for 0.3ms as shown in Figure 2 for the motor to turn in forward direction. The PWM signal at point A and B is shown in Figure 3.

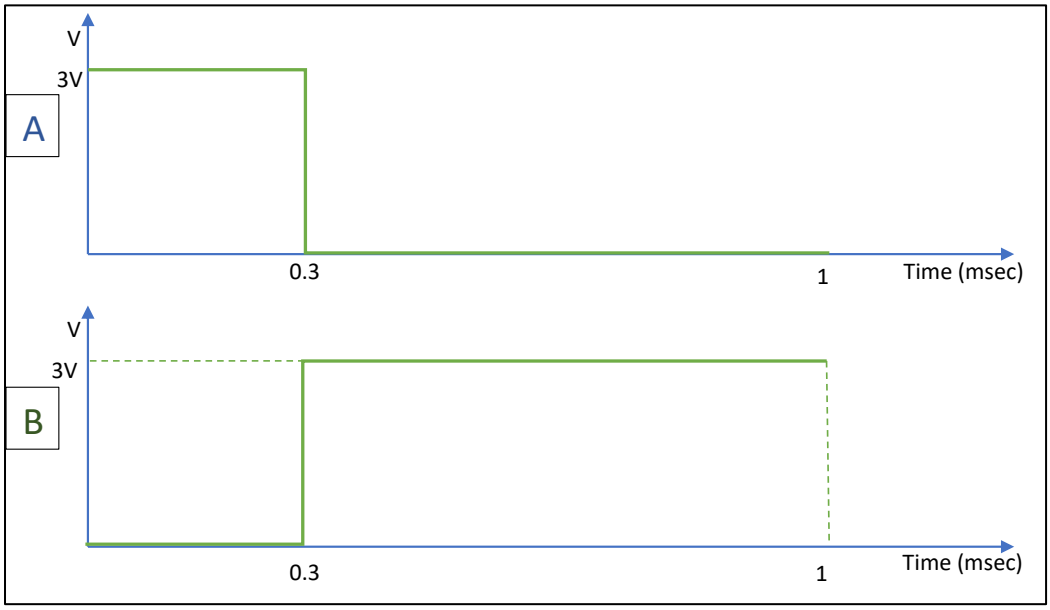

Figure 3: Time domain Signals at point A and B for forward direction

Scenario – 2: Motor turning reverse in 70% speed

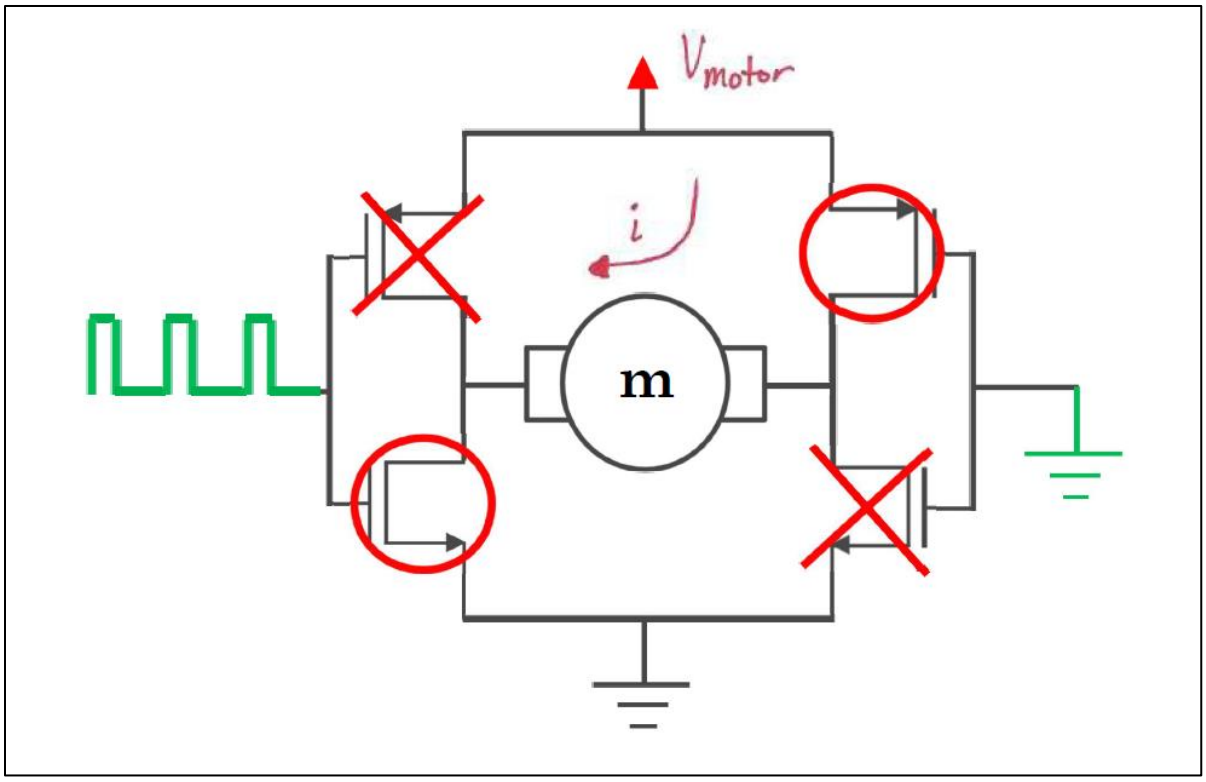

Figure 4: Motor turning reverse

At duty cycle =70%, we need the V_{PWM} to be OFF at point A for 0.7ms and ON at point B for 0.7ms as shown in Figure 4 for the motor to turn in forward direction. The PWM signal at point A and B is shown in Figure 5.

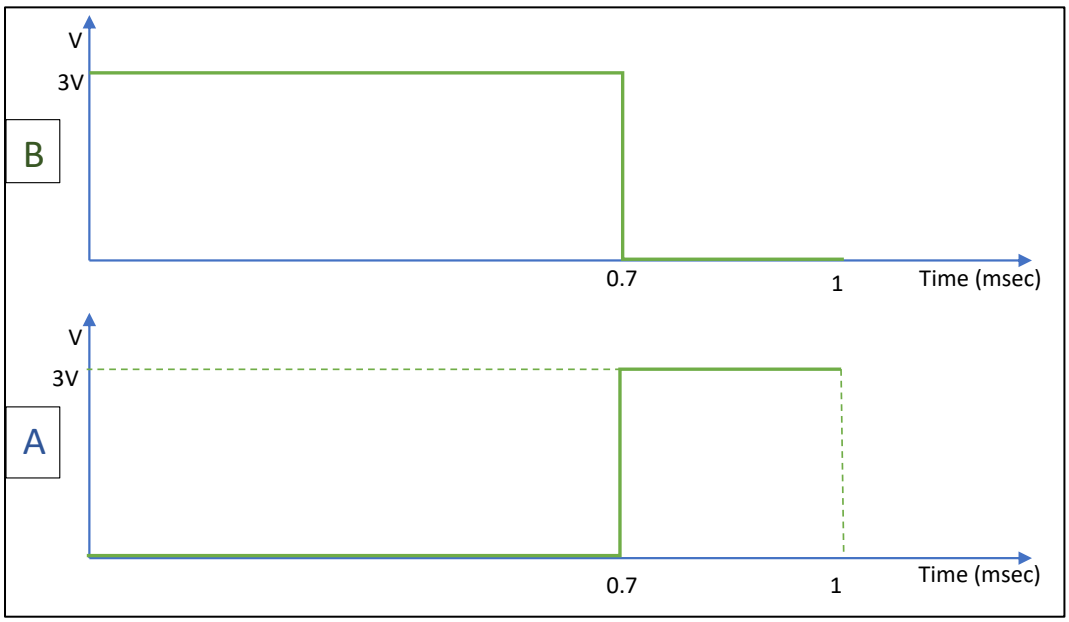

Figure 5: Time domain Signals at point A and B for reverse direction

Video link for teleoperation: https://youtu.be/uS3jiE2qbt0