

ECE 476/676 - Homework #7

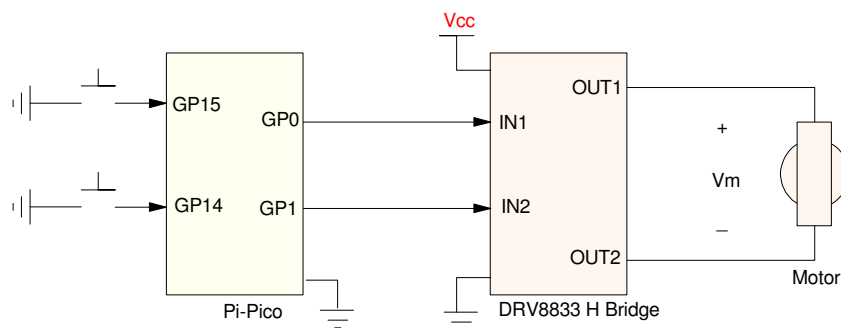
Edge and Timer Interrupts - Due Monday, October 20th

DC Motor

1) Connect the DC servo motor to your PIC board using an H-bridge. Verify that your PIC can turn the motor on and off

- $V_{cc} = 3.3V$
- Forward: $IN1 : IN2 = 1 : 0$
- Stop: $IN1 : IN2 = 0 : 0$
- Reverse: $IN1 : IN2 = 0 : 1$

Note: This probably doesn't work with $V_{cc} = +5.0V$. The in-rush current is too large when you apply a step input from 0% to +100% all at once.

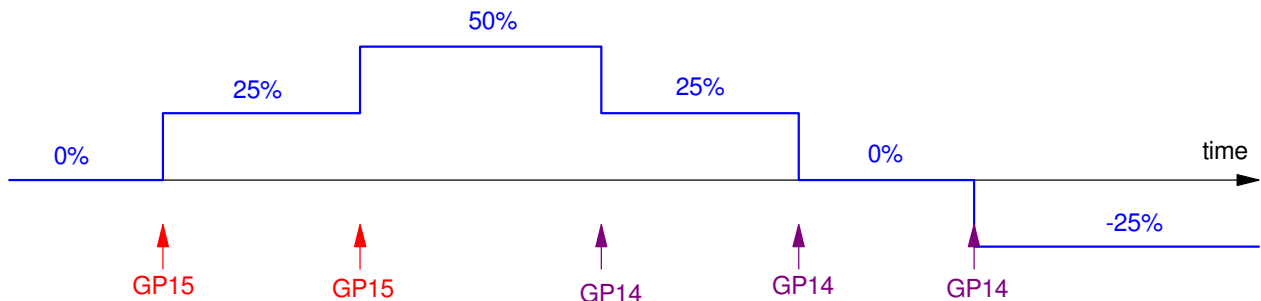


Edge Interrupts

2) Write a Python program using interrupts to allow you to turn the motor on and off:

- The speed of the motor can be adjusted from -100% to +100% of full speed
- PWM sets the speed of the motor
- Edge interrupts on GP15 and GP14 allow you to adjust the speed
 - Each press of GP15 increases the speed by +25% using a falling-edge interrupt
 - Each press of GP14 decreases the speed by -25% using a falling-edge interrupt
 - Speed clips at -100% and +100%
- The current speed is displayed on the LCD display

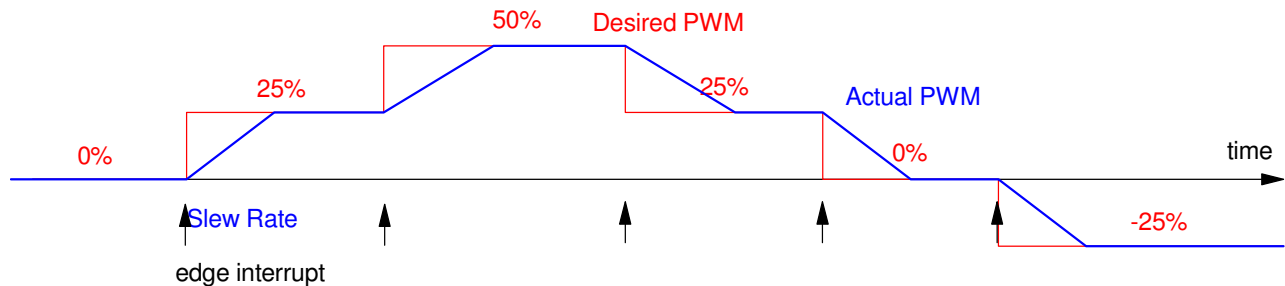
Note: 5.0V might not work due to in-rush current for the motor. If this is the case, set V_{cc} to +3.3V



Periodic Timer Interrupts

3) Modify this program to use timer interrupts so to add a slew-rate limit to the PWM signals. This should reduce the in-rush current to the motor, allowing the H-bridge to operate at 5.0V

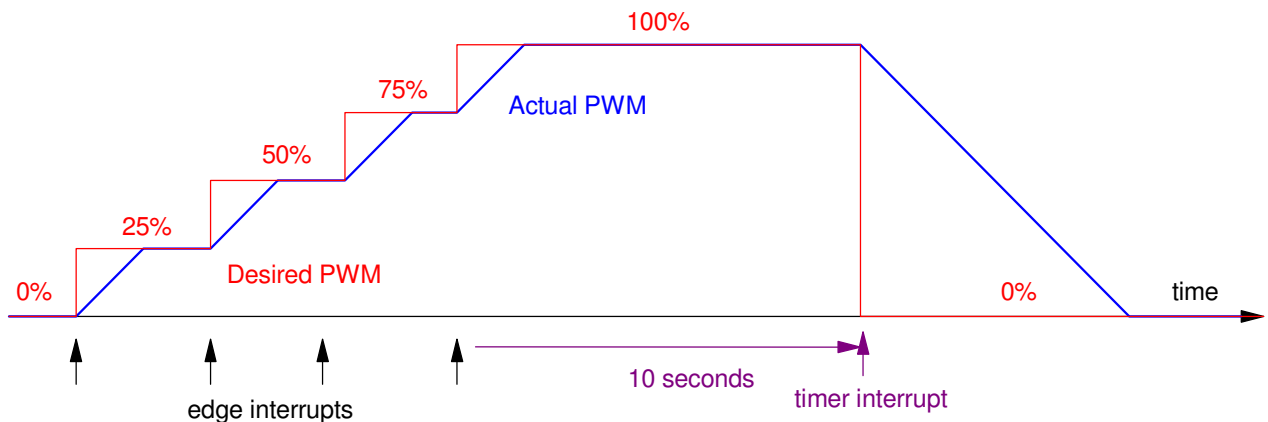
- Turn on a periodic timer-interrupt set to 10ms
- Each interrupt, the PWM changes by +0.25% or -0.25% until you reach the desired PWM (meaning it takes 1.0 second to increase the PWM by 25%. You can change the interrupt frequency if you want as long as it takes 1.0 second to ramp up or down by 25%.)
- The LCD display shows the desired PWM (from problem #1) and the actual PWM (ramping up or down from problem #2)
 - Text or graphics are OK for indicating this



One-Shot Timer Interrupts

4) Modify this program by adding a one-shot timer interrupt that turns off the motor (PWM ramps to 0%) if no buttons are pressed in 10 seconds.

- The LCD display also shows the time until the motor turns off
 - Text or graphics are OK for indicating this



Demonstration

5) Demonstrate you motor controller

- In-person or
- With a video