

## Motors & their applications

### Task 1 – DC motor (1p) [Arduino]

Make the rotation of the DC motor adjustable, so that both direction and speed are set with a potentiometer. When the potentiometer is centered the motor should be stationary (have a small dead zone). Use the L293D to drive the motor.

**Do not connect the motor straight to Arduino 5V as the inducted voltage spikes may damage the electronics.** Use the power supply module to power everything except the Arduino. Remember to connect power supply ground and Arduino ground. Example circuit in ELEGOO V2 materials "2.23 DC Motors".

### Task 2 – DC motor speed (2p) [Arduino]

Make a stroboscope to measure the speed of the DC motor (with the fan attached to it). Make an LED blink and display the frequency on an LCD. Use a rotary encoder to adjust the frequency.

Turning the encoder should have three modes:

- Frequency is incremented/decremented in small steps (e.g., 0.1 Hz)
- Large steps (e.g., 5 Hz)
- Doubled/halved to detect aliasing

The mode is selected by the rotary encoder's button and the active mode should be indicated on the screen.

Is the motor speed linearly proportional to the duty cycle?

### Task 3 – Ultrasonic radar (3p) [Arduino]

Make an "ultrasonic radar". Mount the ultrasonic distance sensor on the servo motor, make it rotate and measure the distance in each direction (e.g., one-degree intervals). Write a script on your PC which reads the data from the Arduino and plots it on a polar plot in real time.

This task is evaluated in three parts: The radar itself, communication, and plotting.