EXPERIMENT (2): CONTROLLING THE SPEED AND THE DIRECTION OF ROTATION OF DC MOTORS

LAB 2 – DC Motors

Components

- Arduino kit, Arduino cable, Bread board, 330Ω resistor, 50KΩ potentiometer, 0.1µf Capacitor, BJT transistor [(NPN) 2N2222], Dc motor (9V), H- Bridge IC.
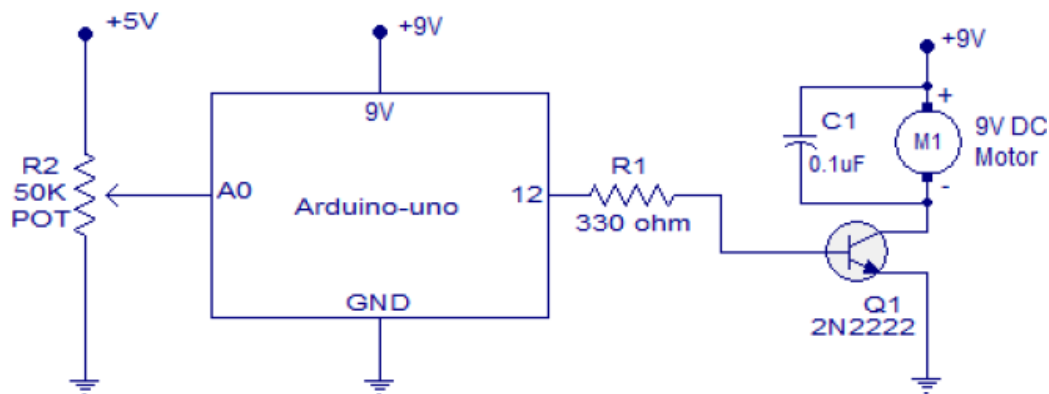
Objective

- The main objective of this lab is to know how to use the above components to control and change the speed and the direction of rotation of Dc motors studied in the lectures.

Experiment

Task 1: Controlling the speed of rotation of DC motors

- Connect the following circuit to control the speed of rotation of your DC motor.
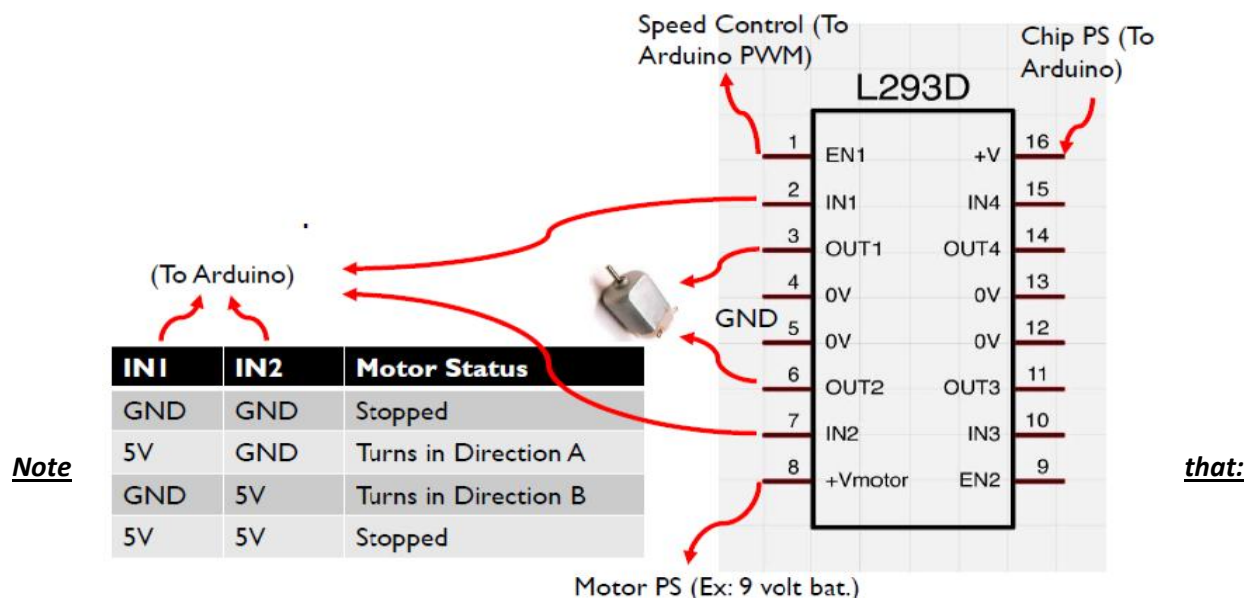

Note that:
- The working principle of the above circuit is same as that of the LED brightness control. The only difference is that and additional motor driver circuit using a transistor is included in the circuit. Each digital pin of the Arduino can sink or source only 40mA.

- DC motors usually consume much more than this and it is not safe to directly connect a heavy load to the digital pin.
- In the circuit diagram, slider of the potentiometer is connected to analog input pin A0 of Arduino. Resistor R1 limits the base current of the transistor Q1.
- The motor is connected as collector load to the transistor. Capacitor C1 by-passes voltage spikes and noises produced by the motor.
- This filter capacitor is very essential and if it is not there the circuit may not work properly.

Using the above information, write a code to let the motor rotate with 60% of its full speed.

Task 2: Controlling the direction of rotation of DC motors

- To control the DC-Motor direction without reversing the battery polarity, we need to use the L293/L293D chip that enables you to control TWO DC-Motors, and their speed as well.

IN1	IN2	Motor Status
GND	GND	Stopped
5V	GND	Turns in Direction A
GND	5V	Turns in Direction B
5V	5V	Stopped

Note *that:*

- There are three input pins for each motor, including Input1 (IN1), Input2 (IN2), and Enable1 (EN1) for Motor1 and Input3, Input4, and Enable2 for Motor2.
- Since we will be controlling only one motor in this lab, we will connect the Arduino to IN1, IN2, and Enable1 of the L293 IC. Pins IN1 and IN2 are digital, i.e. ON or OFF inputs, while pin Enable1 needs a pulse-width modulated (PWM) signal to control the motor speed.
- IN1 pin of the L293 IC is connected to pin 8 of the Arduino while IN2 is connected to pin 9. These two digital pins of Arduino control the direction of the motor. The Enable1 pin of the IC is connected to the PWM pin 3 of the Arduino. This will control the speed of the motor.
- To set the values of Arduino pins 8 and 9, you will have to use thedigitalWrite() function, and to set the value of pin 3, you will have to use the analogWrite() function.

Using the above information, write a code to make the motor rotate in the clockwise direction for 4 second and then counter clockwise for another 4 seconds.