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Aim: To run a dc motor and also control its direction and speed with a push button and potentiometer.

Equipment: Breadboard, Arduino Uno, LCD display (16x2), 10 kΩ potentiometer, DC Motor, L293D motor driver, Connecting wires

Schematic:

Figure 1

Truth Table

A	B	Description
0	0	Motor stops or Breaks
0	1	Motor Runs Anti-Cloclwise
1	0	Motor Runs Clockwise
1	1	Motor Stops or Breaks

For above truth table, the Enable has to be Set (1). Motor Power is mentioned 12V, but you can connect power according to your motors.
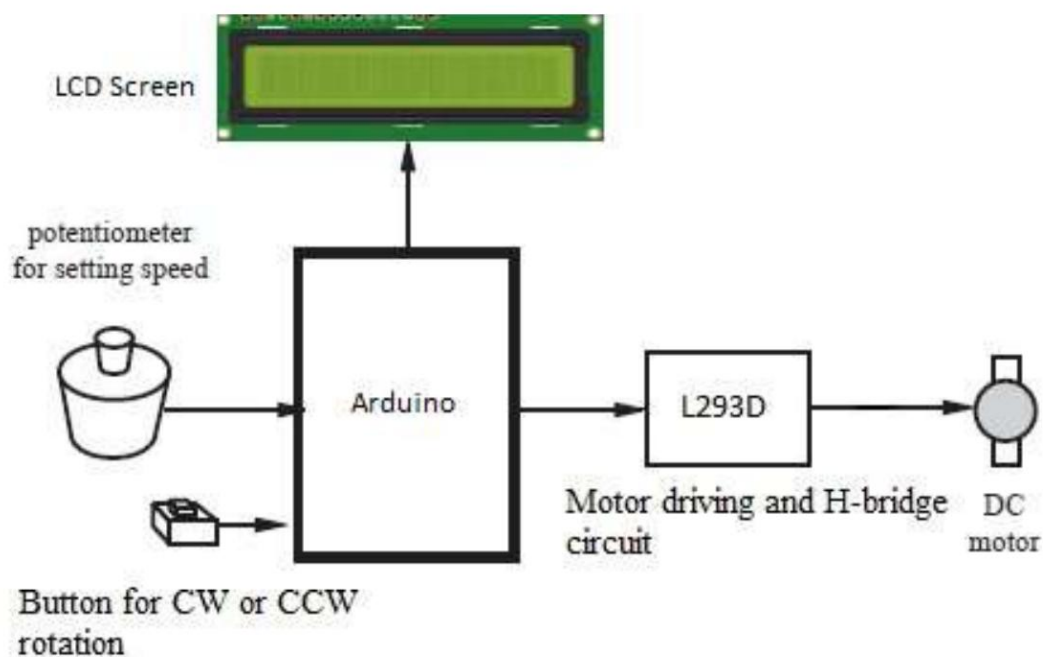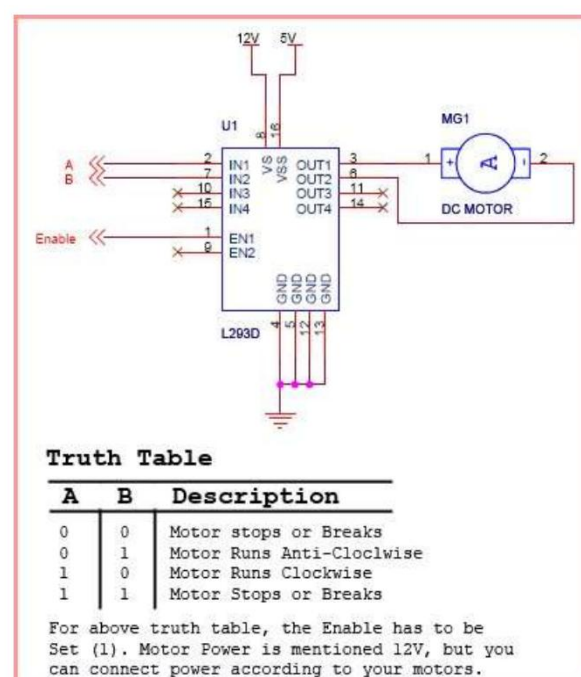
Figure 2

Setup:

The circuit is set up according to the schematic in figure 1 and then the H-bridge is set up according to the schematic in figure 2. The LCD data pins are connected to the arduino, power pins to the voltage supply from the arduino and the LED+ and LED- pins are connected through the 10kΩ potentiometer to control the brightness of the LCD. The Vcc pins on L293D are connected to 5V supply; its enable and input pins are connected to my arduino whereas the output pins are connected to the motor. The 2nd potentiometer is directly connected to the arduino to control the speed of the motor.

Working:

The arduino code is written to perform simple functionality. I'm using an external library for controlling the lcd. On the start-up of the arduino board, the LCD is initialized, after which it initializes all the input and output pins. Following this it starts to take the input from the potentiometer to calculate the speed by converting the 0-1023 input to 0-255. The motor at start is off, when the push button is pressed, it starts the motor in the clockwise direction and displays the speed and the direction on the lcd. If the button is pressed again the direction is reversed.

Code:

```cpp
#include <LiquidCrystal.h>




#define MAX_RES_VAL 1023

#define MIN_RES_VAL 0

#define MAX_VOLT_VAL 255

#define MIN_VOLT_VAL 0




// initialize the library by associating any needed LCD interface pin

// with the arduino pin number it is connected to

const int rs = 12, en = 11, d4 = 5, d5 = 4, d6 = 3, d7 = 2;

LiquidCrystal lcd(rs, en, d4, d5, d6, d7);


const int buttonPush = 13;

const int speedInput = A5;

const int enableOut= 6;

const int input1 = 0;

const int input2 = 1;
```

```
void setup() {

  lcd.begin(16, 2);

  pinMode(enableOut, OUTPUT);

  pinMode(input1, OUTPUT);

  pinMode(input2, OUTPUT);

  pinMode(buttonPush, INPUT_PULLUP);

}

bool isPressed = false;

bool toChange = false;

bool isClockwise = false;

bool isOn = false;


void loop()

{

  int potentiometerInput = analogRead(speedInput);

  int speed = normalize(potentiometerInput);

  lcd.clear();

  lcd.setCursor(0, 0);

  lcd.print("Speed: ");

  lcd.print(speed);


  if(digitalRead(buttonPush) == HIGH)

  {

    if(!isOn)

      isOn = true;


    isPressed= true;

    toChange = true;

    delay(250);

  }

  if(digitalRead(buttonPush) == LOW)

    isPressed = false;
```

```cpp
    if(toChange && !isPressed)
    {
      isClockwise = !isClockwise;

      toChange = false;
    }


    lcd.setCursor(0, 1);

    if(isOn)
    {
      lcd.print(isClockwise ? "Clockwise":"Anti-Clockwise");

      analogWrite(enableOut, speed);

      if(isClockwise)
      {
        //Outputs for clockwise.

        digitalWrite(input1, HIGH);

        digitalWrite(input2, LOW);

      }
      else
      {
        //Outputs for anti-clockwise.

        digitalWrite(input1, LOW);

        digitalWrite(input2, HIGH);

      }
    }
    else
      lcd.print("Motor Off");

    delay(250);

}

float normalize(float input)
{
  return (((float)(input)/(float)(MAX_RES_VAL-
MIN_RES_VAL))*MAX_VOLT_VAL)+MIN_VOLT_VAL;

}
```