AMERICAN INTERNATIONAL UNIVERSITY-BANGLADESH

Faculty of Engineering

Laboratory Report Cover Sheet

Students must complete all details except the faculty use part.

Please submit all reports to your subject supervisor or the office of the concerned faculty.

Experiment Title: Implementation of a motor control system using Arduino: Digital input, outputs and PWM

Experiment Number: 09 Due Date: 02-05-2024 Semester: Spring 23-24

Subject Code: EEE 4103 Subject Name: Microprocessor and Embedded Systems Section: E

Course Instructor: Protik Parvez Sheikh Degree Program: BSc CSE

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Group Number (if applicable): ☐ Individual Submission ☑ Group Submission

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Total Marks:_____ Marks Obtained: _____

Faculty comments_____

Title:
Implementation of a motor control system using Arduino: Digital input, outputs, and PWM.

Objectives:

The objectives of this experiment are to-

- Introduce students to the pulse-width modulation (PWM) signals produced by the Arduinoboard.
- Adjust the velocity of a DC motor by manipulating the Arduino-generated PWM signals.
- Alter the DC motor's rotation by utilizing the input push switch.

Overview of the board:

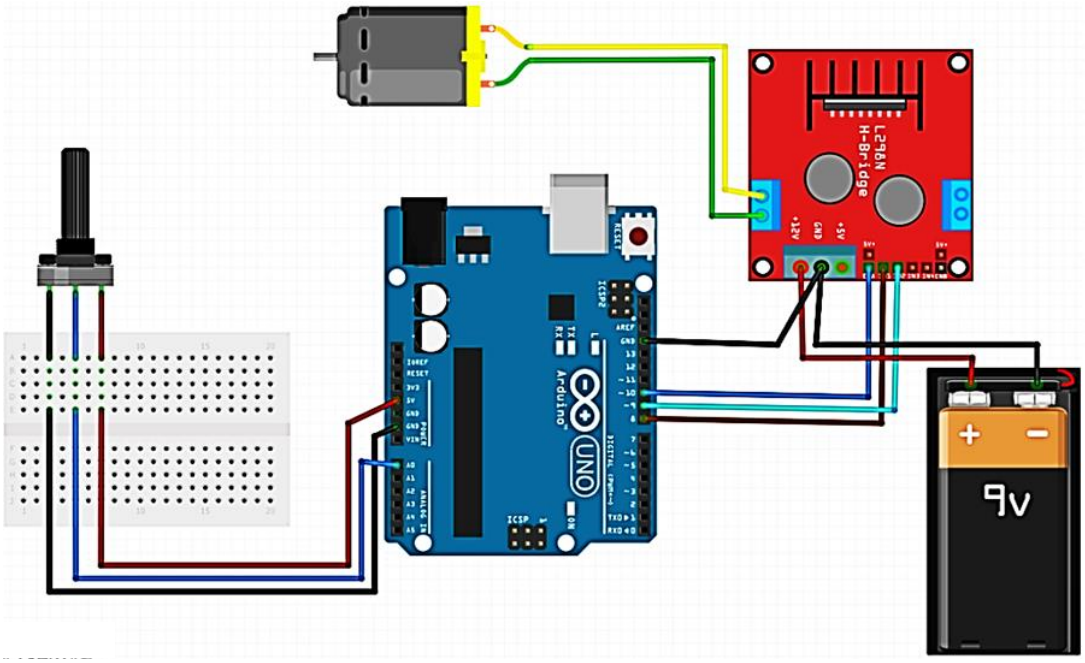

Figure 1: Circuit Diagram of Motor Control using Arduino and L298N [3]

Apparatus:

- L298N Driver
- 12 V High Torque DC Motor
- Arduino Board
- Potentiometer
- A DC power supply
- Breadboard and Jumper Wires

CODE:

```
int in1 = 8; //Declaring where our module is wired
int in2 = 9;
int ConA = 10;// Don't forget this is a PWM DI/DO
int speed1;

void setup() {
Serial.begin(9600);
pinMode(2, INPUT);
pinMode(8, OUTPUT);
pinMode(9, OUTPUT);
pinMode(10, OUTPUT);
}

void TurnMotorA(){ //A function to control the direction and speed

if (digitalRead(2) == LOW){
digitalWrite(in1, LOW); //Switch between these HIGH and LOW states to change direction
digitalWrite(in2, HIGH);
float analogvalue = analogRead(A0); // declaring and reading an analog voltage value from the pin
int PWMvalue = map(analogvalue, 0, 1023, 0, 255); // mapping the analog readings to change
                    // range from 0-1023 to 0-255 to divide the value by 4 to get a PWM value
analogWrite(ConA, PWMvalue);// To activate the DC motor
}

else if (digitalRead(2) == HIGH){
digitalWrite(in1, HIGH); //Switch between these HIGH and LOW states to change direction
digitalWrite(in2, LOW);
float analogvalue = analogRead(A0); // declaring and reading an analog voltage value from the pin
int PWMvalue = map(analogvalue, 0, 1023, 0, 255); // mapping the analog readings to change
                    // range from 0-1023 to 0-255 to divide the value by 4 to get a PWM value
analogWrite(ConA, PWMvalue);// To activate the DC motor
}
}
```

```
void loop() {
float analogvalue = analogRead(A0); // declaring and reading an analog voltage value from the pin
int PWMvalue = map(analogvalue, 0, 1023, 0, 255); // mapping the analog readings to change
                    // range from 0-1023 to 0-255 to divide the value by 4 to get a PWM value

Serial.print("Digital Value = ");
Serial.print(PWMvalue);       //print digital value on serial monitor
                              //convert digital value to analog voltage
float analogVoltage = (PWMvalue *5.00)/255.00;
Serial.print("  Analog Voltage = ");
Serial.println(analogvalue);

TurnMotorA();      // function that keeps looping to run the motor continuously
                   //you can add another one with a different direction or stop
}
```

Simulation:

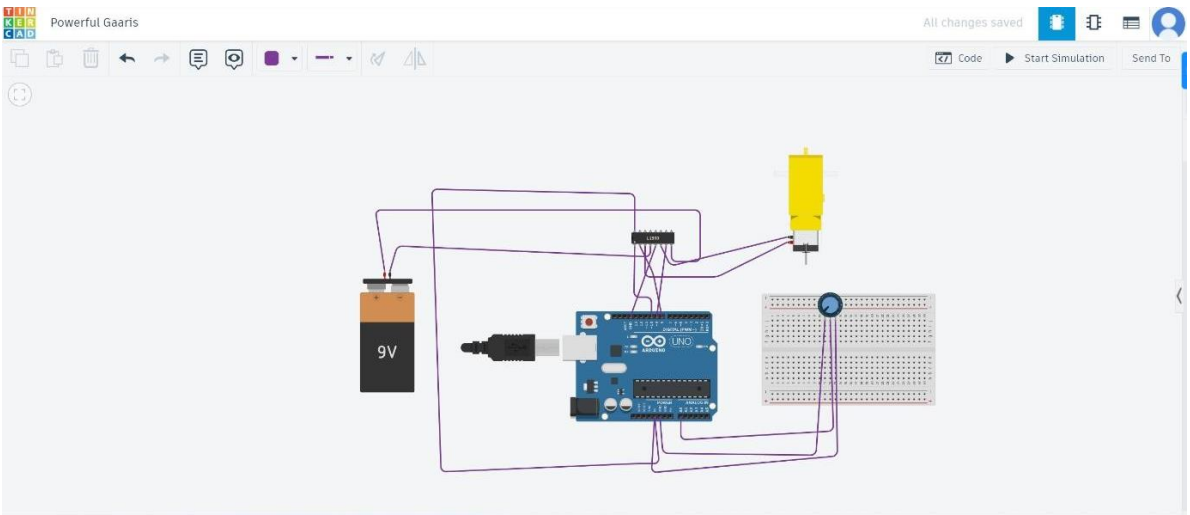

Figure 2: Speed control using potentiometer simulation.

Report writing:

1. Include all codes and scripts in the lab report following the writing template.
   Answer: All codes and scripts are attached above

DISCUSSION:

In this experiment, we connected a DC motor to an Arduino UNO to regulate its speed and direction via PWM (Pulse Width Modulation). The motor was linked to an L298N motor driving module, which we extensively discussed to understand its workings. Our project aimed to control the motor, utilizing a written code uploaded to the Arduino. Using a potentiometer, we managed the speed through PWM, and the module facilitated changing the motor's direction. Additionally, we monitored the motor speed (ranging from 0 to 255) through theserial monitor. Overall, our observations confirmed the successful functionality of the system, validating the achievement of our experiment's objectives.

Conclusion:

In this experiment, we connected a DC motor to an Arduino UNO to regulate its speed and direction via PWM (Pulse Width Modulation). The motor was linked to an L298N motor driving module, which we extensively discussed to understand its workings. Our project aimed to control the motor, utilizing a written code uploaded to the Arduino. Using a potentiometer, we managed the speed through PWM, and the module facilitated changing themotor's direction. Additionally, we monitored the motor speed (ranging from 0 to 255) through the serial monitor. Overall, our observations confirmed the successful functionality of the system, validating the achievement of our experiment's objectives.

References:

[1] Circuit Digest [Online : June 7, 2015] [Cited :December 23, 2023]
Available : https://circuitdigest.com/microcontroller-projects/dc-motor-control-with-arduino-uno-pwm

[2] L298N Motor Driver Module. (n.d.). Components101. [Online] [Cited: December 23, 2023]
Available: https://components101.com/modules/l293n-motor-driver-module

[3] H-bridge DC Motor Control Using Complementary PWM, Shoot-through, and Dead- time. (2022, August,29). Available: https://www.allaboutcircuits.com/technical-articles/h- bridge-dc-motor-control- complementary-pulse-width-modulation-pwm-shoot-through-dead-time-pwm/