# SPEED CONTROL OF DC MOTOR ACCORDING TO THE TEMPERATURE USING PWM TECHNIQUE

[1]Kathan Shah, [2]Harsh Vyas, [3]Harsh Wani, [4]Hitesh Godhani.[5] Prof Ruchit Soni
[1]Student, [2]Student, [3]Student, [4]Student, [5]Assistant Professor
[1]Department of Electrical Engineering
[1]Indus University, Rancharda via Thaltej, Ahmedabad-382115, India

***Abstract:*** Speed control is an essential requirement for getting different values according to the application.. Speed control can be done manually by operator or by automatic control device. Speed control can be done easily in DC motor. In this model we are controlling the speed of DC motor using PWM (PULSE WIDTH MODULATION) TECHNIQUE. The speed of DC Motor is varied according to the temperature with the help temperature sensor and Arduino.

***IndexTerms*** **– DC motor, PWM, DHT temperature sensor, Lead acid battery.L293D motor driver IC**

## I. INTRODUCTION

The project is about controlling of dc fan according the temperature. DHT22 sensor is used to sense the temperature and the speed of DC motor is adjusted accordingly by using pulse width modulation(PWM) technique. The PWM modulation is carried out with the help of an arduino. The L293 driver IC is used to drive the DC motor.

### 1.1 ABOUT PWM

- Definition: Pulse Width Modulation is a technique that conforms a signal width, generally pulses based on modulator signal information.
- The general purpose of Pulse Width Modulation is to control power delivery, especially to inertial electrical devices.
- The on-off behavior changes the average power of signal.
- Output signal alternates between on and off within a specified period.
- If signal toggles between on and off quicker than the load, then the load is not affected by the toggling.
- A secondary use of PWM is to encode information for transmission

### 1.2 BLOCK DIAGRAM

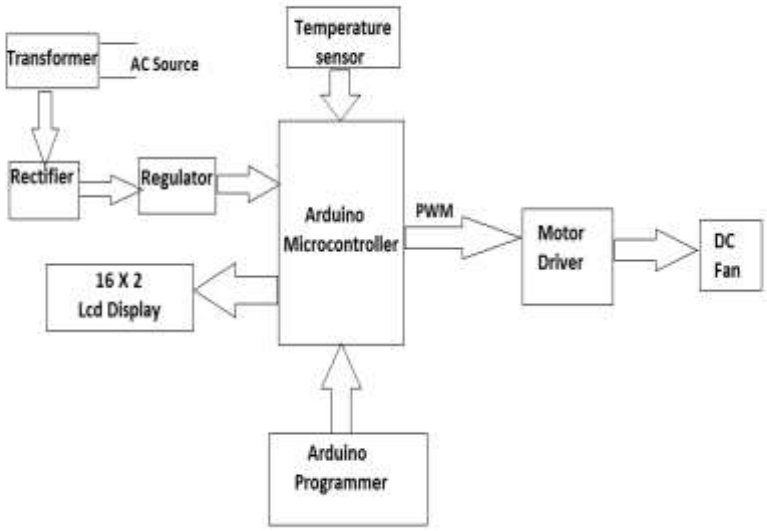


Fig 1: Block Diagram of the Project

The ac supply is converted into dc by the rectifier. The voltage regulator will convert the dc voltage into 5v and provide it to the circuit . DHT22 sensor is used to read the temperature to control fan speed. L293D motor driver IC for controlling DC fan/motor with Arduino. PWM signals are provided using an arduino to the driver IC. The LCD screen will display the percentage fan speed and temperature in Celsius.

Table 1: Required Components

| Sr no | Name | Specifications |
|---|---|---|
| 1 | Dc motor | Permanent Magnet, 9V,3600rpm |
| 2 | DHT22 sensor | Temperature -40-80C |
| 3 | L293 IC | 16 pin, motor driving ac |
| 4 | Rectifier | Converts AC to DC, |
| 5 | Arduino Uno | Atmega 328PU |
| 6 | Transformer | 230/12V step down |
| 7 | LCD Screen | 16x2 |

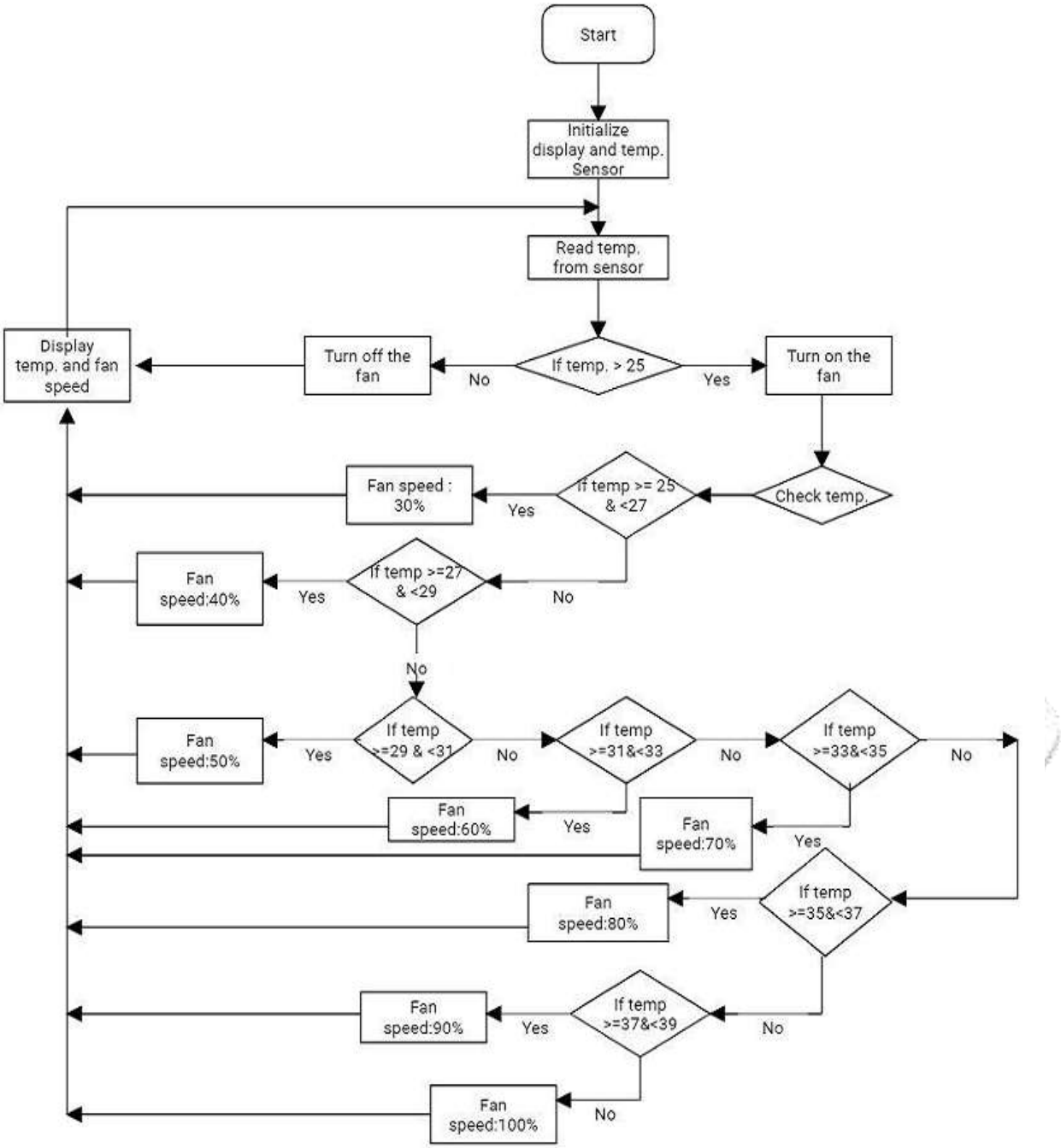


Fig 2: Flowchart

## II CIRCUIT DESIGNING and HARDWARE ANALYSES

### 2.1 Circuit Diagram in Autodesk EAGLE:

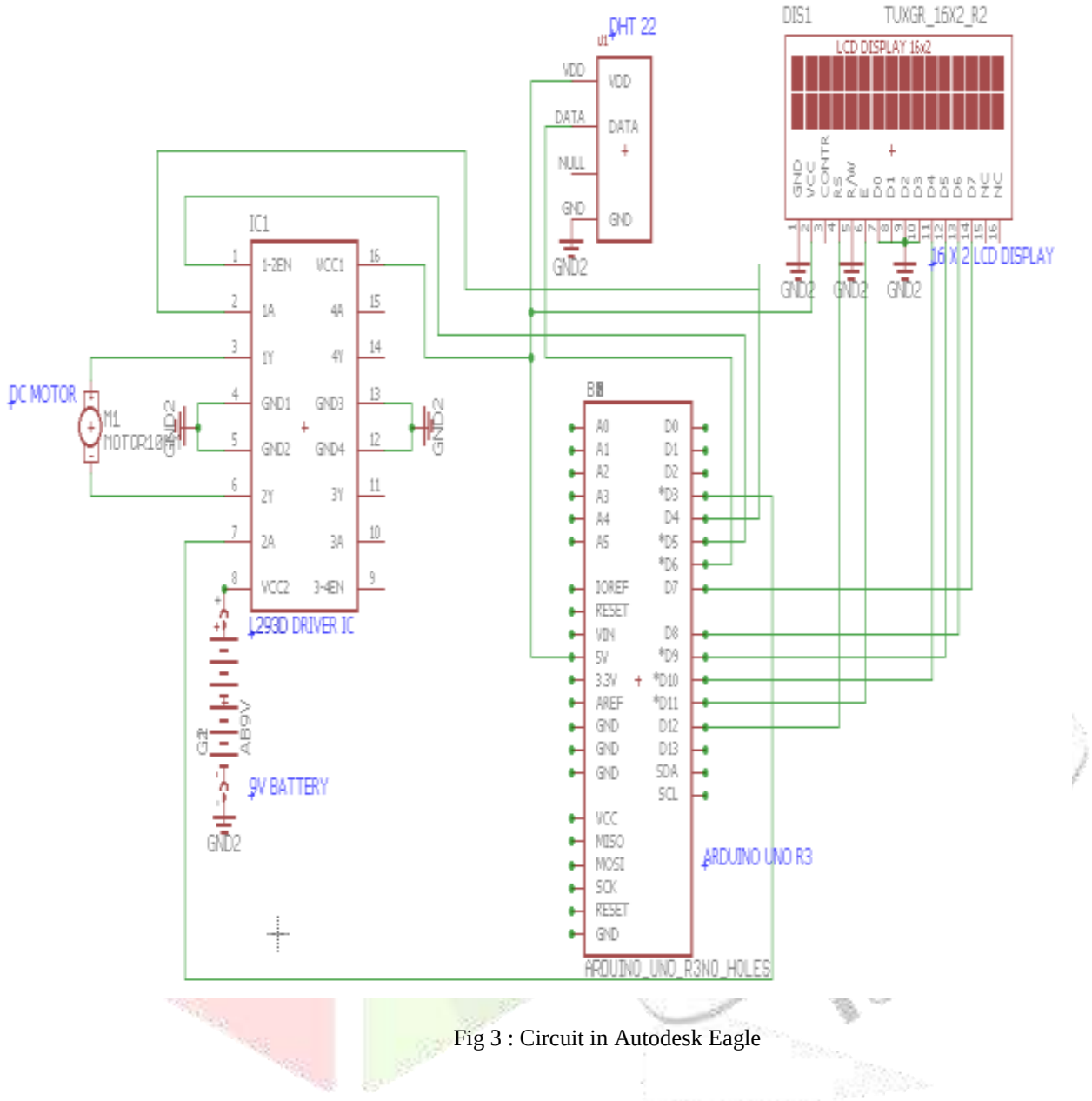


Fig 3 : Circuit in Autodesk Eagle

**2.2 DHT 22 Sensor-** DHT22 output calibrated digital signal. Its sensing elements is connected with 8-bit single-chip computer.Every sensor of this model is temperature compensated and calibrated in accurate calibration chamber and the calibration-coefficient is saved in type of programmed in OTP memory, when the sensor is detecting, it will cite coefficient from memory.Small size & low consumption & long transmission distance(20m) enable DHT22 to be suited in all kinds of harsh application occasions.

**2.3 L293 Driver IC-** L293D is Motor Driver IC which allows DC motor to drive in either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction.

## L293D Logic

Let's consider a Motor connected on left side output pins (pin 3,6). For rotating the motor in clockwise direction, the input pins have to be provided with Logic 1 and Logic 0.

- **Pin2** = **Logic1** and **Pin7** =**Logic0**|Clockwise
- **Pin2** = **Logic0** and **Pin7** =**Logic1**|Anticlockwise
- **Pin2** = **Logic0** and **Pin7** =**Logic0**|Idle[No-rotation] [Hi-Impedance-state]
- **Pin2** = **Logic1** and **Pin7** =**Logic1**|Idle[No-rotation]

**2.3 CIRCUIT SIMULATION:** Chanel -A is connected with output of Motor (9volts Peak to Peak)
Channel-B is connected with input of Driver IC (5 volts Peak to Peak)

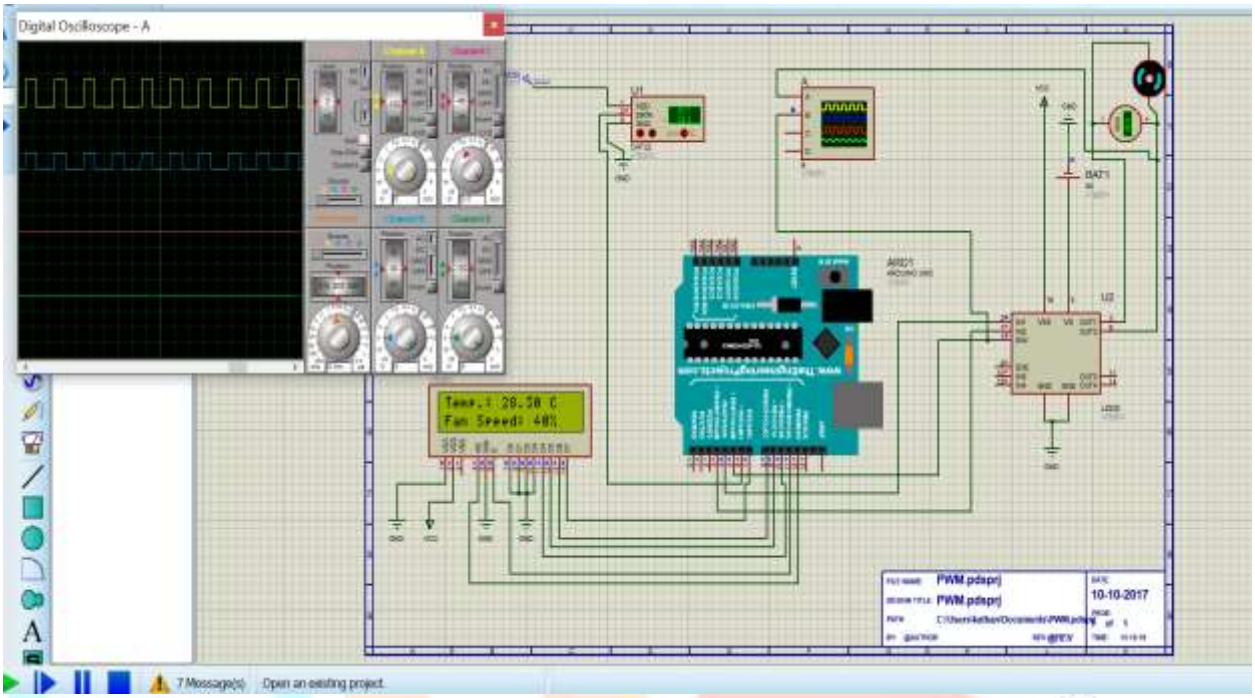


Fig 4 : Circuit Simulation when speed of fan is 40%

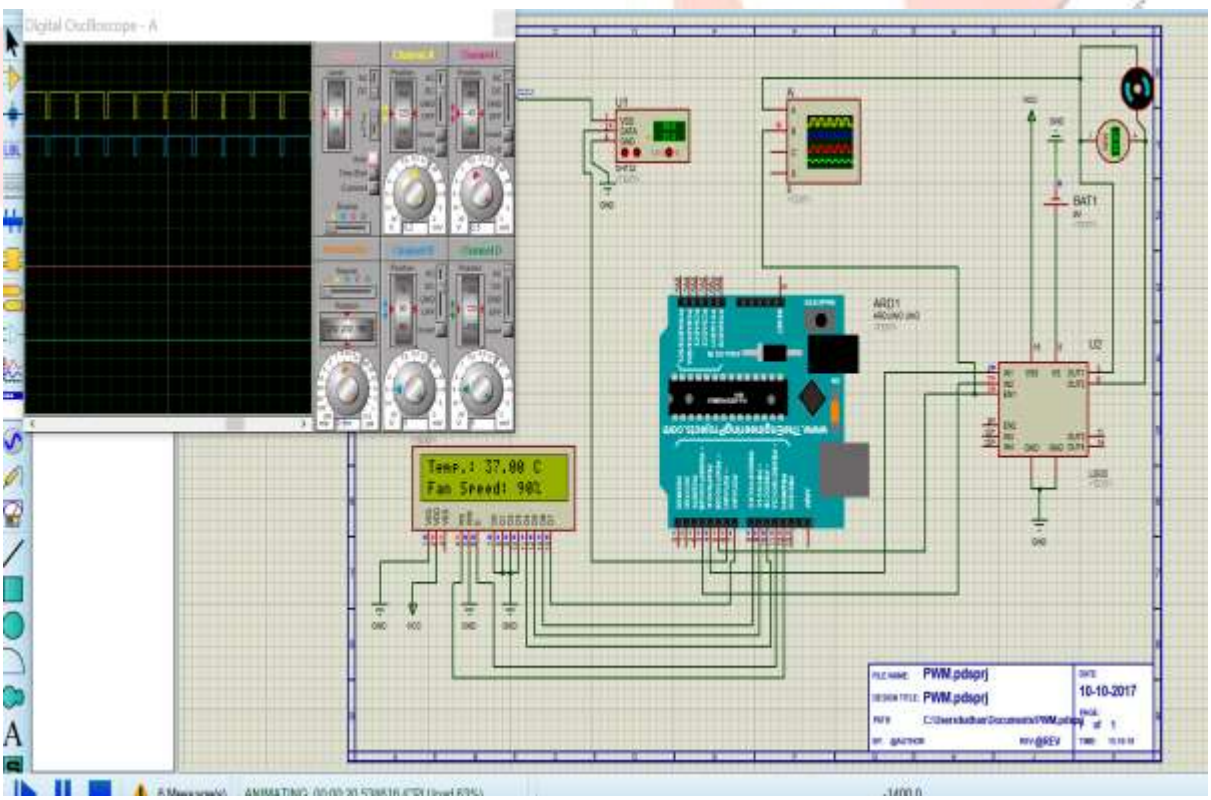


Fig 5: Circuit Simulation when speed of fan is 90%

**III RESULT ANALYSES**

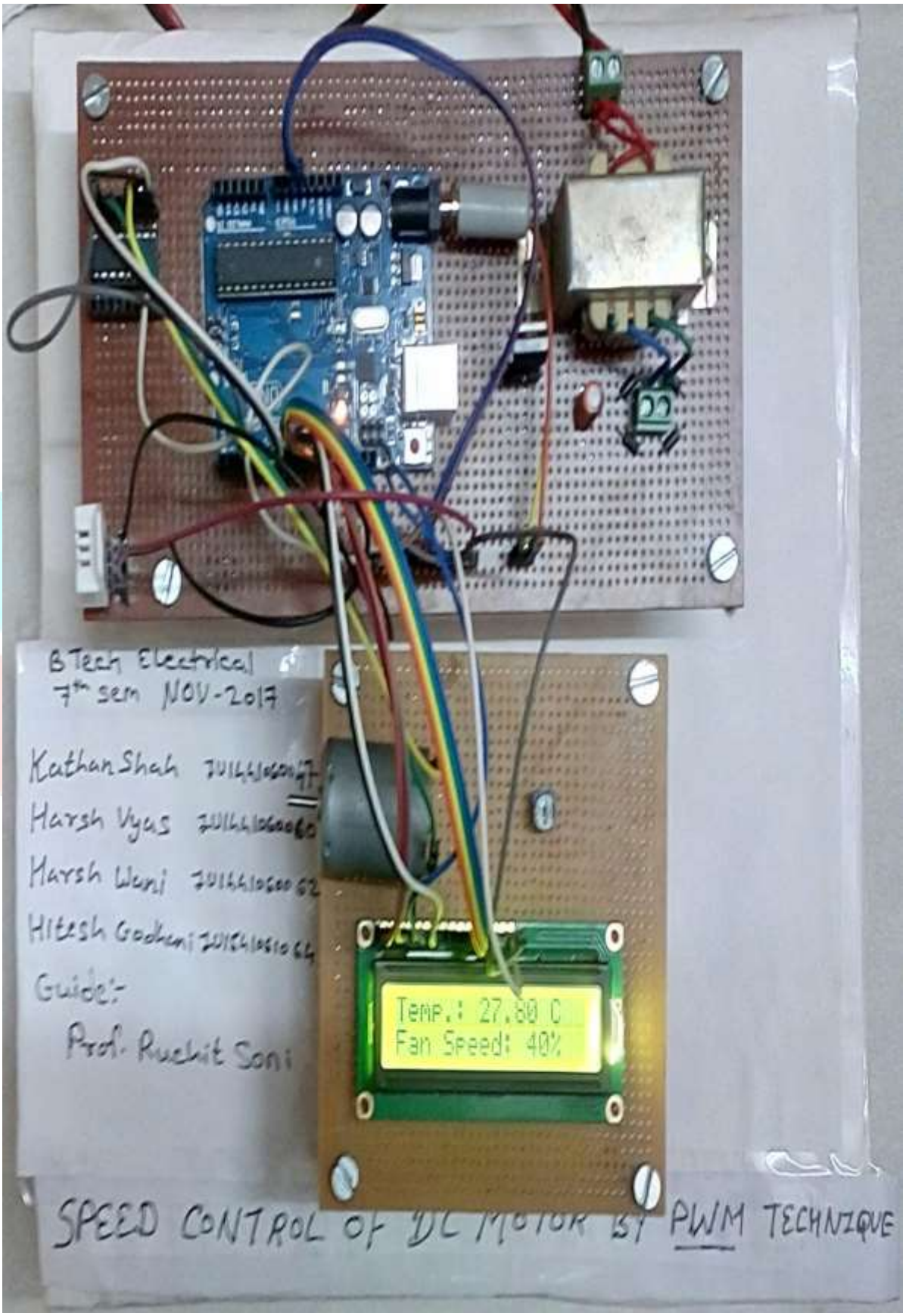


Fig 6: actual circuit of the model

Table 2: Results

| Sr No: | Temp. Range (Celsius) | % Duty Cycle | Speed (Rpm) | Ton time (micro sec) | Toff time (micro sec) | Avg. Voltage (Volt.) |
|---|---|---|---|---|---|---|
| 1 | >= 25 &< 27 | 30 | 1080 | 306 | 714 | 2.90 |
| 2 | >= 27 &< 29 | 40 | 1440 | 408 | 612 | 3.86 |
| 3 | >= 29 &< 31 | 50 | 1800 | 510 | 510 | 4.82 |
| 4 | >= 31 &< 33 | 60 | 2160 | 612 | 408 | 5.30 |
| 5 | >= 33 &< 35 | 70 | 2520 | 714 | 306 | 5.63 |
| 6 | >= 35 &< 37 | 80 | 2880 | 816 | 204 | 5.90 |
| 7 | >= 37 &< 39 | 90 | 3240 | 918 | 102 | 6.14 |
| 8 | >=39 | 100 | 3600 | 1020 | 0 | 6.85 |

**IV.CONCLUSION:**

From this project we can get knowledge about PWM technique for controlling a DC motor and on the basis of this we have made temperature controlled DC fan whose speed can be varied by temperature change.

**4.1 ADVANTAGES AND LIMITATIONS**

**Advantages:**

- The main advantage of PWM is that power loss in the switching devices is very low.
- When a switch is off there being practically no current,and When it is on and power is being transferred to the load, there is almost no voltage drop across the switch.
- Power loss, being the product of both, is thus in both cases close to zero.
- PWM also works well with digital controls, which because of their on/off nature, can easily set the needed duty cycle.

- Also, the temperature sensor DHT22 has low percentage error (0.5%) and its temperature range is high ( -40 to 80C) which is considerable compared to other temperature sensor like LM35, DHT11 etc.

**Limitations:**

- When this system can be used on industry some modification required according to ratings of other machines equipment.
- This circuit is less reliable because it is not highly sensible.

**.4.2 FUTURE SCOPE**

- The circuit can be expanded by using infrared sensor which can sense the presence of any person beneath the fan and the fan can be turned on and off accordingly to the presence of person.
- A change over switch can be used which can enable us to use this temperature controlled system either as automatically or manually depends on the application.
- This temperature controlled fan with some modifications can further be used in other heater circuits to maintain constant temperature of the device.
- With this circuit alarm circuit can be added and used effectively in large equipment where the risk of being overheated and explosions are serious problems, in various industries

## V ACKNOWLEDGEMENT:

It is a known fact that words are never sufficient to express the exact amount of gratitude that a person feels but words are the only way we can express our feeling. Therefore, we would like to express our heart full thanks to Prof Dr. Jaydeep Chakravorty for his valuable guidance, encouragement and kind co-operation extended by him.

## VI REFRENCES:

[1] http://www.electronicshub.org
[2] http://www.engineersgarage.com
[3] Power electronic by PS Bhimra
[4] Electrical drives By GK Dubey