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DC Motor Speed Control by Arduino Nano

Harshad S. Survase[1], Saiprasad S. Gaikwad[2], Saurabh M. Gade[3]
Piyush M. Hiremath[4], Prof. S .S. Survase[5]
Professor, Department of Electrical Engineering[1]
Students, Department of Electrical Engineering[2-5]
Brahmdevdada Mane Institute of Technology, Solapur, Maharashtra

Abstract: *The project is intended to control the speed of a DC motor by varying voltage across the terminal. The concept behind the project is, since the speed of DC motor is directly proportional to the voltage applied therefore the duty cycle of the pulse is varied (i.e. Pulse Width Modulation is used) to control the speed. A micro-controller is used to interface two input buttons for controlling motor speed. The micro-controller programmed in Embedded C language generates PWM i.e. Pulse Width modulation at the output according to program instructions. The ON and OFF time of the pulses or the duty cycle changes the average voltage given to the motor and therefore the speed of the motor changes. The PWM signals are received by a motor driver interfaced to micro-controller for delivering required output in controlling DC motor speed. Working of this project displayed by 16*2 LCD Display*

Keywords: *DC motor*

I. INTRODUCTION

DC motors were the first form of motor widely used for industrial application. Small DC motors are also used in tools, toys and appliances. This motor is a class of rotary electrical machines that converts electrical energy into mechanical energy. Nearly all types of DC motors have some internal mechanism, either electro mechanical or electronic to change the direction of current flow.

DC motors are classified on the basis of their excitation configuration as follows.

1) Separately Excited DC motor
2) Self Excited DC motor
a) Series DC motor
b) Shunt wound DC motor
c) Compound wound DC motor

The basic working principle of DC motor is “Whenever a current carrying conductor is placed in a magnetic field, it experiences a mechanical force”. The direction of this force is given by Fleming Left Hand Rule.

The project is intended to control the speed of a DC motor by varying voltage across the terminal. The concept behind the project is, since the speed of DC motor is directly proportional to the voltage applied therefore the duty cycle of the pulse is varied (i.e. Pulse Width Modulation is used) to control the speed. A micro controller is used to interface two input buttons for controlling motor speed. The micro controller programmed in Embedded C language generates PWM i.e. Pulse Width modulation at the output according to program instructions.

The ON and OFF time of the pulses or the duty cycle changes the average voltage given to the motor and therefore the speed of the motor changes.

The PWM signals are received by a motor driver interfaced to micro controller for delivering required output in controlling DC motor speed. Working of this project displayed by 16*2 LCD Display.

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II. LITERATURE REVIEW

IOT based control of DC traction motor Akanksha1, Shubham Kathuria2 1,2 School of Electrical Engineering, VIT University, Chennai Tamil Nadu 600127, India We have gone through this paper and got so many useful information regarding our project. In this paper, the IOT based control of DC traction motor has been reported. Internet is the most widely used, high speed and easily accessible communication medium in the modern-day world. The proposed system allows any person from any corner of the world to control heavy industrial machines. The proposed system is simple and highly effective in terms of cost and efficiency. In this system, the switching and the speed of the DC motor can be controlled by using a self- developed android Application.

The PROTEUS simulation confirmed the theoretical estimates of the performance of the proposed system. The theme of this paper is almost same as our project like controlling the dc motor with the help of internet, by using esp. 8266 WIFI module. Also, they have used the driver for motor control which is not modern and effective (L293D). therefore, to compensate that we decided to use the new motor driver which (L298N). To control the dc motor, they have opted mobile phone (android smartphone) as a tool to do that they had to build the app using android studio which is quite a complicated task, to make it simpler we have used the inbuilt serial monitor to control the Moorthy have used the micro-controller UNO which is a very cost-effective alternative for micro-controller also it offers lots of feature like inbuilt PWM(pulse with modulation) pins which helps to increase or decrease the motor speed or control the speed of motor by changing the width of the supply pulse. Speed Control of DC Motor by using IoT Pratima

A. Uparwat1, Lalit S. Khiradkar2, Arati S. Sindhimeshram3, Chaitrali P. Dhenge4, Kunal K. Kamble5, Pratiksha Panchabhai6 1,2,3,4,5UG Students, Dept. of Electrical Engineering, JDCOEM, Maharashtra, India 6 Professor Dept. of Electrical Engineering, JDCOEM, Maharashtra, India. We gone through this paper and the theme of the paper to be as follows, DC motor plays very important role in different industry application. This paper deals with a system which provides protection to the DC motor as well as helps in controlling and monitoring a various parameter. This project makes used of Atmega328, 8266 Wi-Fi modules and DC motor. The main zest of this paper is to controlled the speed of DC motor using IOT (Internet of Things). This paper has mentioned various types of dc motor based on their excitation as follows

i. Separately excited dc motor
ii. Self-excited dc motor
iii. Shunt wound dc motor
iv. Compound wound dc motor

The main methodology of this entire project depends on IoT based embedded system so interfacing of hardware's with wi-fi and internet is very important part in its functioning. The whole programming is done in Arduino IDE and then load in the ATMEGA 328 micro-controller and with the help of wi-fi and various sensors.

The required results will be done like providing protection to motor from the abnormal or faulty conditions. Observation of various parameters of motor like temperature, current and voltage will be achieved and also controlled direction of motion of motor with the help of relay and heat developed in motor which is sense by temperature sensor.

This paper, introduced a system that can protect, control and monitor the speed of DC motor remotely with the help of Wi-fi modules and IOT based system. Protection against the over current and thermal overloading is done by current and temperature sensor.

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1. BLOCK DIAGRAM

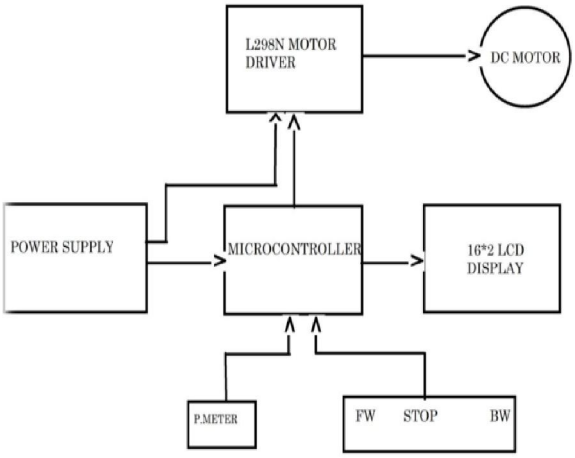

Fig -1: Block Diagram

III. SOFTWARE AND HARDWARE PLATFORM

Hardware Used :-ATmega328P, Microcontroller, Arduino NANO , LCD Display (16x2), LM2596 Buck Converter, Motor Drive L298N, DC Motor, Push Botton ,

Software Used: Arduino IDE

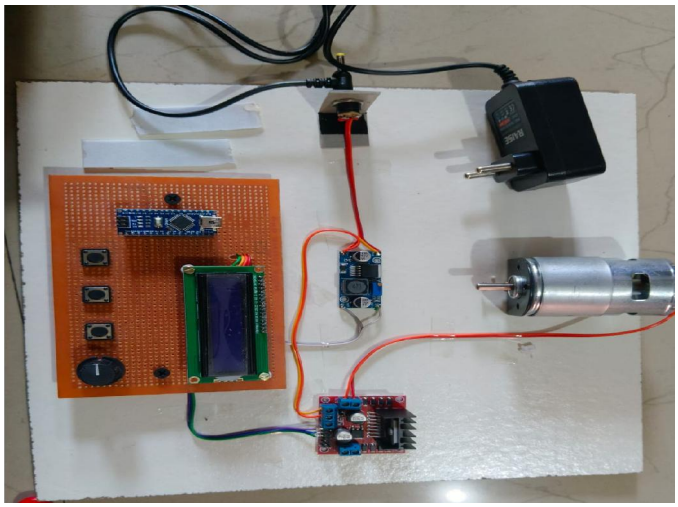

Fig -2: Project Image

IV. WORKING PRINCIPAL

Arduino Nano: Generates PWM signals to control the DC motor speed.

DC Motor: Converts electrical energy into mechanical rotation.

Motor Driver (L298N): Controls the motor's speed and direction based on signals from the Arduino.

DC Power Supply: Provides the required electrical power to the motor and circuit.

Connecting Wires: Connect all components and transmit power and control signals

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V. ADVANTAGES AND APPLICATIONS

Advantages

Speed Control: Allows easy adjustment of motor speed.
Energy Efficiency: PWM control can reduce power losses.
Automation: Enables automatic motor speed regulation.
Low Cost: Uses affordable and easily available components.
Easy Programming: Arduino Nano simplifies motor control.
Wide Applications: Useful in electric vehicles, fans, robotics, and industrial automation.

Applications

Electric Vehicles (EVs)
Industrial Automation
Robotics
Electric Fans
Conveyor Belt Systems
Electric Toys
Battery-Powered Devices
Automated Machines

VI. CONCLUSION

The project "DC Motor Speed Control Using Arduino Nano" was successfully studied and implemented. The Arduino Nano controls the speed of the DC motor by using the PWM (Pulse Width Modulation) technique. By changing the PWM duty cycle, the speed of the motor can be increased or decreased. This project is simple, cost-effective, and useful for applications such as robotics, electric vehicles, and industrial automation. Humidity), Rain Sensor, and Ultrasonic Water Level Sensor, the system continuously monitors environmental parameters and intelligently controls the water pump through a relay interface. The inclusion of the ESP8266 Wi-Fi module enables seamless connectivity with the Thing Speak Cloud, allowing users to observe real-time data and irrigation status remotely via any internet-enabled device.

VII. FUTURE SCOPE

1. IoT Integration: Control motor speed remotely using a smartphone.
2. Automatic Speed Control: Adjust speed according to load conditions.
3. AI Integration: Optimize motor performance using intelligent control.
4. Energy Efficiency: Improve power consumption and reduce losses.
5. Feedback Control: Use sensors to maintain the desired motor speed.
6. Industrial Applications: Integrate the system into robotics, electric vehicles, and automated machinery..

REFERENCES

1. IOT based control of DC traction motor Akanksha1, Shubham Kathuria2 1,2 School of Electrical Engineering, VIT University, Chennai Tamil Nadu 600127, India
2. Speed Control of DC Motor by using IoT Pratima A. Uparwat1, Lalit S. Khiradkar2, Arati S. Sindhimeshram3, Chaitrali P. Dhenge4, Kunal K. Kamble5, Pratiksha Panchabhai6 1,2,3,4,5UG Students, Dept. of Electrical Engineering, JDCOEM, Maharashtra, India 6 Professor Dept. of Electrical Engineering, JDCOEM, Maharashtra, India.
3. SPEED MONITORING AND CONTROLLING OF MOTOR USING INTERNET OF THINGS (IOT) ENHANCED WITH WI-FI 1Mr.P.Balaji,2Mr.A.Karthick, 3Mr .R. Murali, 4Mr .M .Sudhakaran, 1,2UG Student ,Dept. of EEE, Ganadi path Tulis's Jain Engineering College, Vellore, India, 3 Assistant Professor, Dept. of EEE, Ganadi path

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Tulis's Jain Engineering College, Vellore, India, 4Associate Professor, Dept. of EEE, Ganadi path Tulis's Jain Engineering College, Vellore, India.

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