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# DC Motor Speed Control Unit Design

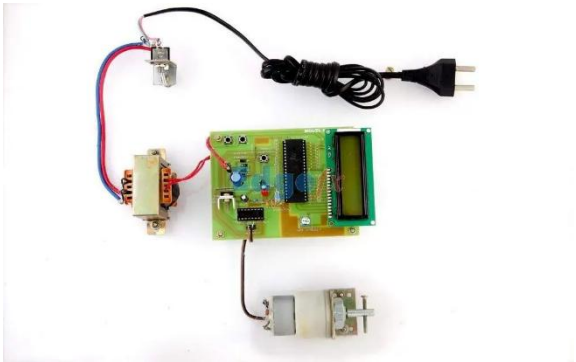
**Juhi Dawale[1], Rohit Jarande[2], Sneha Nawalkar[3], Gauri Ujawane[4], Keya Gawai[5], Diksha Mate[6]**
Student Third Year, Department of Electrical Engineering[1,2,4,5,6]
Jawaharlal Darda Institute of Engineering and Technology Yavatmal, India
MCA Second Year, PG Department of computer Science, SNDT Women's University Mumbai, India[3]
Juhi.dawale@gmail.com[1], Jaranderohit41@gmail.com[2], snehanawalkar57@gmail.com[3]
gaurisujawne2003@gmail.com[4], keyagawai9@gmail.com[5], dikshamate3011@gmail.com[6]

**Abstract:** *This paper describes the speed control of a DC shunt motor using conventional controllers (PID, IMC) and Fuzzy Logic controller based on Matlab Simulation program. A mathematical model of the process has been developed using real plant data and then conventional controllers and Fuzzy logic controller has been designed. A comparative analysis of performance evaluation of all controllers has been done*

**Keywords:** DC shunt motor

## I. INTRODUCTION

The speed of a DC motor is directly proportional to the voltage applied across its terminals.
The speed of a DC motor is directly proportional to the voltage applied across its terminals. This project uses the above principle to control the speed of the motor by varying the duty cycle of the pulse applied to it (popularly known as PWM control). A microcontroller is used to deliver the PWM pulses to the motor.



The project is designed to control the speed of a DC motor using an 8051 series microcontroller. The speed of DC motor is directly proportional to the voltage applied across its terminals. Hence, if voltage across motor terminal is varied, then speed can also be varied
This project uses the above principle to control the speed of the motor by varying the duty cycle of the pulse applied to it (popularly known as PWM control). The project uses two input buttons interfaced to the microcontroller, which are used to control the speed of motor. PWM (Pulse Width Modulation) is generated at the output by the microcontroller as per the program. The program can be written in Assembly language or in Embedded C. The average voltage given or the average current flowing through the motor will change depending on the duty cycle (ON and OFF time of the pulses), so the speed of the motor will change. A motor driver IC is interfaced to the microcontroller for receiving PWM signals and delivering desired output for speed control of a small DC motor.
Further the project can be enhanced by using power electronic devices such as IGBTs to achieve speed control higher capacity industrial motors.
The speed of DC motor is directly proportional to the voltage applied across its terminals. Hence, if voltage across motor terminal is varied, then speed can also be varied. This project uses the above principle to control the speed of the motor.

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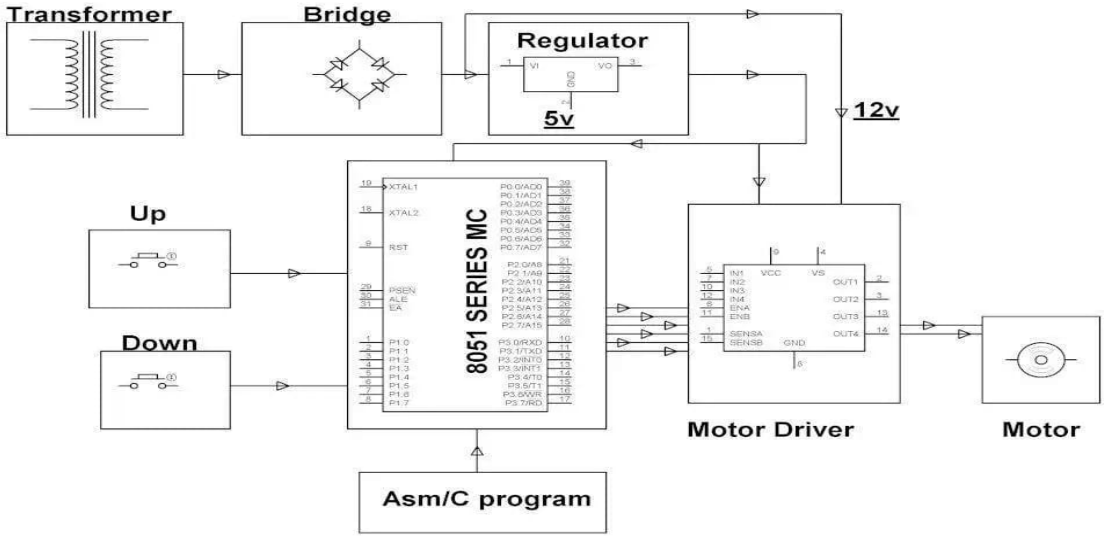


## II. ADVANTAGES OF DC MOTOR SPEED CONTROL

**High Efficiency –**
DC motors are known for their high efficiency, meaning they can convert electrical energy into mechanical energy with minimal losses. This makes them a popular choice for applications where energy efficiency is important, such as electric vehicles and renewable energy systems.

**Precise Speed Control –**
DC motors offer precise speed control, meaning they can be easily adjusted to run at different speeds depending on the needs of the application. This makes them ideal for applications where precision is important, such as in robotics and automation.

**Compact Size –**
DC motors are typically smaller and more compact than their AC motor counterparts, making them a popular choice for applications where space is at a premium. This can be especially important in industries like aerospace and medical equipment, where size and weight are critical considerations.

**Low Maintenance –**
DC motors are relatively simple and easy to maintain, with few moving parts and no brushes to wear out. This means they require less maintenance than some other types of motors, which can be especially important in applications where downtime is costly or disruptive.

**Easy to Control –**
DC motors are also easy to control, with simple control circuits that can be easily programmed and adjusted to meet the needs of the application. This makes them a popular choice for hobbyists and DIY projects, as well as for industrial applications where precise control is critical.

## III. DISADVANTAGES OF DC MOTOR SPEED CONTROL

**Limited Speed Range –**
DC motors have a limited speed range, meaning they can only operate effectively within a certain range of speeds. This can make them less suitable for some applications where variable speed control is critical.

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**Wear and Tear –**
DC motors can experience wear and tear over time, especially if they are used frequently or for extended periods of time. This can result in decreased performance or even failure, which can be costly to repair or replace.

**Electromagnetic Interference –**
DC motors can generate electromagnetic interference (EMI), which can interfere with the operation of other electronic devices in the vicinity. This can be especially problematic in applications where sensitive electronic equipment is in use.

**Limited Torque –**
DC motors can have limited torque, or rotational force, especially at lower speeds. This can make them less suitable for applications that require high torque, or rotational force, especially at lower speed.

## IV. Conclusion :

Conclusion In this paper, comparative studies of performance of different conventional controllers and fuzzy logic controller has been studied. According to the comparison of results of the simulations, it is found that the Fuzzy Logic Controller is better than conventional controllers namely PID and IMC. Hence it is concluded that the proposed Fuzzy Logic Controller provides better performance characteristics and improve the control of DC motor.

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