A Review: Speed Control of DC Motor Using Android Application

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Abstract: *Speed control of DC motor has wide range of application in today's world. This paper presents different methods of controlling the DC motor by using Android phones remotely with the help of Bluetooth technology. The signal is sent from the android mobile that is connected to Arduino Uno through Bluetooth module. In most cases, PWM technique is used to control the speed of DC motor.*
Keyword: *Arduino, Android mobile, DC motor, Bluetooth module*

I.   Introduction

Now days DC motors are used in industrial & domestic applications because of its better performance and superior characteristics over the AC motors. DC motors are used in smart home, industrial equipment, automobile, medical devices, electronic products etc. Therefore, speed control of DC motor is very important and essential where the precision and protection is essential. That is why in this paper we are concentrating on controlling the speed & monitoring the direction of DC motor. Speed of motor is controlled wirelessly using different recent techniques.

II.   Literature Review

Bhattacharjee and team have studied the speed control of BLDC motor through mobile application via secured Bluetooth. For controlling the speed and direction of a BLDC motor signal is sent by the android application and further transmitted to the Bluetooth module & received by Arduino Uno. With the help of this scheme, we can drive the motor in clockwise or anticlockwise direction. Direction of motor is controlled by reversing the direction of current flow either in armature or in field winding of the BLDC. This technique uses four main hardware's Arduino Uno ATmega328 microcontroller, Android mobile, BLDC motor & Bluetooth module. In this technique, user send the instruction to the Arduino Uno ATmega328 microcontroller via android mobile, which is wirelessly connected with the Bluetooth module. The Bluetooth module reads the information sent by the user & further sends to the Arduino Uno microcontroller, which drives the BLDC motor. PWM technique is used to control the speed & direction of BLDC motor. PWM technique is most widely used for speed control application. Speed of DC motor is controlled by varying the duty cycle of PWM pulse. Speed of motor increases when duty cycle is increased & motor speed decreases as duty cycle is decreased. Advantages of using this technique is BLDC motor is used its rotating speed is very high & motor accelerate & decelerate quickly due to low inertia & its power is very high and more reliable. It is most widely used in BlueTerm & BlueArd to control any device via Bluetooth. In this paper, researchers conclude that Arduino Uno is used for controlling the speed & direction of BLDC motor via Bluetooth. Terminal voltage has been changed with change in duty cycle. PWM control vary the duty cycle.[1]

In the paper of N.Barsoum, simple technique is used to control the speed of DC motor by sending SMS from mobile phone. The GSM module will receive SMS of desired motor speed in RPM send by the user. SMS received on the GSM module will be proceed by MCU and MCU will convert the SMS into suitable duty cycle for PWM pulse to control the speed of the DC motor. MCU is programmed to continuously send an AT command to the GSM module to check for message in the SIM every 5 second at location 1. Program will go to next step after receiving the massage after that, MCU will receive the SMS, extract the speed & change it to a suitable duty cycle for the PWM.

Suitable voltage is produced by controlling the motor drive L2931 using PWM pulse. This suitable voltage is supplied to the motor so that desired speed can be achieved. After completing this process, message was deleted at location 1 of GSM module by using AT command & loop back to the first step & again read the SMS in SIM. This process will repeat continuously. There are many advantages of controlling a motor using SMS i.e. Manual work will be reduced as the speed of motor is controlled by giving instruction to the MCU, cost of wiring will also get reduced by using wireless technology, using this method speed of DC motor is controlled wirelessly from far distance.[2]

Ritesh Chaubey and his team investigated about the implementation of microcontroller, to control the speed and direction of a dc motor in either direction i.e. clockwise or/and anticlockwise, using android mobile

application. A high frequency PWM signal is fed to dc chopper that is used to drive the dc motor. By controlling the duty cycle of this PWM signal, the terminal voltage of dc motor is controlled, which in turn directly controls the speed of dc motor. In this system, a dc motor is interfaced with the microcontroller. The major elements used in this system are Arduino UNO, Bluetooth module and DC motor. A 12v transformer powers the entire system. When an android device sends command, it is received by the Bluetooth module, which then sends the commands to microcontroller. Whenever the motor is turned on, it can run in both directions. A LCD is used to display the status and speed of dc motor. To control the signal speed and direction of dc motor, a signal from android device will be sent to microcontroller through Bluetooth module. This signal will be represented by a single direction that denotes the speed and direction of the motor. Different letters will represent the three directions of rotation i.e. clockwise, anticlockwise and stopping of the motor. This letter will vary the speed of motor with reference to Arduino code. The duty cycle of PWM signal is varied in between 0-255 to change the speed of dc motor. Direction of DC motor is controlled by using H- bridge concept. This system is advantageous as it uses Bluetooth module that consumes less power as compared to other devices providing user-friendly environment. Technically more skilled persons are not required in this system. But the problem is that the usage of Bluetooth module makes the usage only within a short range and usage of android app in smart phone consumes battery.[3]

In the paper of Ankesh N.Nichat and team, speed & direction control of DC motor is achieved by wireless & radio frequency technology with the help of PWM & H-bridge techniques. In which PWM technique is used for the speed control of DC motor. The microcontroller is used for generating the PWM signal. The duty cycle of PWM pulse is varied to control the speed of DC motor. And the H-bridge technique is used for controlling the direction of the DC motor. It consist of four transistor switches. These four transistor are connected in bridge form so it is called H-bridge. At a time, only two switches are turned on & remaining two switches are turned off. Radio waves are generated by RF transmitter. These radio waves are used for communication between the whole assembly. So conclusion made from this paper is that the speed & direction of DC motor is controlled by PWM & H-bridge techniques successfully. Microcontroller programming is used for achieving better speed control with reliable operation, high performance, easy control & better protection.[4]

In this paper, Abhishek Khanna & Priya Rajan have described "Android based speed control of DC motor via Bluetooth". In this system, a motor driver IC L293D that is interfaced with the microcontroller Arduino Uno controls a dc motor. Two basic elements that are Bluetooth of mobile phone, which is connected to Arduino Uno microcontroller & a Bluetooth module communication with each other. The data is sent by the smart phone to the microcontroller via Bluetooth. A 12V solar panel or a 12V adaptor is used to power the entire system. This solar panel converts solar energy into electrical signals directly or indirectly through photovoltaic (PV) and concentrated solar power (CSP). To concentrate large area of sunlight on solar panels, lenses, tracking system and mirrors can be used. This project is cost effective and eco-friendly as it uses the solar panels as a power source. This system can be integrated with robotics, drones, house door, lockers etc.[5].

In this paper VJ sivanagappa and K-Haribalan has proposed a system, which consists of a rectifier, filter capacitor, DC/DC converter. The main component of DC/DC converter is IGBT, which is driven by PWM pulses fed from the microcontroller. An Arduino Ethernet shield is used to connect the Arduino on board microcontroller to the internet by plugging the Ethernet module to RJ45 cable. By scrolling the slider in android app, the data is sent to the microcontroller through internet. The slider is configured with 0-255 digital values. According to the value that is fixed by the user, the data is sent to Ethernet shield and the corresponding pulse with duty ratio is achieved. The speed of the motor is controlled by driving the IGBT through the microcontroller signal.[6]

III.   Conclusion

In this paper, different techniques are reviewed for controlling the speed & direction of DC motor wirelessly. In each technique various types of microcontrollers are used. By using microcontroller programming, speed control has been achieved with high performance, reliable operation, easy control & better protection.

IV.   Future Scope

- GSM & Internet module can be used for long range wireless communication.
- Speed of single phase & three-phase AC motor is also controlled wirelessly.
- This system can be integrated with robotics, drones, cameras, house doors, lockers etc.

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