Speed and Direction Control of DC Motor using Android Mobile Application

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Abstract:
The Android-is the most popular mobile platform, which is very useful in creating much real time application which is useful in our day to day life. The DC motors are widely used for variable speed drive system in industrial applications such as industrial automation, electric traction, aircraft, military equipment, hard disk drives because of their high efficiency, silent operation, compact, reliability and low maintenance. Due to the advancement of wireless technology, there are several connections introduced such as GSM, Wi-Fi, ZIGBEE and Bluetooth. Each of the connection has their own unique specifications and applications. Among these wireless connections, Bluetooth technology is often implemented. The speed control was implemented using Bluetooth technology to provide communication access from smart phone. On the other hand we have ARDUINO UNO platform that we can use to quickly prototype electronic systems. Android mobile act as a transmitter and the received by Bluetooth receiver interfaced to ARDUINO which send data to the Bluetooth module and which in-turn run the motor

Keywords: ARDUINO, Android mobile, DC Motor, Bluetooth module

I. INTRODUCTION

Today most of the industries use DC motors. So, speed controlling of DC motors plays a very vital role. Therefore our paper concentrates on monitoring and controlling the speed of DC motor using Android mobile application, with the help of Bluetooth technology. Smart phones have in-built Bluetooth technology, so and external Bluetooth module is interfaced with the microcontroller unit (ARDUINO) for wireless communication. The Bluetooth module receives command from the mobile phone android application. So, according to the input signal, with the help of arduino, MOSFET can be used to vary the voltage as well as the speed of the DC motor using PWM technique. Direction of the DC motor can also be varied with the help of relay circuit or H-Bridge network.

II. BLOCK DIAGRAM

The major elements of block diagram are:
- Arduino UNO
- Bluetooth Module
- DC motor

2.1 ARDUINO UNO
The Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. The ATmega328 on the Uno comes preprogrammed with a boot loader that allows you to upload new code to it without the use of an external hardware programmer.

2.2 BLUETOOTH MODULE
Bluetooth serial communication module has two work modes: order-response work mode and automatic connection work mode. And there are three work roles at the automatic connection work mode. When the module is at the automatic connection work mode, it will follow the default way set lastly to transmit the data automatically. When the module is at the order-response work mode, user can send the AT command to the module to set the control parameters and sent control order. The work mode of this Module can be switched by controlling the module PIN (PIO1) input level. In this project Bluetooth module is used to send signals from the ARDUINO UNO.

2.3 DC MOTOR
Almost every mechanical movement that we see around us is accomplished by an electric motor. Electrical machines are used for the converting energy. Motors take electrical energy and produce mechanical energy. Electric motor is used to power hundreds of devices we use in everyday life. An example of
small motor applications includes motors used in automobiles, robot, hand power tools and food blenders.

III SYSTEM ARCHITECTURE

Figure 2. Circuit Diagram

3.1 WORKING
Signal from Android device will be sent through Bluetooth. This signal will be communicated with arduino with the help of transmitter and receiver of both the devices. This signal will be represented by a single letter which denotes the speed and direction of the motor. There are three different direction of rotation: clockwise, anti-clockwise and stopping of the motor and these will be represented by different letters. This letter will vary the speed with reference to the arduino code. For forward direction the transistor Q1 and Q4 will be ON and for the reverse direction Q2 and Q3 will ON. Q1 and Q2 are PNP transistors which becomes ON when low signal is sent and Q3 and Q4 are NPN transistors which becomes ON when high signal. PWM pins 5 and 6 are used to control the speed of the in both directions, they use the concept of varying the dutycycle (PWM Technique). Dutycycle varies from 0 - 225. So by choosing different duty cycle speed can be varied. Direction is controlled with the concept of having H-Bridge.

IV SOFTWARE SIMULATION

The android application in the mobile phone is developed with the help of Android Studio Software.

4.1 ANDROID STUDIO
Android Studio is a free integrated development environment (IDE) from Google and official development environment for Android. Android Studio is based on IntelliJ IDEA. In addition to the features that are already implemented in IntelliJ IDEA, furthermore, the following functions are available: Support for the development of Android, Android Wear and Android TV Apps. Android Studio uses a build management automation tool, the on Gradle is based. The system gives the developer the opportunity for different device types such B. Tablets to create optimized versions of the app. Theme editor Android Lint It is possible to configure Google services like Google Cloud Messaging within the IDE and apply it directly to the app. Support for ProGuard and automatic app signing. The source code of Android Studio is freely available.

Figure 3. Android App Layout

V ADVANTAGES
- Bluetooth consumes less power than other devices.
- Android application is user-friendly.
- Technically expert persons are not required.
- Wireless communication is enhanced.
- Programming is simpler.

VI DISADVANTAGES
- Usage of Bluetooth module makes the usage only within a short range.
- Usage of android app in smart phones consumes battery.

VII APPLICATIONS
- Home automation.
- Many industrial applications require adjustable speed drive and constant speed for improving the quality product.
- Intensity of light can also be controlled with the help of android app.

VIII CONCLUSION
Thus the speed and direction control of the DC motor is achieved with the help of Android mobile application with the help of Bluetooth technology. In this way wireless communication is also achieved.

IX FUTURE SCOPE
- In future, apart from controlling the speed and direction of DC motors, the same technique can be implemented in both single phase and three phase AC motors as well.
- For long range wireless communication WIFI-module can be used.
- Touch screen technology can also be implemented.
X REFERENCE


