International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 06 Issue: 07 | July - 2022 Impact Factor: 7.185 ISSN: 2582-3930

DC MOTOR CONTROL SYSTEM THROUGH ANDROID APPLICATION USING ARDUINO NANO: A REVIEW

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Abstract. ***The goal of the research is to create an Android application that will control D.C motors. The D.C motors are represented by a robot model car, and the control programme uses Bluetooth technology to connect with the system. The user of an Android mobile device must first install an application on his device, after which the user must enable Bluetooth connectivity on the device. To drive the robot model automobile, the user can utilise orders like forward, back, stop, left, and right. The Android mobile smartphone sends these commands to the Bluetooth receiver, which is connected to the control system. A Bluetooth HC-06 receiver in the control system receives and sends commands from the control application.***

Keywords D.C Motor, Bluetooth, Control, Arduino, Android

1. Introduction

The research's goal is to develop an Android application that can operate DC motors. The D.C motors are represented by a robot model automobile, and the control programme connects to the system via Bluetooth technology. The user of an Android mobile device must first install an application before enabling Bluetooth communication. The user can utilise commands like forward, reverse, stop, left, and right to drive the robot model automobile. [1].

Mobile devices now feature faster processors, larger storage capacities, and improved connection capabilities. The smartphone is a little device with enough processing power to perform almost anything, and it's revolutionising how humans interact with robots. Smartphones evolved into a universal portable item that people used on a regular basis for a variety of purposes. The Android operating system (OS) has been increasingly popular in smartphones in recent years. The Android platform includes an OS, a middleware layer, and basic apps. Unlike other platforms, such as the iPhone OS, it comes with software that may be used as a developer kit (SDK) [2].

Because of its efficiency, quiet operation, small size, reliability, and low maintenance, the D.C motor is commonly employed in various driving applications in the industrial sphere. The most common uses are in automation, traction, civil, and military systems. [3].

Multiple communication techniques, such as Bluetooth and Wi-Fi, have been established as a result of advancements in wireless technology. Each link has its own description and purpose. Bluetooth technology is the most often utilised Wi-Fi connection.Bluetooth is mostly used for data transport, but it also gives devices new features. Ericsson pioneered Bluetooth technology in 1994, and it has proven to be a significant benefit by incorporating it into cellphones.The communication method has influenced how people use their mobile devices at home and at work, as well as assisting in the move from wired to wireless devices. A Bluetooth device acting as a host can communicate with up to seven bluetooth devices at once via a single Bluetooth connection.[4]

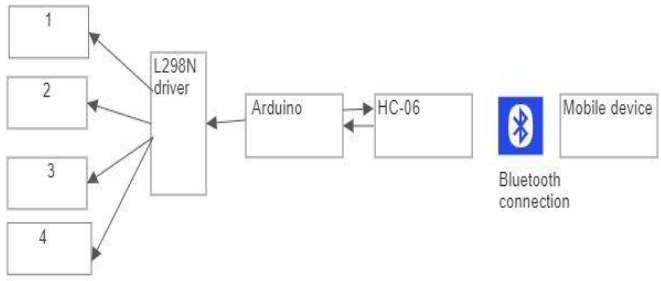

Fig 1. Block schematic of the system.

The motors' movement direction is controlled via the Bluetooth connection technology. A miniature robot model car is used to control the system, which is made up of an Arduino Nano microcontroller, a Bluetooth HC-06 module, two L298N driver modules, and four D.C motors. When the Android application is connected to this system via Bluetooth, the user can control the little robot model automobile using wireless orders provided in the app. Left, right, forward, and backward movement are all possible for the robot model car.

1.2 Arduino Nano

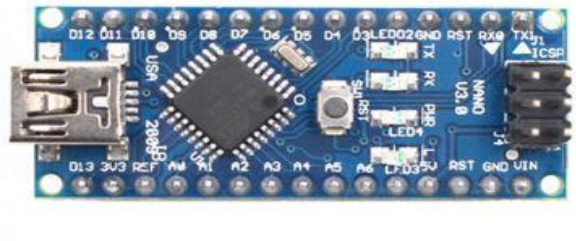

Fig 2. Arduino Nano.

The Arduino Nano is a compact development board that measures 18 x 45 mm. The ATmega328 microcontroller is used on the development board, this microcontroller includes a customized 8-bit AVR Atmel processor that runs at a frequency of 16 MHz.[5] The development board includes 32 KB of FLASH memory, 2 KB of SRAM memory, 1 KB of EEPROM memory, 6 analogue pins (A0-A5), and 14 digital pins (of which 6 support a PWM style output). The development board is powered by a 5V supply and delivers 40 mA on the output/input pins (50 mA on the 3.3V output pin). I2C, SPI, and USART are the communication protocols supported by the Arduino Nano development board. [6]
The Android Nano technical specifications are:
- Atmega328 microcontroller
- Working voltage: 5V
- Input voltage recommended: 7V-12V
- Input voltage limit: 6V-12V
- 14 digital pins (6 PWM output)
- 6 analogue pins
- 40 mA current per I/O pin - 50 mA 3.3V current
- 32 KB flash memory, including 0.5 KB for the bootloader
- 2 KB SRAM - 1 KB EEPROM - 16 MHz clock speed

1.3 Bluetooth HC-06

Fig 3.Bluetooth module HC-06.

The HC-06 Bluetooth Module is a wireless serial communications Class 2 slave module. When the module is connected to a primary Bluetooth device (such as a computer, smartphone, or tablet), the transmission becomes completely invisible to the user. When the module gets data via the serial input from the microcontroller, it sends it via the serial interface.Because of the serial interface mentioned above, connecting the module to a microcontroller doesn't require any special software. The Bluetooth module HC-06 runs on 3.6V to 6V.

1.4 L298N driver

The L298N module is a powerful motor driver that can operate both DC and stepper motors.
The L298N module is designed to control up to four DC motors or the direction and speed of two DC motors. A IC L298, resistors and capacitors, a 5V voltage regulator, a power supply indicator, and a 5V power jumper are used to activate the voltage regulator when the jumper is entered make up the module. If the user decides to power the driver with a voltage less than or equal to 12V, the module will be powered by the voltage regulator, and the microcontroller will be powered by the 5V pin.
ENA and ENB are the pins that regulate the motor speed, and the motor speed is controlled by a PWM input signal. IN1, IN2, IN3, and IN4 are the pins that control the direction of both motors, and the direction is controlled by a HIGH logic input signal.The following are the technical specifications for the L298N:
- Chip type: Bridge H - Supply voltage (motors): 46V - IC model: L298N - Motor supply current: 2A - Voltage for operation: 5V - Module voltage ranges from 5 to 35 volts. - Current consumption of the module: 2A - Current consumption: 0-36mA

1.5 DC motor with reducer

The voltage used by the D.C motor with reducer is between 3V and 6V. The reducer ratio is 1:48, with 125 RPM at 3V and 60 mA current consumption, 200 RPM at 5V and 100 mA current consumption, and 230 RPM at 6V and 120 mA current consumption.The following are the technical characteristics for the D.C motor with reducer:
- Engine reduction: 1:48
- 3V-6V DC motor supply voltage
- Torque (kg/cm): 0.8 kg
- RPM: 3V: 125, 5V: 200, 6V: 230
- Current: 60 mA at 3 volts, 100 mA at 5 volts, and 120 mA at 6 volts

1.6 Electronic Board

The electronic board is made up of the Arduino Nano developing board, which is used to control the motor driver, motor driver connectors, HC-06 Bluetooth module, which is used to send commands to the Arduino, L7805 voltage regulator, which supplies 5V to the developing board and Bluetooth module, and the power connector, which supplies power to the entire system.

2. The Principle of Working

The technology allows the user to manage the speed and direction of four D.C motors, which are represented by a tiny model car, using an Android application designed for mobile devices. The user establishes a Bluetooth connection with the

model car and transmits commands to operate it. The app transmits a text message to the HC-06 slave module, which is then processed by the Arduino Nano, which controls the L298N drivers and hence the DC motors [7].
Forward movement is accomplished with the text message "1," backward movement is accomplished with the text message "2," left movement is accomplished with the text message "3," right movement is accomplished with the text message "4", and stopping the DC motors is accomplished with the text message "0." Figure 4 shows the fully completed controlled model automobile. The L298N drivers that control the DC motors are attached to the electronic board.

2.1 Application software

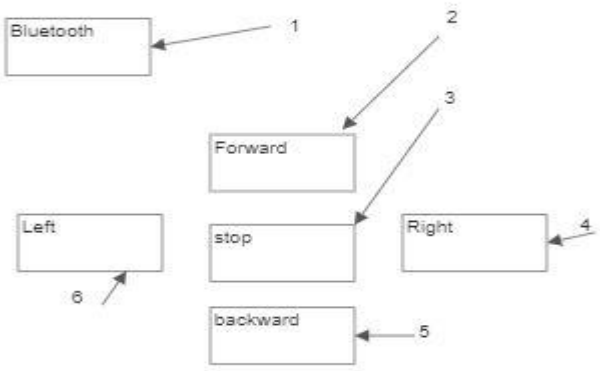

Fig 4.A control application for Android.

There are six buttons on the Android control application. The Bluetooth button (1) connects to the HC-06 slave module, the forward button (2) sends the text message "1," the stop button (3) sends the text message "0," the backward button (5) sends the text message "2," the left button (6) sends the text message "3," and the right button (4) sends the text message "4".

3. Conclusion

This paper serves as an introduction to the world of Bluetooth control systems and smart mobile devices running the Android operating system. The Android smartphone operating system is an ideal environment for creating an efficient and simple-to-customize programme that allows the user to control the developed system via a Bluetooth connection. The Atmega328 microcontroller is used in the controlled system; this microcontroller was designed for the implementation of various technical solutions in the fields of electronics, mechatronics, and automation. Most wireless control systems use RF modules, however the study shows that Bluetooth technology may be used in a similar or superior way to effectively and securely operate certain wireless systems.

The L298N module, which controls the D.C motors, is simple to use with a development board like the one used to build this system, and the D.C motors, despite their modest size and power, are still a feasible alternative for a variety of applications.

4. REFERENCES

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