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DEVELOPMENT OF AN ANDROID-BASED INTELLIGENT CONTROL SYSTEM FOR DC MOTOR APPLICATIONS

Dr. K. Naveen Kumar, Professor & Head of the Department,
Department of ECE,
PALLAVI ENGINEERING COLLEGE (AUTONOMOUS), Hyderabad.

ABSTRACT: Employing these new tools is essential for improving outcomes due to the continuous evolution of technology. Android is the predominant smartphone platform, ideal for developing real-time daily applications. The study examines the development and application of an economical, reliable, and secure Bluetooth-enabled controller for regulating the speed and direction of a DC motor. The smartphone enabled communication, while Bluetooth technology regulated the vehicle's speed. The PIC platform enables the swift advancement of electrical systems. The RPM of a DC motor is measured with an infrared monitor. A PWM signal can activate a DC motor. The Bluetooth module acquires data from the Android phone, energizes the DC motor, and presents the speed on an LCD screen. The data is transmitted through a Bluetooth receiver linked to a PIC.

Keywords: PIC micro controller, LCD, Bluetooth, IR sensor,DC motors.

1. INTRODUCTION:

The ability to regulate DC motor speed is crucial. An external Bluetooth module (HC05) is linked to the PIC computing unit. This enables remote monitoring and control of a DC motor using Android phones. The Android software on a smartphone signals the Bluetooth listener. Therefore, an I/P output that functions with PIC and PWM is frequently used by an IR sensor to regulate the speed of a DC motor. An H-bridge device or a driving circuit can also be used to reverse direct current motors.

Electric power systems must be incredibly dependable, linearly controllable, and stable. DC-powered devices offer numerous advantages. The various methods for controlling the DC motor's speed have a significant impact on the overall performance of the power system. The primary function of a speed controller is to set the direction and speed of a DC motor at a specific speed using a Bluetooth-enabled device. In contrast, the primary function of a DC drive is to maintain a constant speed regardless of variations in the load.

The "Android-based speed control of a DC motor," a piece of experimental gear that enables smartphone control of a motor via Bluetooth, is the primary focus of this work. An integrated circuit and a microprocessor are the two primary components of this configuration. The Bluetooth module of a smartphone is linked to the IC-interfaced DC motor and motor driver. Bluetooth enables wireless data transmission and reception between a smartphone and the CPU. The user can communicate and share data while monitoring the DC motor's operation thanks to an Android app that has been developed and installed on their smartphone.

In this project, the microprocessor uses sensors to display the motor's location on a smartphone. Our microcontroller-based remote control technology allows you to adjust the speed of a DC motor.

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2. LITERATURE SURVEY

Using a simple text message sent from a mobile phone, researchers headed by N. Barsoum have shown that it is possible to control the speed of a DC motor. The client will send an SMS indicating the desired RPM motor speed to the GSM module. The speed of the DC motor is controlled by the GSM module, which takes incoming SMS and turns them into the necessary duty cycle for a PWM signal. Starting with step one, the MCU is set up to send a with command to the GSM module every five seconds, telling it to check the SIM for messages. The machine will move on to the next step after it gets the message. The motor control unit (MCU) will read the SMS, calculate the speed, and then turn that into a duty cycle that the pulse width modulator (PWM) can control.

In this review, Abhishek Khanna and Priya Rajan talk about their research on "Android-based control of DC motor speed via Bluetooth." Here, we use an L293D, an integrated circuit motor driver, to control a DC motor. It is linked to a microcontroller called an Arduino Uno. To connect to an Arduino Uno microcontroller wirelessly, you'll need a smartphone and a Bluetooth module.

The data is transferred to the microcontroller from the mobile device using Bluetooth. The required energy can be supplied by a 12V power adapter or a 12V solar panel. This solar screen uses concentrated solar power (CSP) and photovoltaic (PV) technology to directly or indirectly transform sun energy into electrical signals. Lenses, monitoring systems, and mirrors can greatly increase the amount of sunlight that solar cells absorb. This idea uses solar energy to cut costs while helping the environment. With this technology, you can link up things like drones, robots, garage doors, and lockers.

3. HARDWARE IMPLEMENTATION

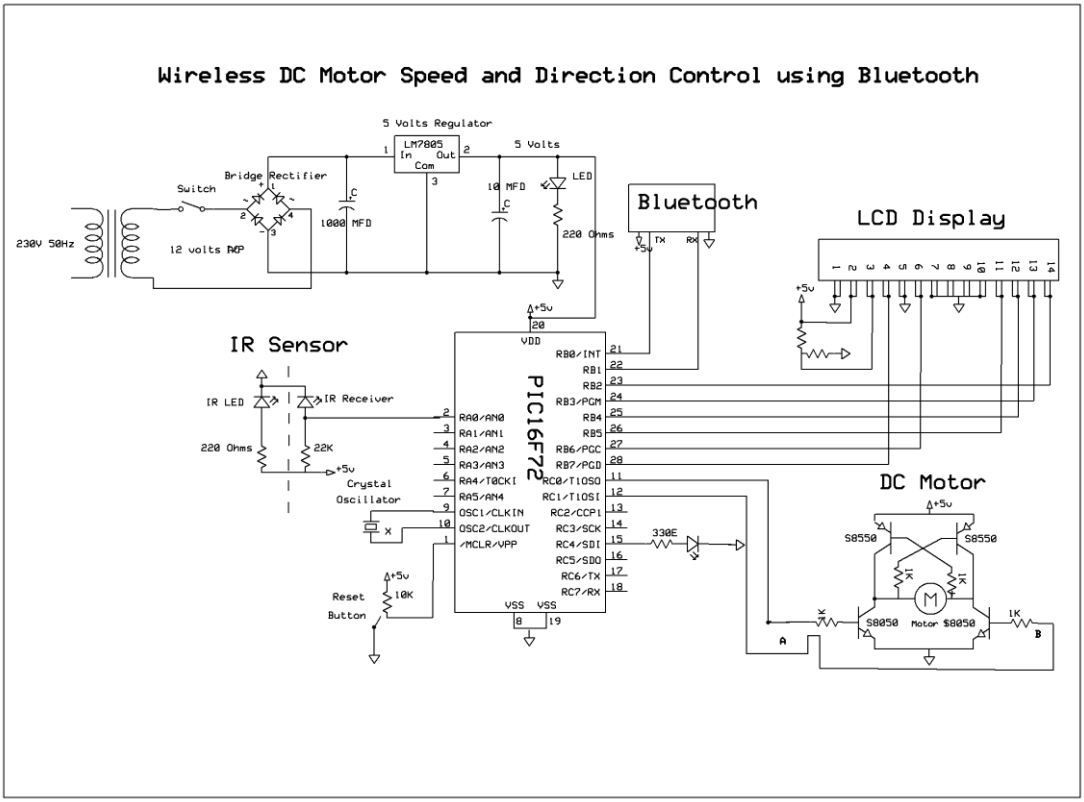

Fig: circuit diagram

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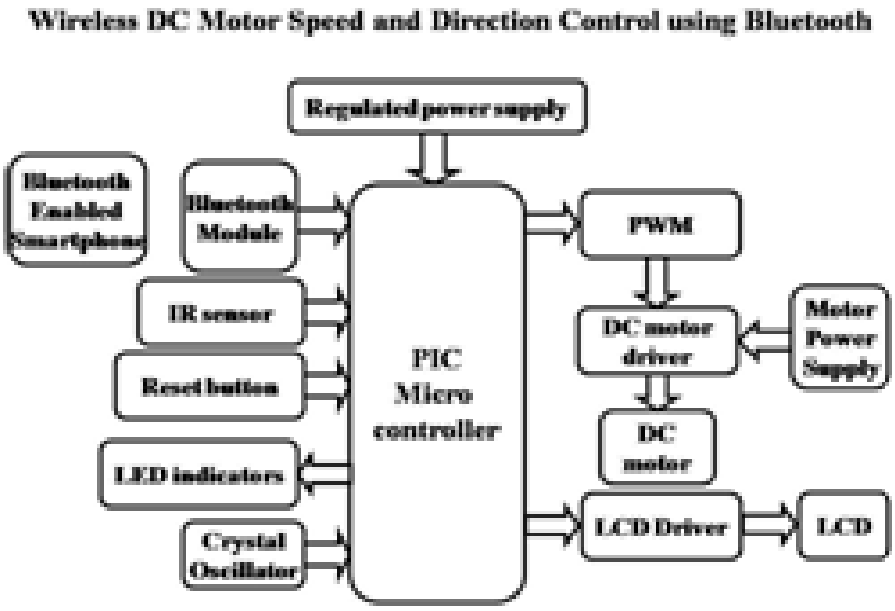

Fig: Block diagram of Wireless Dc Motor Speedand Direction Control Using Bluetooth

A schematic showing the use of Bluetooth technology to control a DC motor's speed and direction wirelessly.

A regulated power supply, a PIC microcontroller, DC actuators, an LCD display, an infrared sensor, and a Bluetooth receiver module are the main topics covered in this article.

The PIC processor is guided in its operation within this endeavor by the C programming language. Connecting to data-transfer devices is within the capabilities of this PIC microcontroller. Linking up the microcontroller with the Bluetooth module and DC motor driver. The Bluetooth module sends data to the PIC CPU whenever a Bluetooth-enabled smartphone's trigger is pressed. The PIC microprocessor uses the data to control the DC motor as needed. Task execution is made possible by the "C" program running in the processor. You can see different speed and direction readings on the LCD. A DC motor's revolutions per minute (RPM) is tracked by an infrared sensor. A pulse-width modulation signal can be used to activate a direct current motor.

Apps for Android-powered devices can be created with the help of Android Studio.

Using a pulse width modulator (PWM) is an efficient way to control the speed of a direct current (DC) motor. This task can make use of DC gadgets that demand a lot of current. Depending on the system voltage, the circuit can be easily adjusted to work with either 12 or 24 volts. A direct current motor's rotational speed and the intensity of a vehicle's back light can both be controlled by this gadget. The square wave output of a pulse width modulator (PWM) is controllable. Hence, the load continually receives a variable amount of energy, and the time average can be varied between 0% and 100%.

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4. RELATED WORK:

This section provides a brief summary of the various modules utilized in this project.

Bluetooth Module:

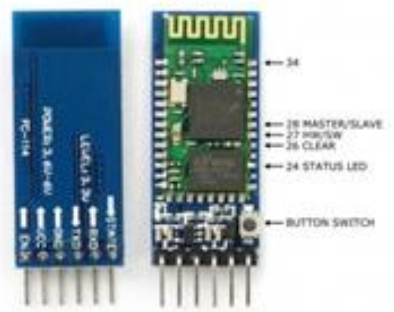

Fig: Bluetooth module

The short-range wireless communication technology known as Bluetooth allows for the interconnection of a wide range of devices, including personal digital assistants, desktop computers, and mobile phones. This section delves into the strategic choices that Motorola needs to make in order to integrate this cutting-edge technology into its offerings. With the goal of improving communication between the team in charge of Bluetooth's strategic and practical integration into Motorola's product lines and the head of the communications division at Motorola, this document aims to give a thorough understanding of Bluetooth technology. You can switch between master and slave modes using the Bluetooth HC-05 module. The default Windows configuration is called SLAVE. To change the module's status from Master to Slave, you must use AT COMMANDS. Though they can join existing Bluetooth networks, these modules can't set up a first link. Additional modules can be integrated with the core module.

Hardware Features

- Typical -80dBm sensitivity.
- Up to +4dBm RF transmit power.
- 3.3 to 5 V I/O.
- PIO (Programmable Input/Output) control.
- UART interface with programmable baudrate.
- With integrated antenna.
- With edge connector.

DC Motor:

A direct current motor uses current-conducting wires and magnetic fields to transform electrical energy into mechanical energy. The final step is the transformation of mechanical energy into electrical energy by means of a dynamo, generator, or source. Sources can include electric motors of many kinds, and electric motors themselves can function as sources. By applying voltage and electrical power to a DC motor, torque—the mechanical equivalent of a rotational force—is produced.

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Fig: DC Motor

The two main parts of a direct current motor are the armature and the field coils. The armature is responsible for rotation, while the field coils contain wire windings and stabilize the motor. The part that remains in one place is called the stator. The schematic shows a DC frame, a unique DC motor, and a rotor. The armature is shown in the picture as a series of wire rings twisted around a central core, which is connected to a shaft that, when turned, turns.

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LCD Module:

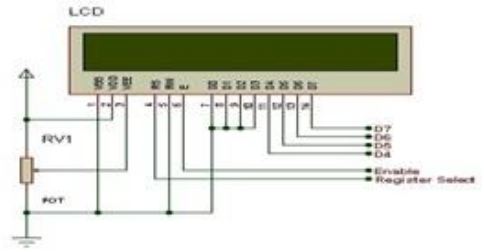

Fig: LCD

A large number of 16x2 LCDs are operated by microcontrollers. The result is sixteen characters spread out over two lines. In order to show the DC motor's rotational speed on an LCD panel, this project uses an infrared sensor in conjunction with a PIC microprocessor.

PIC micro controller:

Fig: PIC micro controller

Its synchronous serial interface can be set up as either a 2-wire Inter-Integrated Circuit (I2C) bus or a 3-wire Serial Peripheral Interface (SPI) bus. An extra two timers and five 8-bit analog-to-digital converter channels are also included. These features make it an excellent choice for complex A/D applications in the automotive, industrial, consumer, and home appliance markets. A wide variety of input/output (I/O) ports, analog-to-digital (A/D) converter and DAC modules, and support for UART, USB, CAN, and I2C are all features of

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PIC devices. We also have CPUs with 6-pin SMD, 8-pin DIP, and 144-pin connections. Writers of all skill levels love PIC devices because they are easy to find, cheap, have a large user base, a wealth of application notes, free or cheap development tools, can be programmed serially, and have reprogrammable flash memory.

Peripheral Features:-

- Salient features: Timer0, which is currently 25 mA and has a high current sink/source, is also a clock and an 8-bit prescaler.
- If you want to use an external crystal or clock source with a 16-bit timer/counter, you can customize it to work faster.
- Timer2 may do double duty as a clock and a timer by using pre- and post-scalers.
- One meaning of the term CCP is "Capture, Compare, and Pulse Width Modulation." The PWM resolution is 10 bits, the record speed is 12.5 nanoseconds, and the comparison speed is 200 nanoseconds.
- Using the SPI (Master/Slave) and I2C (Slave) protocols, synchronous serial port (SSP) brown-out reset (BOR) devices have 8 bits and 5 channels.

IR sensor:

Fig: IR sensor

Essentially, an infrared (IR) sensor module consists of an IR emitter and a receiver. An acronym for "light-emitting diode," or LED. This is the frequency range in which the light-emitting diodes (LEDs) included in this package work. Infrared light is invisible to the human eye because its wavelength is much longer than visible light's (700 nm to 1 mm). They can reach out and touch my hand, which is around 10–15 cm (4–6 in) away. In order to find out how fast the DC motor is spinning, an infrared sensor is used in this project.

5. CONCLUSION:

Every one of the metal parts was made to fit together snugly and perform as intended. The performance of the unit was enhanced by carefully selecting the design and appearance of each module. To get the job done well, modern technology and complex integrated circuits were used. We have deliberated and honed the paper's concept. The intended purpose of the article titled "Wireless DC Motor Speed and Direction Control Using Bluetooth" was to showcase the use of Bluetooth and PWM in controlling a DC motor and displaying its speed on an LCD screen. A DC motor's revolutions per minute (RPM) is tracked by an infrared sensor. A pulse width modulation (PWM) signal can turn on a DC motor.

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6. RESULTS

Fig: project output image

Using a Bluetooth module and pulse width modulation (PWM), this paper shows how to easily control the direction and speed of a DC motor over Bluetooth. On the device's LCD screen, you can also see the motor speed. A DC motor's revolutions per minute (RPM) is tracked by an infrared sensor. A pulse-width modulation signal can be used to activate a direct current motor.

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