A DYNAMIC SPEED CONTROL OF DC MOTOR USING ARDUINO

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ABSTRACT

There is a growing demand for electric drive systems in mechanical applications in order to fulfil improved performance and reliability requirements. Due to its ease of controllability, the DC motor is an attractive piece of hardware in many contemporary applications needing changing speed and load characteristics. A practical way to meet these needs is via microcontrollers. Furthermore, Android is the most widely used adaptable platform, which is highly beneficial in developing many real-time apps that are useful in our daily lives. The most crucial and significant component of every industrial organisation is the machine's speed control. The purpose of this study is to construct a microcontroller-based four-quadrant speed control system for a DC motor. The motor may be turned in four directions: anticlockwise, forward, reverse, and clockwise. It also features a speed control option. The industries that employ motors are most suited for the four quadrant functioning of DC motors, which allow them to revolve in both clockwise and anticlockwise directions and apply brakes instantly in either direction as needed. When performing a particular task in an industrial setting, the engine must be stopped right away. This suggested system is ideal in this situation since it has both a forward and a reverse brake as standard features. Applying a reverse voltage across the operating motor for a limited period of time causes an instantaneous brake in both directions. The microcontroller's PWM pulses are used to manage the motor's speed. This project uses a microcontroller from the 8051 series. To operate the motor, push buttons are available. These buttons are interfaced with the microcontroller, which receives an input signal from it and regulates the motor's speed via a motor driver integrated circuit.

I. INTRODUCTION

In both industry and everyday life, DC machines are indispensable. One of DC machines' greatest advantages is their readily adjustable properties. The purpose of this study is to construct a microcontroller-based four-quadrant speed control system for a DC motor. The motor may be turned in four directions: anticlockwise, forward, reverse, and clockwise. It also features a speed control option. The industries that employ motors are most suited for the four quadrant functioning of DC motors, which allow them to revolve in both clockwise and anticlockwise directions and apply brakes instantly in either direction as needed. When performing a particular task in an industrial setting, the engine must be stopped right away. This suggested system is ideal in this situation since it has both a forward and a reverse brake as standard features. With the aid of a microcontroller via a motor driver (L293D), the notion of four quadrant speed control—that is, clockwise movement, anticlockwise movement, instantaneous forward braking, and instantaneous reverse braking of a DC motor—has been introduced in this work.

Developing four-quadrant control for DC motors is the project's goal. Her four quadrants, or clockwise, are where the motor operates. For both forward and reverse braking, turn anticlockwise. DC motors are perfect for businesses where motors are needed on demand because of their 4-quadrant functioning, which enables them to revolve both clockwise and anticlockwise and to brake instantly in both directions. You may accomplish immediate braking in both directions by temporarily providing the operating motor with a reverse voltage. To activate the motor, a push button is supplied. It is coupled to a circuit that feeds the motor an input signal and uses a driver integrated circuit (IC) to control the motor.

II. LITERATURE SURVEY

[1] Channel capacitance and VJ SIVANAGAPPA & K.HARIBALAN's used rectifier N. Barsoum: SMS dispatching from a phone microphone for DC motor control. The desired motor speed will be sent to the GSM module via SMS via an RPM tor and DC to DC converter. IGBT

[2] Bhattacharyya and group: Bluetooth control allows for clockwise and anticlockwise BLDC speed control.

[3] Ankesh N. Nichat and colleagues: radio frequencies are used to regulate the speed and direction of DC motors. Wireless technology and science.

[4] N. Barsoum: SMS dispatching from a phone microphone for DC motor control. The necessary motor speed in RPM will be SMSed to the GSM module.

[5] Abhishek Khanna and Priya Rajan: Low-cost and environmentally friendly projects used for robotic drones, home entrances, and other things. Motor driver IC L293D interface with Arduino Uno using solar panel for 12 volt supply in connection.

III. DESIGN OF HARDWARE

This chapter provides a quick explanation of the hardware. It goes into great depth about each module's circuit diagram.

ARDUINO UNO

A microcontroller board based on the ATmega328 is called the Arduino Uno (datasheet). It has a 16 MHz ceramic resonator, 6 analogue inputs, 14 digital input/output pins (six of which may be used as PWM outputs), a USB port, a power connector, an ICSP header, and a reset button. It comes with everything required to support the microcontroller; all you need to do is power it with a battery or an AC-to-DC converter or connect it to a computer via a USB connection to get going.The FTDI USB-to-serial driver chip is not used by the Uno, setting it apart from all previous boards. As an alternative, it has the Atmega16U2 (or Atmega8U2 up to version R2) configured as a serial-to-USB converter. The 8U2 HWB line on the Uno board is pulled to ground by a resistor, which facilitates DFU mode entry. The Arduino board now includes the following updates:

• 1.0 pin out: two further new pins, the IOREF, are positioned next to the RESET pin, the SDA and SCL pins that were introduced, and they enable the shields to adjust to the voltage supplied by the board. Shields will eventually work with both the Arduino Due, which runs on 3.3V, and the boards that utilise the AVR, which runs on 5V. The second pin is unconnected and set aside for future uses.

• A more robust RESET circuit.

• The 8U2 is replaced with an ATMega 16U2.

"Uno" is an Italian word for one, and it was chosen to commemorate the impending introduction of Arduino 1.0. Going future, the Arduino reference versions will be the Uno and version 1.0. The Uno is the most recent in a line of USB Arduino boards and the platform's standard model; see the index of Arduino boards for a comparison with earlier iterations.

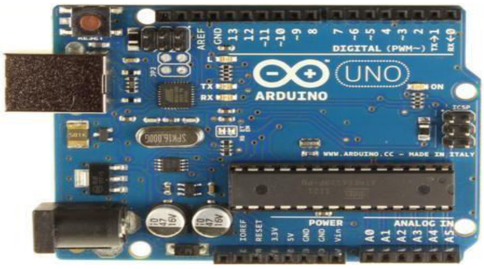


Fig: ARDUINO UNO

POWER SUPPLY:

The purpose of the power supplies is to convert the high voltage AC mains energy into a low voltage supply that is appropriate for use in electronic circuits and other devices. One may disassemble a power supply into a number of blocks, each of which carries out a specific task. "Regulated D.C. Power Supply" refers to a d.c. power supply that keeps the output voltage constant regardless of differences in the a.c. main or the load.

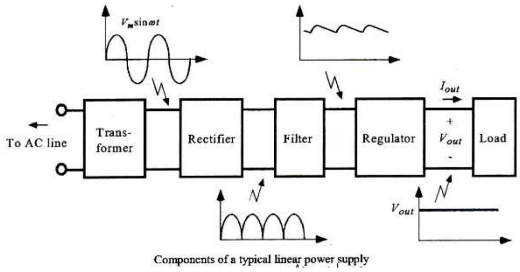


Fig: Block Diagram of Power Supply

LCD DISPLAY

The model shown here is the one that is most often utilised in practice due to its cheap cost and enormous potential. Its HD44780 microcontroller (Hitachi) platform allows it to display messages in two lines of sixteen characters each. All of the alphabets, Greek letters, punctuation, mathematical symbols, etc., are shown. Furthermore, it is possible to show custom symbols created by the user. Some important features are the automatic changing of the message on the display (shift left and right), the presence of the pointer, the lighting, etc.

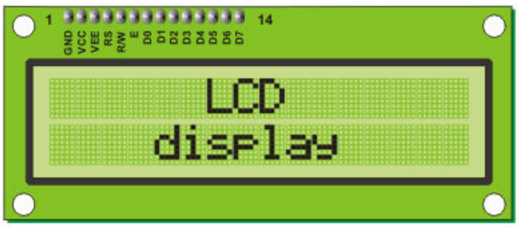
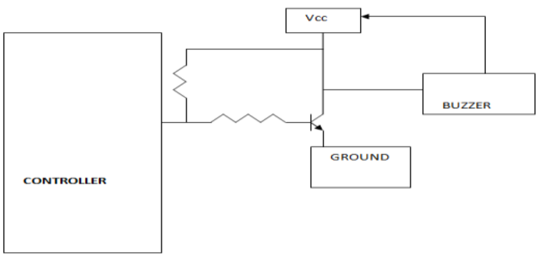


Fig: LCD

BUZZER

Relays, buzzer circuits, and other circuits cannot be driven by the current available on digital systems and microcontroller pins. The microcontroller pin can provide a maximum of 1-2 milliamps of current, even though these circuits need around 10 milliamps to work. Because of this, a driver—such as a power transistor—is positioned between the buzzer circuit and microcontroller.

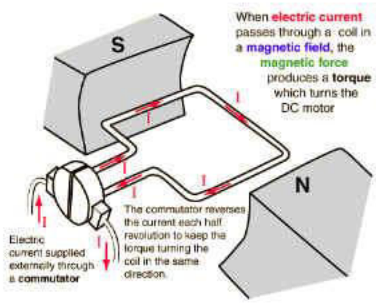


L293D:

Half-H drivers with triple high-current include the L293 and L293D. With voltages ranging from 4.5 V to 36 V, the L293 is intended to provide bidirectional driving currents of up to 1 A. Up to 600 mA of bidirectional driving current may be achieved with the L293D at voltages ranging from 4.5 V to 36 V. In positive-supply applications, these devices are intended to drive inductive loads such solenoids, relays, dc, and bipolar stepping motors, in addition to other high-current/high-voltage loads. Every input is compatible with TTL. With a pseudo-Darlington source and a Darlington transistor sink, each output is a full totem-pole driving circuit. Drivers 1 and 2 are enabled by 1,2EN, while drivers 3 and 4 are enabled by 3,4EN. Drivers are enabled in pairs. The corresponding drivers are activated and their outputs are active and in phase with their inputs when an enable input is high. These drivers are disabled and their outputs are turned off and in the high-impedance condition when the enable input is low. Each pair of drivers creates a full-H (or bridge) reversible drive appropriate for solenoid or motor applications when the right data inputs are provided.

DC MOTOR

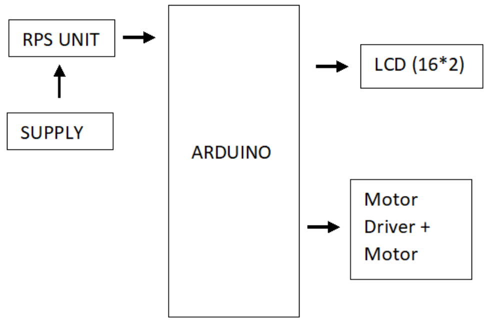
A DC motor is intended to operate with DC electricity. Michael Faraday's homopolar motor, which is rare, and the ball bearin motor, which is a recent invention, are two instances of pure DC designs. The two most popular forms of DC motors are brushed and brushless, which are not strictly speaking DC machines since they require internal and external commutation, respectively, to produce an oscillating AC current from the DC source.



PROJECT DESCRIPTION

The operation and circuitry of "A Dynamic Speed Control Of Dc Motor Using Arduino" are covered in this chapter. Its block diagram and circuit diagram make it easily understandable.

IV. BLOCK DIAGRAM:



Working:

A wifi signal will be transmitted from an Android device. With the aid of the devices' transmitter and receiver, this signal will be sent to an Arduino. The motor's speed is indicated by the single letter that will be used to address this signal. Three distinct rotational directions exist for the motor: clockwise, anticlockwise, and halting. Each of these rotational directions is denoted by a different letter. The speed in relation to the Arduino code will change as a result of this letter. Q1 and Q4 of the semiconductor will be ON for forward motion, while Q2 and Q3 will be ON for reverse motion. Q3 and Q4 are NPN semiconductors that turn on when a high signal is received, whereas Q1 and Q2 are PNP semiconductors that turn on when a low signal is received. PWM pins 5 and 6 use the concept of varying the duty cycle (PWM Technique) to regulate their speed in two different ways. Duty cycle varies between 0 and 225. Thus, speed may be adjusted by selecting different duty cycle options. Direction is managed by the concept of an H-Bridge.

V. CONCLUSION

The Android smartphone application and Bluetooth technology work together to help regulate the speed and direction of the DC motor in this manner. Consequently, distant communication is also successful.

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