# ARDUINO BASED DC MOTOR SPEED CONTROL

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***Abstract***

***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. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again. "Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. This is called a boot loader. 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. It communicates using the original STK500 protocol we can also bypass the boot loader and program the microcontroller through the ICSP (In-Circuit Serial Programming) header using Arduino ISP B. 8 channel.***

## I. INTRODUCTION

Power supply Motor speed control of DC motor is nothing new. A simplest method to control the rotation speed of a DC motor is to control its driving voltage. The higher the voltage is the higher speed the motor tries to reach.

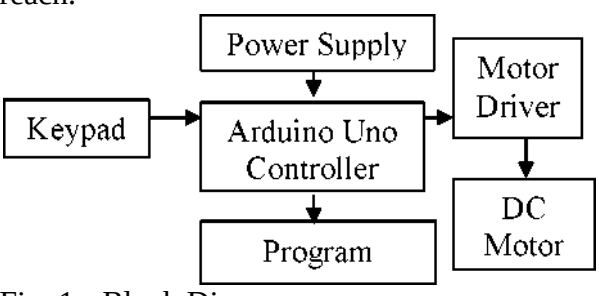


Fig: 1:- Block Diagram

In many applications simple voltage regulation would cause lots of power lesson control circuit, so a pulse width modulation method (PWM) is used in many DC motor controlling applications. In the basic Pulse Width Modulation (PWM) method, the operating power to the motors is turned on and off to modulate the current to the motor. The ratio of "on" time to "off" time is what determines the speed of the motor. In this paper I am going to introduce speed control of DC motor. The microcontroller receive decoded binary signal and perform programmed logical operation and drive H- Bridge. The H-bridge is used to drive DC motor According to microcontroller input. Our project is programmable, Using keypad we can select, motor direction, Speed and time of rotation. The special feature of our project is that we have added one extra circuit which counts RPM of DC motor.

## II. SOFTWARE USED

Keil compiler

Language: Embedded C or Assembly.

## III. HARDWARE COMPONENT

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. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again. "Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0.


Fig:2:- Arduino system

The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform; Microcontrollers are usually programmed through a programmer unless you have a piece of firmware in your

microcontroller that allows installing new firmware using an external programmer. This is called a boot loader. (HED) is a commonly used means for providing this positional feedback. In some applications brushless motors are commutated without sensors or with the use of an encoder for positional feedback. A brushless motor is often used when high reliability, long life and high speeds are required. The bearings in a brushless motor usually become the only parts to wear out. In applications where high speeds are required (usually above 30,000 RPM) a brushless motor is considered a better choice (because as motor speed increases so does the wear of the brushes on traditional motors). A brushless motor's commutation control can easily be separated and integrated into other required electronics, thereby improving the effective power-to-weight and/or power-to-volume ratio. A brushless motor package (motor and commutation controller) will usually cost more than a brush-type, yet the cost can often be made up in other advantages. For example, in applications where sophisticated control of the motor's operation is required. Brushless motors are seen nowadays in very many computer applications, they for example rotate normal PC fans, hard disks and disk drives.

Frequency energy, and hence will not perform well using high frequencies. Reasonably low frequencies are required, and then PWM techniques will work. Lower frequencies are generally better than higher frequencies, but PWM stops being effective at too low a frequency. The idea that a lower frequency PWM works better simply reflects that the "on" cycle needs to be pretty wide before the motor will draw any current (because of motor inductance). A higher PWM frequency will work fine if you hang a large capacitor across the motor or short the motor out on the "off" cycle (e.g. power/brake PWM). The reason for this is that short pulses will not allow much current to flow before being cut off. Then the current that did flow is dissipated as an inductive kick - probably as heat through the fly back diodes. The capacitor integrates the pulse and provides a longer, but lower, current flow through the motor after the driver is cut off. There is not inductive kick either, since the current flow isn't being cut off. Knowing the low pass roll-off frequency of the motor helps to determine an optimum frequency for operating PWM. Try testing your motor with a square duty cycle using a variable frequency, and then observe the drop in torque as the frequency is increased. This technique can help determine the roll off point as far as power efficiency is concerned. There are also

applications where you need PWM controlling for two directions. In those cases you usually combine PWM controlling with H Bridge. There are many ways to do this In locked anti-phase system the motor is always driven either forward or backwards, but always connected to the power. 50% duty cycle has no net current flow and the motor doesn't move. Because the motor is always being driven, it always has a low impedance across it's terminals. A side effect of this is that the motor, at 50%, not only doesn't turn, but it resists turning - it is in brake mode: low impedance (e.g. a short) is across the terminals. No capacitors are needed. The one drawback is intense inductive noise at the switching frequency.

IV D.C. MOTOR DRIVES

The H-Bridge is used for motor driver. The H-Bridge is widely used in Robotics for driving

| Pin No | 1(Control) | 2(Data-1) | 7(Data-2) |
|---|---|---|---|
| Clockwise | 1 | 1 | 0 |
| Anticlockwise | 1 | 0 | 1 |

DC motor in both clockwise and anticlockwise. As shown in the circuit diagram in H Bridge is made using IC L293D.

The L293 and L293D are quadruple high-current half-H drivers. The L293 is designed to provide bidirectional drive currents of up to 1 A at voltages from 4.5 V to 36 V. The L293D is designed to provide bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V. Both devices are designed to drive inductive loads such as relays, solenoids, dc and bipolar stepping motors, as well as other high-current/high- voltage loads in positive-supply application. Motor drive table

Power supply: The 12V DC supply for the circuit is obtained from a 12V adaptor with 500mA rating. Any other source such as a 12V lead-acid battery can also be used. This 12V DC is used for operation of the relays used in the circuit. The regulated + 5V supply for the microcontroller is derived using regulator IC 7805 (ICI). Diode D 1

protects the circuit from reverse supply connections. Capacitor Cl filters out the ripples present in the incoming DC voltage.

## V. CONCLUSION

Arduino represents the receiver side interface 8 channel relay module with 8 bit RF receiver. It is isolated from transmitter side. Figure 8 represents the DC SSR interface with DC Geared motor. Arduino Uno microcontroller board is interfaced with the RF transmitter side. Console is connected with personal computer through USB cable. DC SSR is placed between H- Bridge and DC source. It is operated by PWM signals from Arduino Uno board.

## VI. REFERENCES

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