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Motor Speed and Direction Control System using IR TV Remote

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Abstract: In this paper the design and execution of speed control of a DC motor through infrared receiver module is presented. The proposed speed control method enables the user to function an DC motor remotely. In this method any button on the remote can be used for the speed control of the DC motor. Whenever any push button switch of remote controller is pressed on the remote control, the infrared light emitting diode transmits the signal to the regulator‟s infrared sensor. Afterward, this signal was decoded by the decoder and the firing angle of ac voltage controller can be controlled. Hence the DC motor operates at the orientation speed in harmony with the action commanded by the remote controller.

Index Terms - On/Off control, Speed control, Microcontroller.

I. INTRODUCTION

Today, electronics are extensively used in home appliances such as the motor speed regulation of a washing machine, the control of a vacuum cleaner, the light dimming of a lamp and the heating in a coffee vendor machine etc. This provision increases rapidly because appliances require enhanced features, easy to build and modify as electronics based solutions become cheaper and more sophisticated. With the evolution of VLSI technology, the microcontrollers replace analog controllers and discrete solutions are available in low cost applications. The design and development of a variable-speed controllerof DC motor drives, employing CPLD device is reported in [1]. The control of induction motor drives is a quite complex task. Usually the vector control algorithm is used to control induction motor. In vector control scheme, the rotor speed and the position of the magnetic flux inside the motor during the speed control process are required [2]. The measuring, modelling, and decoupling of saturation-induced saliencies in carrier signal injection based sensor less control is reported in [3]. AC drive system in conveyor applications can be very challenging. This scheme is suitable for a medium voltage AC drive system where electrical power can besupplied through a common AC Bus [4]. Stator flux estimation may be used to control the electromagnetic torque of the induction motor during soft starting. The inherent problems related to pure integration of the back electromagnetic force. To estimate the stator flux are minimized using the low pass filter [5]. A speed-estimation method may be used for controlling the induction-motor drive and it operates based on a special current-control scheme called integral sliding-mode current control. Classic current control for the induction motor drive is done by regulating the d-q synchronous reference frame currents using PI controllers with or without a decoupling compensator[6]. In this paper, the design and development of speed control of a single phase induction motor through infrared receiver module is presented. The proposed method enables the user to operate an induction motor remotely.

II. METHODOLOGY

In the shown in block diagram of circuit component are connected in a such way to get a desired output. The main aim of project is to build a versatile device that can control the DC motor by using communication. The RF modules used in the circuits STT-433 MHz transmitter along with an RF encoder HT12E STR-433 MHz receiver along with an RF decoder HT12D.

The aim of project is designed in such a way that three switches will be interfaced to the controller is controlled the speed of the motor. These three switches are performed a task to increase and decrease the speed of motor and to stop the motor. The RF transmitter is a also interfaced with the controller. Through and RF encoder to encode the data received by the controller. Hence encoded data will be transmitted by the transmitter over the wireless medium and will be received by RF receiver. The RF decoder is used to decode received data in to four bit digital data with has send to the microcontroller.

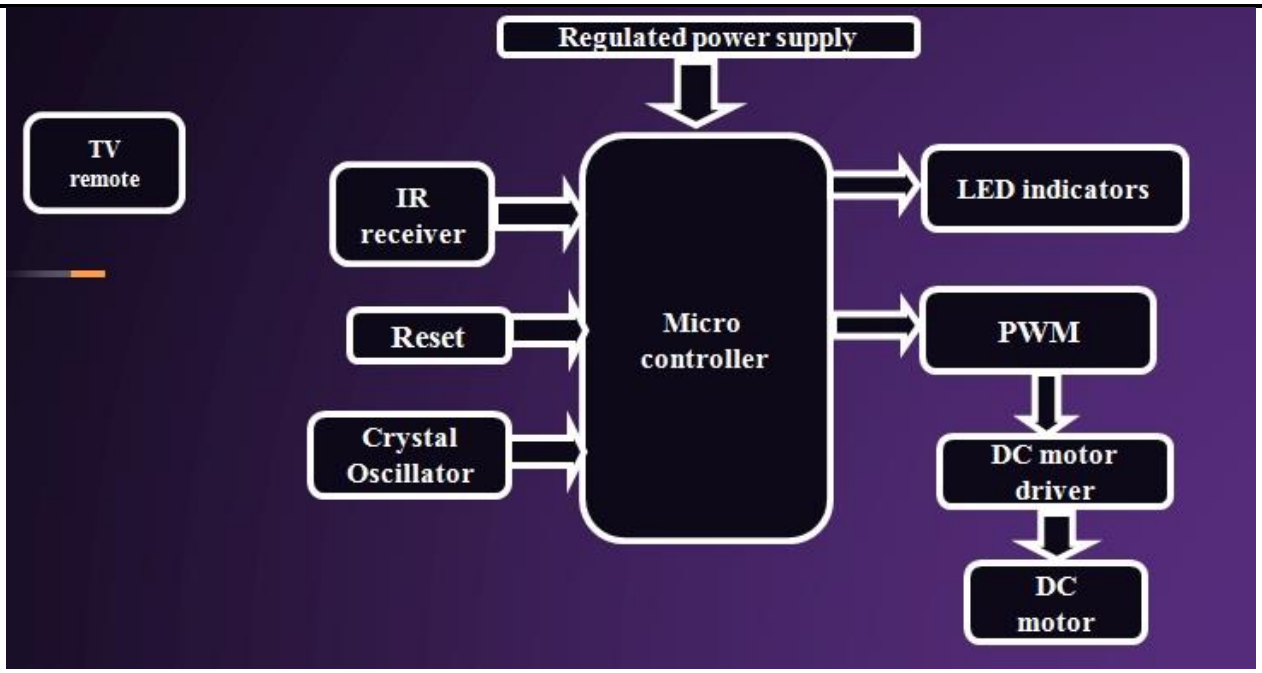


Fig: Block Diagram of DC Motor Speed control Scheme

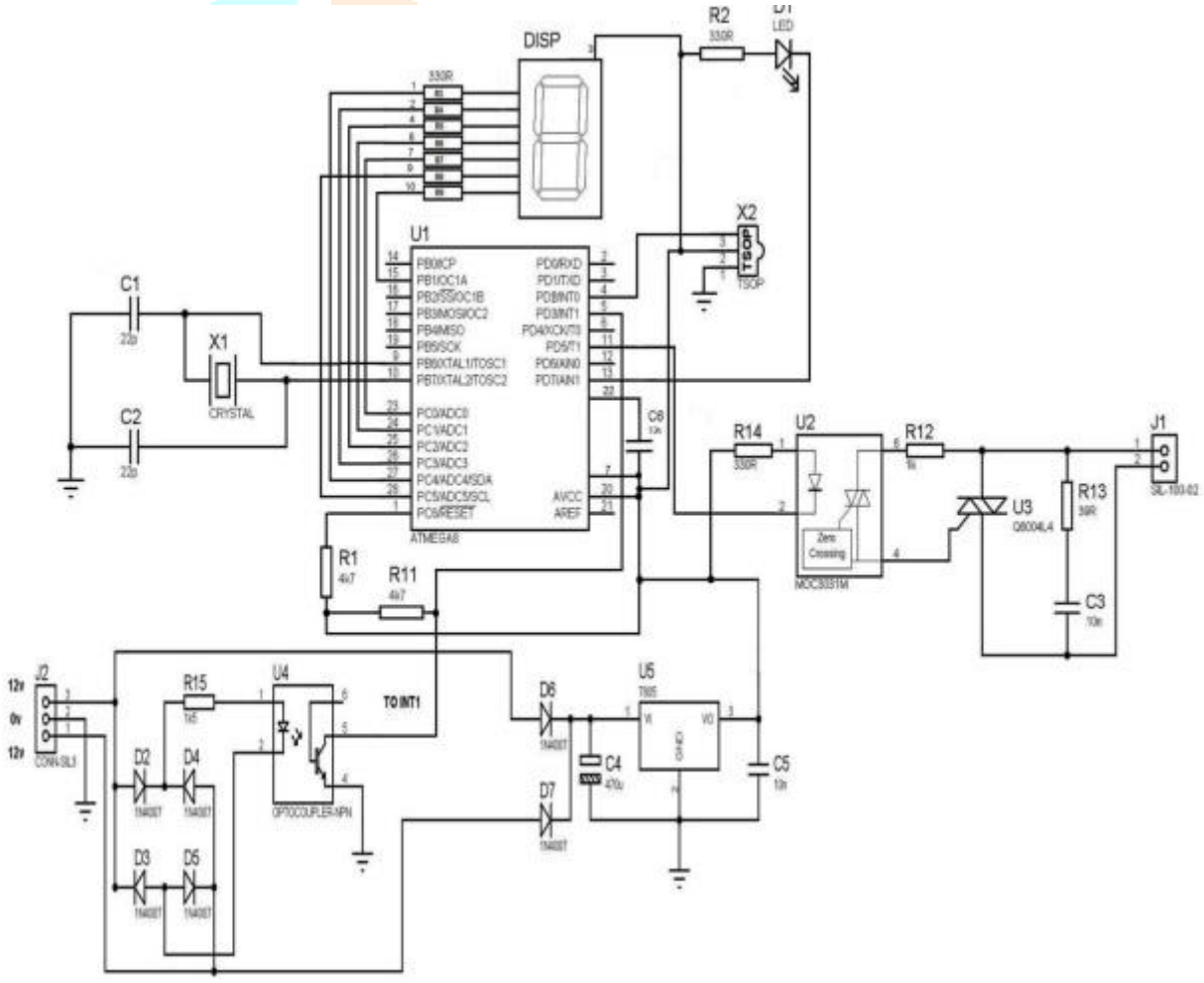


Fig: Transmitter and Receiver Signal Block Diagram with Microcontroller

III. COMPONENTS

A. DC motor

A DC motor is an electric motor that runs on direct current (DC) electricity. In any electric motor, operation is based on simple electromagnetism. Every DC motor has six basic parts -- axle, rotor, stator, commentator, field magnet(s), and brushes.

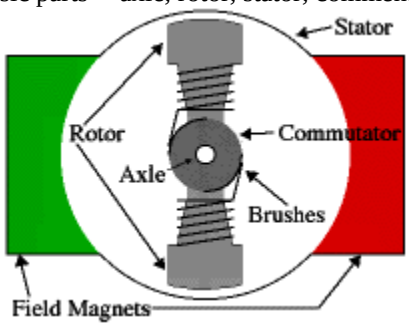
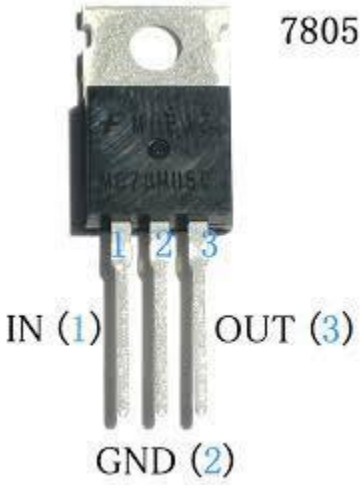


Fig: DC Motor

B. Voltage regulator

A voltage regulator is designed to automatically maintain a constant voltage level. A voltage regulator may be a simple "feed-forward" design or may include negative feedback control loops. It may use an electromechanical mechanism, or electronic components. Depending on the design, it may be used to regulate one or more AC or DC voltages. Electronic voltage regulators are found in devices such as computer power supplies where they stabilize the DC voltages used by the processor and other elements. In automobile alternators and central power station generator plants, voltage regulators control the output of the plant. In an electric power distribution system, voltage regulators may be installed at a substation or along distribution lines so that all customers receive steady voltage independent of how much power is drawn from the line.



C. REMOTE CONTROL

IR remote control is a device you can find everywhere where you can find TV, VCR or home theatre. As we know remote control devices uses IR light. This is invisible light about 950nm wavelength. One biggest problem in using IR light is that there many other sources of it like sun, light bulbs, fire. In order to exclude other sources, IR signal is modulated by some frequency. Receiver has to be tuned for this frequency. Mostly remote controls transmit IR signal using 38kHz frequency signals. Transmitting and coding is one part which can be done more easily than receiving and decoding. Decoding is usually performed by using microcontrollers This receiver simply removes 38 KHz carrier signal and gives clean pulses that are used for device control.

D. RF TRANSMITTER AND RECEIVER

i) RF modules are divide in to two groups,RF transmitter will transmitted data which encode by encoder.
ii) RF receiver will receive data in to 4 bit digital data which has send to the microcontroller.
iii) 433MHz transmitter and receiver is used for the remote control.

IV. METHODOLOGY

This project demonstrates a technology to turn a dc motor in mutually clockwise and counterclockwise direction. It also has the condition to control the motor's direction using a TV remote. When a TV remote key is pressed, it transmits an infrared sign al in RC5 code which is received by an infrared receiver called TSOP-1738. The microcontroller gets the IR signal from the remote, the code which is recognized by the receiver to function a set of the relays.

The relays activate the appropriate relay to control a dc motor to get preferred direction by exchanging the leading supply terminals from the major winding to the secondary winding. The TSOP output is fed to an ARDUINO microcontroller which is interfaced to a relay driver IC. After that, the relay switching is done by steady mode for a dc motor to rotate in forward and reverse directions.

This proposed system demonstrates a technology to rotate a dc or ac motors such as squirrel cage induction motors etc. In both clockwise and counterclockwise direction.

Here is the block diagram of bidirectional rotation of an induction motor with a remote control device with all their essential components.

The working of this bidirectional rotation of a DC motor with a remote control device is very simple. For controlling the direction of rotation of any type DC motor or ac induction motor such as exhaust fan or any motor, this device is connected in series with main supply of that specific circuit.This device mostly consists of electronic components which are operated at 5 or 6v dc. For making 5or 6V dc, main supply is stepped down to 12v ac with the help of single phase transformer then these voltages are converted into dc with the help of bridge rectifier. After that, these voltages are regulated into 5V dc with the help of voltage regulator.

From these regulated voltages the Arduino microcontroller and IR sensors are powered up. Microcontroller is the main controller of this device. It is programmed in c language with the help of Arduino IDE software.IR sensor are basically the infrared sensors which can be operate with any type of TV remote. When TV remote switch is pressed then IR sensors are switched on. When these are switched on, then these give the logic high signal to Arduino microcontroller. Then microcontroller efficiently controls the direction of rotation of DC motor. DC motor is directly cannot powered up with 230V ac, So we are using a bridge rectifier and a voltage regulator to get required dc voltage. In this bidirectional rotation of a Dc motor control device, we have configured the remote switch no.1 for forward direction of rotation of motor, switch no.2 for stop and switch no.3 for reverse direction of rotation of DC motor. This was done only for make the convenient for user interface. Two relays have been used for making the polarities of supply to change the motor rotating direction. These relays are derived through relay driver IC.

Further it can extend to ac motors which have wide range of applications.

Applications and Advantages of Bidirectional Rotation of a Motor with a Remote Control Device

i) By using this bidirectional rotation of a motor with a remote control device the user can easily rotate the series motor in either direction.

ii) This bidirectional rotation of an induction motor device could be easily used with domestic and industrial exhaust fans for fresh air in and hot air throw out.

iii) By using bidirectional rotation of an induction motor device, the user can easily on or off the split phase inducing motor with some distance without wasting any time.

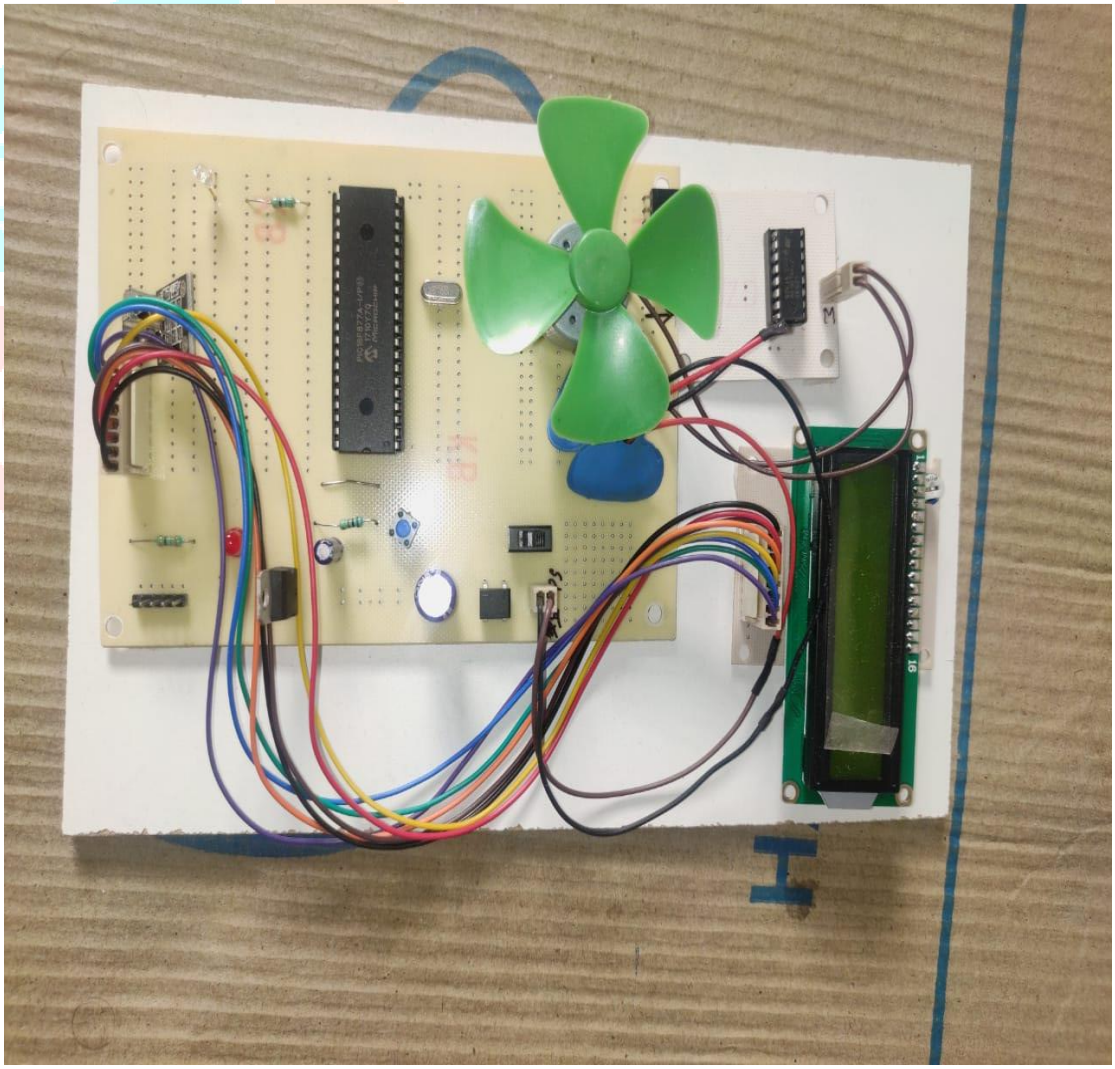


Fig: Working Model of Proposed work

Conclusion :

It is observed that when supply is switched on, the motor starts rotating in clockwise direction, and on pressing the push button present on the TV remote enables the motor to rotate in anti-clockwise direction. Using the microcontroller program enables the motor to rotate in both directions (clockwise and anticlockwise direction). It is simpler compared to other methods of rotating motors, flexible in design, lighter in weight and suitable for low power applications. In future this idea can be implemented by using ac motors to control the rotation motor in both directions.

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