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DC Motor Speed Control Using LDR Sensor and Atmega89s52

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Abstract: ***In robotic applications DC Motor control is very common. Other than it there are many applications that have been developed based on motor control in electronic field such as in automation, Flexible Manufacturing System (FMS) and Computer Integrated Manufacturing (CIM). The purpose of this project is to control the speed of DC motor depending on the light intensity falling on an LDR using microcontroller.***

Keywords: ***DC motor, LDR, Microcontroller, ATMEGA 89S52.***

1. INTRODUCTION

The field of electrical energy will be divided into three areas: Electronics, Power and Control. Electronics basically deals with the study of semiconductor devices and circuits at lower power. Power involves generation, transmission and distribution of electrical energy. The electric motors are perhaps the most widely used energy converters in the modern machine tools and robots. These motors require automatic control of their main parameters such as speed, position, acceleration etc [1]. In this paper to control the speed of DC motor, separately excited DC drive system is used, since their simplicity, ease of applications such as reliability and favorable cost have long been a backbone of industrial applications and it will have a long tradition of use as adjustable speed machines and a wide range of options have evolved for this purpose. In these applications, the motor should be precisely controlled to give the desired performance [2].

A light-dependent resistor (LDR) whose resistance is inversely proportional to the intensity of light is often used as a sensor in electronic projects that makes the use of light. In this project the speed of DC motor is controlled depending on the light intensity falling on an LDR.Here; we are controlling speed of DC motor using LDR arrangement system with the help of microcontroller. Basically when the light falling on LDR varies it's resistance also varies. This variation in resistance acts as input to the microcontroller which in turns provides variation in speed of DC motor as per the variation in light intensity.

PROJECT OBJECTIVES

The objectives of this project are as follows:

- To design a microcontroller based controller that can be used on to control speed of the DC motor.
- To design a speed control system which may be used where we need actuation with respect to different intensities of light.
- This circuit could be very useful in applications where one tries to control the movement of a robot using a wired/wireless channel, keeping different arrangements of LDR and transmitting the same through the channel to the receiving side, where the movement of the robot can be controlled.

2. THE MICROCONTROLLER

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry standard 80C51 instruction set and pin out. The on-chip flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with in-system programmable flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications. The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM con-tents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset [5].

Pin Configurations

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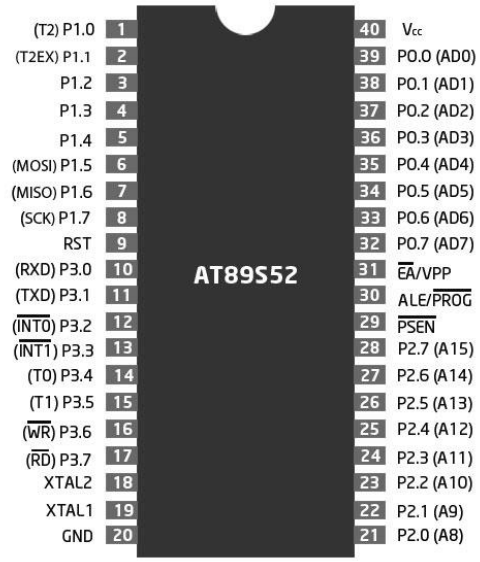

Fig. 1.1 Pin Diagram

Table 1.1 Pin description for Atmel AT89S52 microcontroller

Pin Number	Description
1 – 8	P1.0 - P1.7 - Port 1
9	RST – Reset
10 – 17	P3.0 - P3.7 - Port 3
18	XTAL2 – Crystal
19	XTAL1 – Crystal
20	GND – Ground
21 – 28	P2.0 - P2.7 - Port 2
29	PSEN - Program Store Enable
30	ALE - Address Latch Enable
31	EA - External Access Enable
32 – 39	P0.7 - P0.1 - Port 0
40	Vcc - Positive Power Supply

3. LDR

LDR (Light dependent resistor), as its name suggests, offers resistance in response to the ambient light. The resistance decreases as the intensity of incident light increases, and vice versa. In the absence of light, LDR exhibits a resistance of the order of mega-ohms which decreases to few hundred ohms in the presence of light. It can act as a sensor, since a varying voltage drop can be obtained in accordance with the varying light. It is made up of cadmium sulphide (CdS).
An LDR has a zigzag cadmium sulphide track. It is conducts in both directions in same fashion.

Fig. 1.2 An LDR[3]

4. DC Motor

The electric motor is a motor that convert electrical energy into mechanical energy. There are two types of motor which are AC motor, and DC motor. A simple DC motor use electricity and magnetic field for producing torque which rotate the motor. Permanent magnet DC motor (PMDC) outperforms to AC motor because it provides better speed control on high torque loads and use in wide industrial application. DC motors are more usable as it designed to use with batteries and solar cells energy sources, which provide portability where we required it and thus provide cost effective solution, because it is not possible to have AC power supply in every place, DC motor show its response at both voltage and current. The applied voltage describes the speed of motor while current in the armature windings shows the torque. If applied load increased in the shaft of motor, then in order to sustain its speed motor draws more current from supply and if supply is not able to provide enough current then motor speed will be affected. Generally, it can be said that applied voltage affect speed while torque is controlled by current. DC motors provide more effective results if chopping circuit is used. Low power DC motor usually use in lifting and transportation purposes as low power AC motors do not have good torque capability. DC motor used in railway engines, electric cars, elevators, robotic applications, car windows and wide verify of small appliances and complex industrial mixing process where torque cannot be compromised. There are several types of DC motor but most common are brushed DC motor, brushless DC motor, stepper motor, and servo motor. These DC motors have three winding techniques such as shunt DC motor, series DC motor, and compound DC motor.

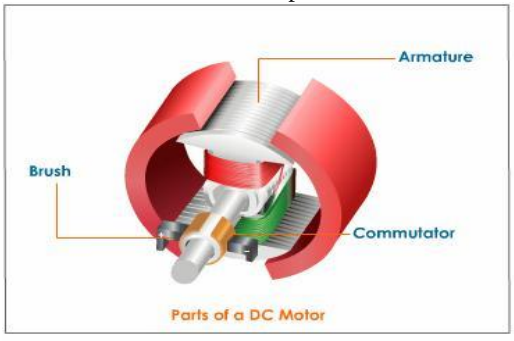

Fig. 1.3 Basic DC electrical motor parts[4]

5. EXPERIMENTAL RESULTS

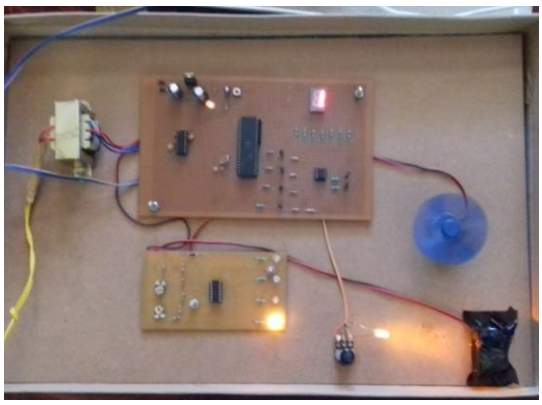

Fig 1.3 Pictorial view of the hardware

Presently the project is designed for the following modes and speed of DC motor :

Table 1.1

Display on 7 segment	Speed of DC motor	Approx. Speed in RPM
1	Low	350
2	Medium	700
3	High	900
4	Very high	1500

6. CONCLUSION

Controlling speed of DC motor as per variations in light can be very useful in various applications.An interesting application can be control of DC motor speed from remote place without using any wires.A LASER and LDR may be used for this purpose.Low frequency pulses may be transmitted from the transmitter to the receiver using LASER diode.On the receiver side,an LDR may receive these pulses and provide input to the microcontroller which in turn controls the speed of DC motor.

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