Microcontroller- 89C52 Based Auto Speed Controlled Robotic Vehicle

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ABSTRACT—
Motor speed controllers using dc motor can be useful in robotic and industrial automation systems. **The microcontroller used here changes motors speed using the pulse-width modulation (PWM) technique**. The basic objective of this project is to control speed of dc motor. In DC motor relation between Speed and Torque can be varied in many useful forms. Motor speed controller is used to examine the input signal which helps in manipulating the speed of the motor using pulses. Generation of pulses is done using AT89c51 microcontroller.For any load condition speed of the must remain constant. Using this method we can run higher rating motors easily. High feasibility is the main advantage of this system **Speed control of a DC motor becomes highly reliable,accurate and efficient using this method.**

Key Words— DC motor, Speed control, Microcontroller, PWM

I. INTRODUCTION
Speed of DC motor can be controlled using electrical and mechanical technique. The primary purpose is designing and implementing process of both software and hardware of a microcontroller based controlling of direct current motor and learn about various overload condition that occur during the process.

DC MOTOR
DC motor is a device that runs on DC power supply and is used convert electrical energy into mechanical energy. These are preferred over AC motors because of the following reasons:
• DC motors have higher efficiency (98%) than AC motors.
• These motors have higher overload and peak voltage characteristics
• Relationship of speed and torque in DC motor can be changed tomany useful forms.

PWM
Pulse width modulation is a technique used for binary signals generation, which has 2 signals (high and low). Width of every pulse is varied between 0 and period t. So, we can vary the speed by changing the duty cycle .The conduction time for the load is controlled. Let t1 be the input voltage that appears across the load i.e. ON state and t2 is time for which voltage across the load is zero.

• The average voltage at output can be written as$V_a = 1/T \int v_o \, dt = t_1/T \, Vs = ft_1 \, Vs = kVs$

• The average load current $I_a = V_a/R = kV_s/R$ where, T is the total time period =t1+t2, k = t1/T is the duty cycle.

MICROCONTOLLER
A microcontroller is a small microcomputer integrated on small chip with a processor core, memory, and programmable input/output ports. We use AT89C52 microcontroller here. The AT89C52 is a CMOS 8-bit microcomputer with 8K bytes of Flash PEROM. It consumes low power and has high performance characteristics.

Advantages of Microcontroller

Microcontrollers are used for the following reasons:

- **Design and Simulation** –Detailed simulations can be performed before actual testing to assure correctness of code and check system performance.
- **Flexibility**It's a very flexible system it can be reprogrammed any time using flash drives which makes it easier to use.
- **Cost** –As the system is highly flexible the cost of designing the microcontrollers are generally very low. Because various devices are required on a single IC, the other important aspect of microcontroller is the board area and component saving.
- **Easy to Use** –Today microcontroller use c compilers which make them easier to write and understand
- **High Integration** –Due to their small size they can be integrated on a single chip. This creates eve wider scope for these microcontrollers
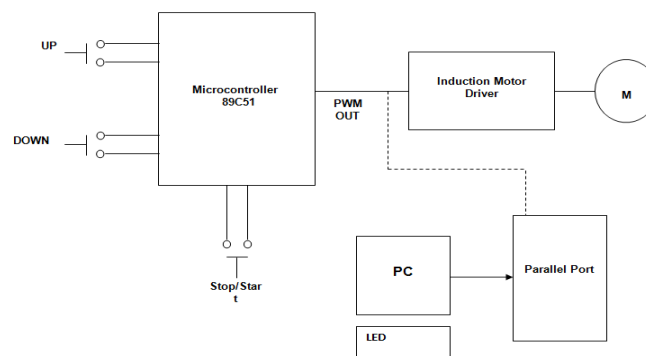
II. BLOCKDIAGRAM

Fig.1 Block diagram of project

Several methods can be used for controlling the speed of induction motors. First, method is to add series resistance using a rheostat. Due to considerable power consumption by the rheostat, this method is not economical. Second method is to use a series switch that can be closed/opened rapidly. This type of control is called chopper control. A PWM based chopper circuit can smoothly controls the speed of general-purpose induction motors. The PWM output from microcontroller moves to driver circuit Controlled by traic triggering unit.
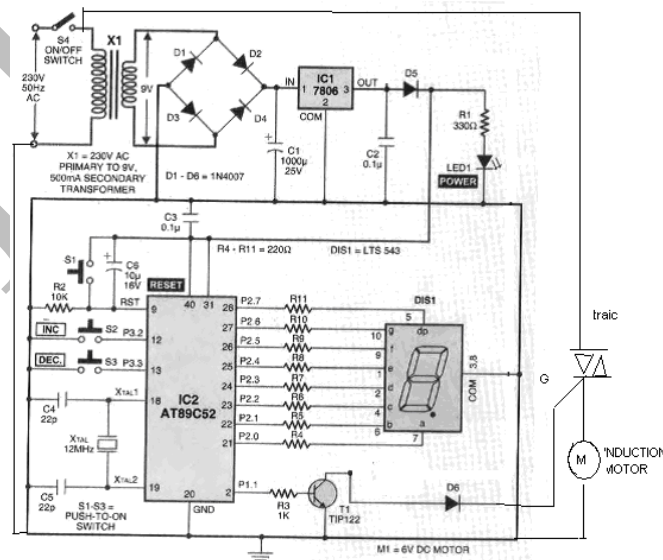

Fig.2 Circuit diagram of the project

Transformer of 230v is stepped down to the output of 9v, 500MA .rectification is done using full wave diode rectifier, and capacitors are used for filtering. Voltage is regulated by IC7806 (IC1). Second Capacitor skips any ripple found in the regulated o/p. LED1 indicates the power in the system.

Resistor controls the current moving through LED. Diode is used to create voltage drop of 0.6v changes the final output to 5.4V approximately.

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- IC AT89C52 (IC2) is, 8-biti microcontroller with a low-power and high-performance characteristics and8 KB of Flash programmable and erasable read-only memory (PEROM).It supports two software power-saving modes. The idle mode stops the CPU while allows other interrupt systems to continue functioning. The power-down mode continues functioning of RAM but stops the oscillator. Microcontroller AT89C52 (IC2), generates (with the help of timer) pulses of changing width for pulse-width modulation and controls the motor speed.
- If one of switches are pressed, a signal is created, which effectspulse pattern of the PWM pulse. Switch S2 when interfaced to Interrupt-0 increases the duty cycle, when switch is interfaced with Interrupt-1 decreases the duty cycle of the pulse waveform. For manual reset we use switch 1.
- We use a 8-bit, bi-directional, input/output (I/O) port which has internal pull-ups. Port-2 output buffers can sink/source four TTL inputs. The output of the pulse train is displayed on a 7-segment display named (DIS1).
- One-tenthvalue of pulse is displayed on the display As it is only a 'single-digit display system' numbers such as '10' is displayed as'0'.The program in c language is written such that the pulses only increase or decrease in fixed intervals of '10'since it can only represent values from 0-9 .
- Port pin P1.1 is internally pulled up the main function of this port pin controlling the motor's speed with driver transistor. Whenever timer-0 exceeds a predefined value, value of port-pin changes width of the square wave causing changes in the pulse train and saturation current starts flowing in the transistor.
- Power transistor is used with heat sink

III. WORKINGPRINCIPLE

When the motor is started it takes some time to reach its full speed. As the power is given to the DC motor it starts increasing speed and if power supply is switched off before it touches the maximum achievable speed, its speed decreases. If this speed is done in quick succession, the motor rotates at a slower speed between zero and full rated speed. This is the working principle of PWM technique based controller .It controls the motor according to the signals from pulse train. For controlling the motor's speed, it varies the pulse's width. When the motor is kept 'on' for a limited duration and 'off' for a large duration, it will rotate at low speed. Whereas, when the motor is 'on' for most of the time and 'off' only for a limited while, it will rotate at relatively higher speed. Measurement of signal representing the required speed and controlling of motor at that speed is done using microcontroller.
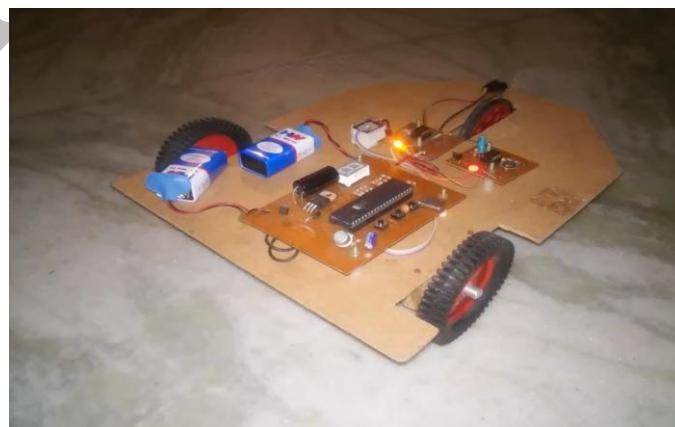
IV. RESULT

Fig: Final status of our project

V. FUTURE SCOPE

There are a number of topics for future work and development related with the simulation model. These may include

This circuit can also be used for any robotic application such as automated helicopters' or aircrafts' where directional control is needed with speed control

It is practical, highly feasible and highly economical,

It also known for reliability and accuracy. It is programmable therefore it can control various motors.

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