North South University

Department of Electrical & Computer Engineering

PROJECT REPORT

Course Code: CSE 331

Course Name: Microprocessor Interfacing And Embedded System

Project Name: Automatic Traffic Light Controller Using 8051 Microcontroller

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Section: 5

Group Num: 4

Group Member

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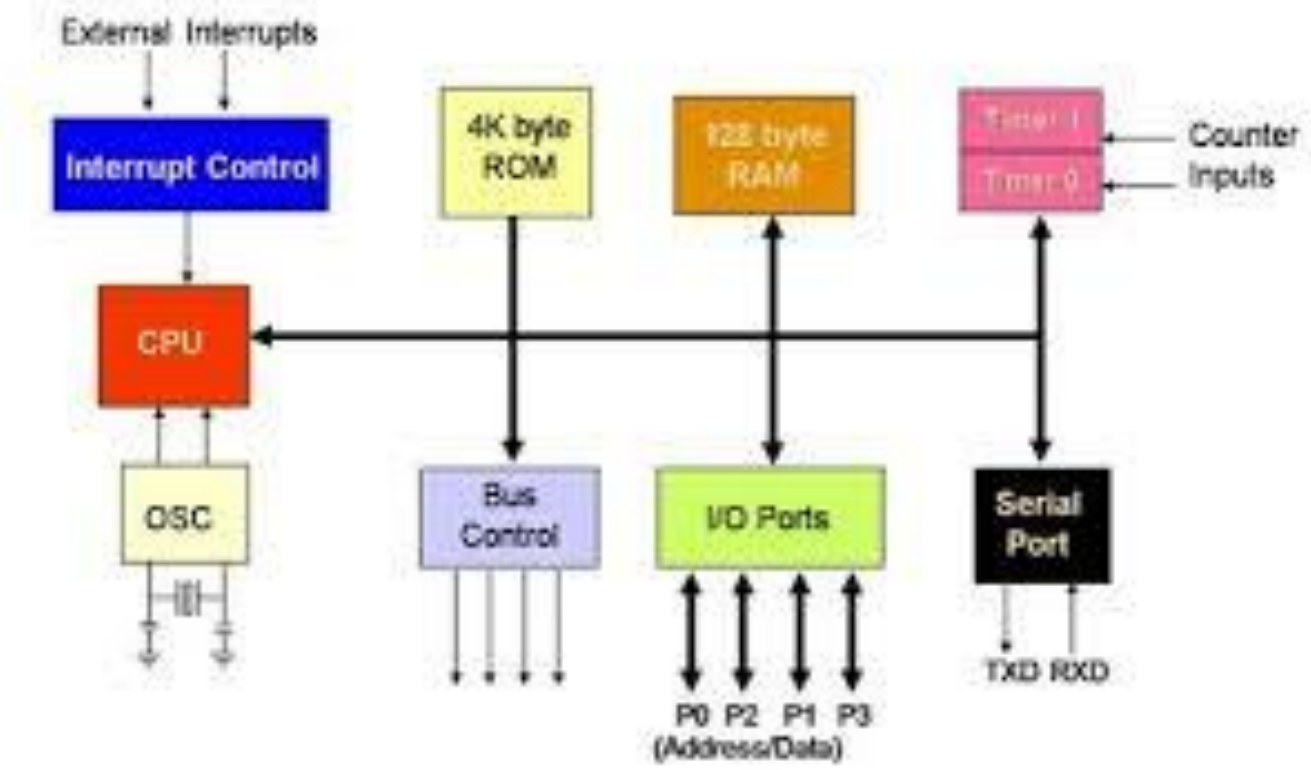
Introduction:

Traffic Light system was one of the fascinating applications of Embeded systems and have been using the same till this day. This is the four way traffic light system using embedded systems which was bit complex in nature as we need to consider the traffic flow in four different directions providing appropriate timings to each of the lights. This systems uses 8051 microcontroller (AT89C52) and Led's for indication. The Led's which was used as lights was connected to the Microcontroller by means of common Anode configuration.

The name itself specifies its meaning by splitting the word micro-controller into two MICRO is derived from a Greek word Micros which means small (in size, quantity, number and dignity) and Controller is the logic circuitry that does the control action based on the program written. A single chip that contains the processor (the CPU), non-volatile memory for the program (ROM or flash), volatile memory for input and output (RAM), a clock and an I/O control unit that is being used to operate or to control a machine using fixed program that is stored in non volatile memory is known as a Microcontroller. Also called a "computer on a chip," or on chip microcomputer

8051 Microcontroller It is Very popular general purpose microcontroller. Widely used for small scale embedded systems. It was introduced by Intel in 1971.At that time it was known as System on Chip. This family is known as MCS 51 family. Other members are 8031 and 8052. 8031 is the cut down version of 8051 and 8052 is the enhanced version of 8051. Many vendors such as Atmel, Philips, and Texas Instruments produce MCS-51 family microcontroller chips. 8-bit microcontroller. It has 8 bit data bus and 16-bit address bus. It can address a 64K(216) byte code memory space and a separate 64K byte of data memory space. It has various Special Function Registers (SFR) such as the Accumulator, the B register, and many other control registers. 34 8-bit general purpose registers in total. The ALU performs one 8-bit operation at a time. It has 4 kB of ROM memory for storing the program code and128 bytes of internal RAM for variablesIt has16 bit timers , 32 I/O lines and 6 interrupt sources . The 8051 has 256 bytes of internal addressable RAM, although only first 128 bytes are available for general use by the programmer. The first 128 bytes of RAM (from 0x00 to 0x7F) are called the direct memory, and can be used to store data. The lowest 32 bytes of RAM are reserved for 4 general register banks. The 8051 has 4 selectable banks of 8 addressable 8-bit registers, R0 to R7. This means that there are essentially 32 available general purpose registers, although only 8 (one bank) can be directly accessed at a time. The advantage of using these register banks is time saving on the context switch for interrupted program to store and recover the status. Otherwise the push and pop stack operations are needed to save the current state and to recover it after the interrupt is over. The default bank is bank 0.The second 128 bytes are used to store Special Function

Registers (SFR) that C51 program can configure and control the ports, timer, interrupts, serial communication, and other tasks.

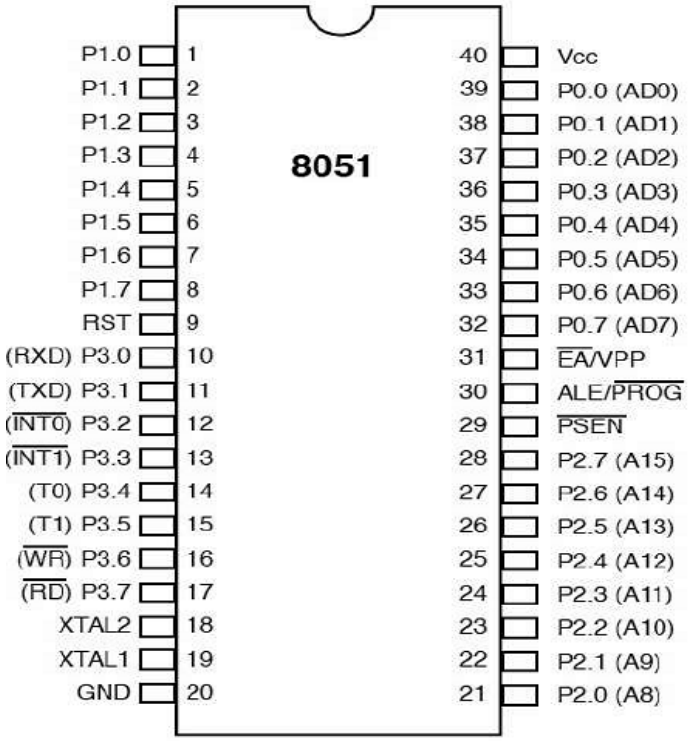


Architecture Of 8051 Microcontroller

Vcc(pin 40)- Vcc provides supply voltage to the chip. The voltage source is +5V. GND(pin 20):Ground XTAL1 and XTAL2(pins 19,18):These 2 pins provide external clock. EA(pin 31):The EA (External Access) pin is used to control the internal or external memory access. The signal 0 is for external memory access and signal 1 for internal memory access.

- There is no on-chip ROM in 8031 and 8032 .
- The EA pin is connected to GND to indicate the code is stored externally.

P SEN (pin 29):Program store enable This is an output pin and is connected to the OE pin of the ROM. The P SEN (Program Store Enable) is for reading external code memory when it is low (0) and EA is also 0. The ALE (Address Latch Enable)



Pin Configuration of 8051 Microcontroller

activates the port 0 joined with port 2 to provide 16 bit external address bus to access the external memory. The ALE multiplexes the P0: 1 for latching address on P0 as A0-A7 in the 16 bit address buss, 0 for latching P0 as data I/O.

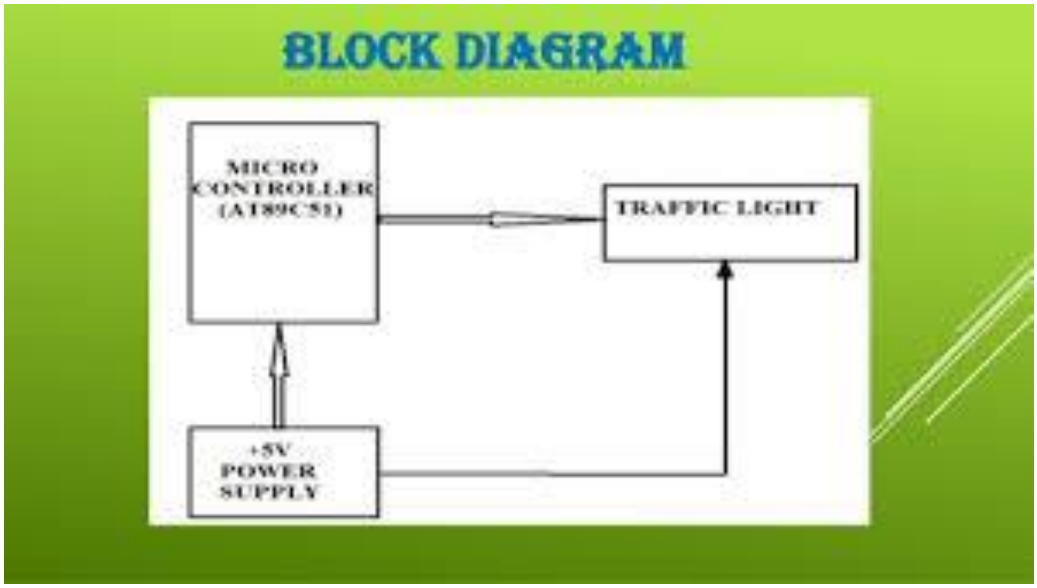
• P SEN and ALE are used for external ROM

For 8051, EA pin is connected to Vcc RST(pin 9):Reset It is an input pin and is active high normally low. The high pulse must be high at least 2 machine cycles. 4 I/O port take 32 pins(4 x 8 bits) plus a pair of XTALS pins for crystal clock . A pair of timer pins for timing controls, a group of pins EA, ALE, P SEN, W R, RDfor internal and external data and code memory access controls . The 8051 requires an external oscillator circuit. The oscillator circuit usually runs around 12MHz. The crystal generates 12M pulses in one second. The pulse is used to synchronize the system operation in a controlled pace. An 8051 machine cycle consistsof 12 crystal pulses (clock cycle). The first 6 crystal pulses (clock cycle) is used to fetch the opcode and the second 6 pulses are used to perform the operation on the operands in the ALU [11]. Port P1 (Pins 1 to 8): The port P1 is a port dedicated for general I/O purpose. The other ports P0, P2 and P3 have dual roles in addition to their basic I/O function. Port P0 (pins 32 to 39): When the external memory access is required then Port P0 is multiplexed for address bus and data bus that can be used to

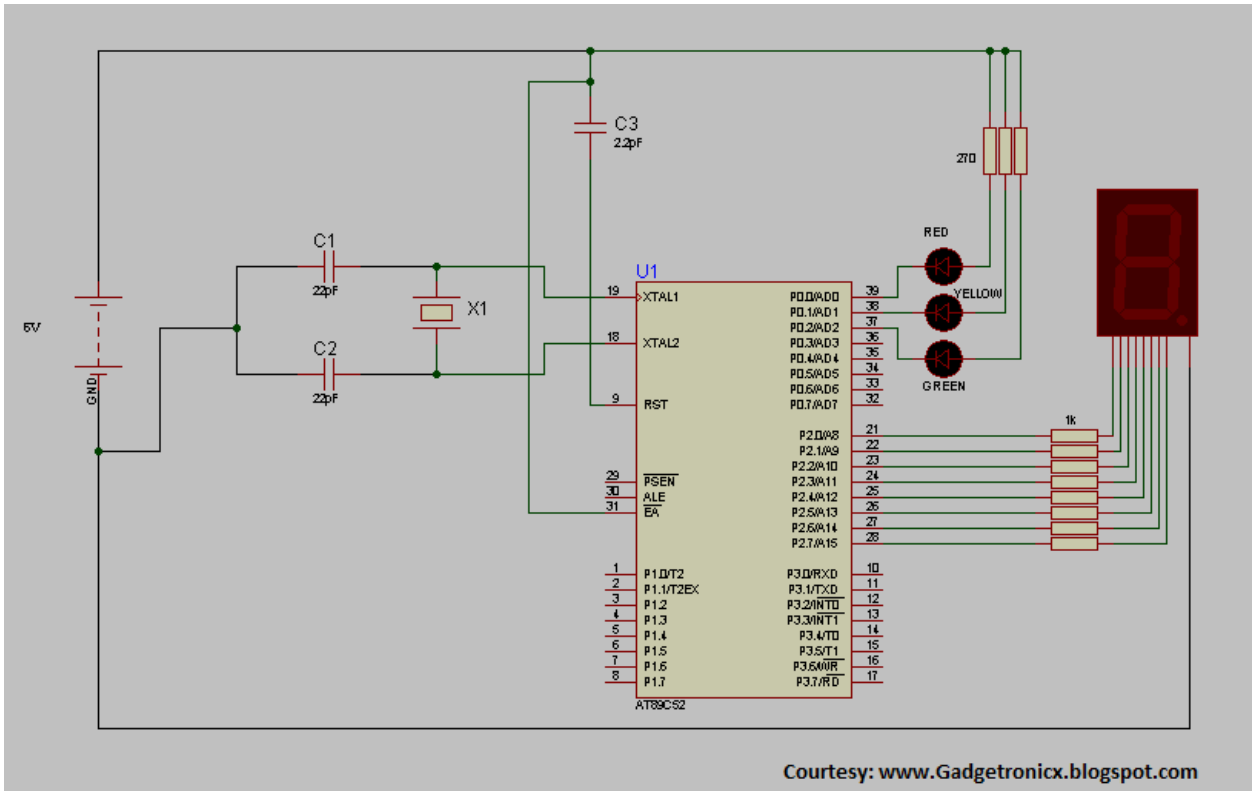
access external memory in conjunction with port P2. P0 acts as A0-A7 in address bus and D0-D7 for port data. It can be used for general purpose I/O if no external memory presents. Port P2 (pins 21 to 28): Similar to P0, the port P2 can also play a role (A8-A15) in the address bus in conjunction with Port P0 to access external memory. Port P3 (Pins 10 to 17): P3.0 can be used for serial receive input pin(RXD) P3.1 can be used for serial transmit output pin(TXD) in a serial port, P3.2 and P3.3 can be used as external interrupt pins(INT0' and INT1'), P3.4 and P3.5 are used for external counter input pins(T0 and T1), P3.6 and P3.7 can be used as external data memory write and read control signal pins(WR' and RD')read and write pins for memory access.

Traffic Lght Control System Using 8051 Microcontroller:

The Block diagram of Microcontroller based Traffic Light Control system. The pins of the various input output ports of the microcontroller are connected directly to the given leds. The 8051 is programmed in a manner that the respective Leds glow by setting the required bit using assembly language and a certain amount of delay is provided depending on the user . Figure 5.4 shows a simple arrangement and port connection for microprocontroller based Traffic Light control. The 8051 microcontroller is a popular microcontroller used in industries for various applications. Such as Traffic light control, temperature control etc.

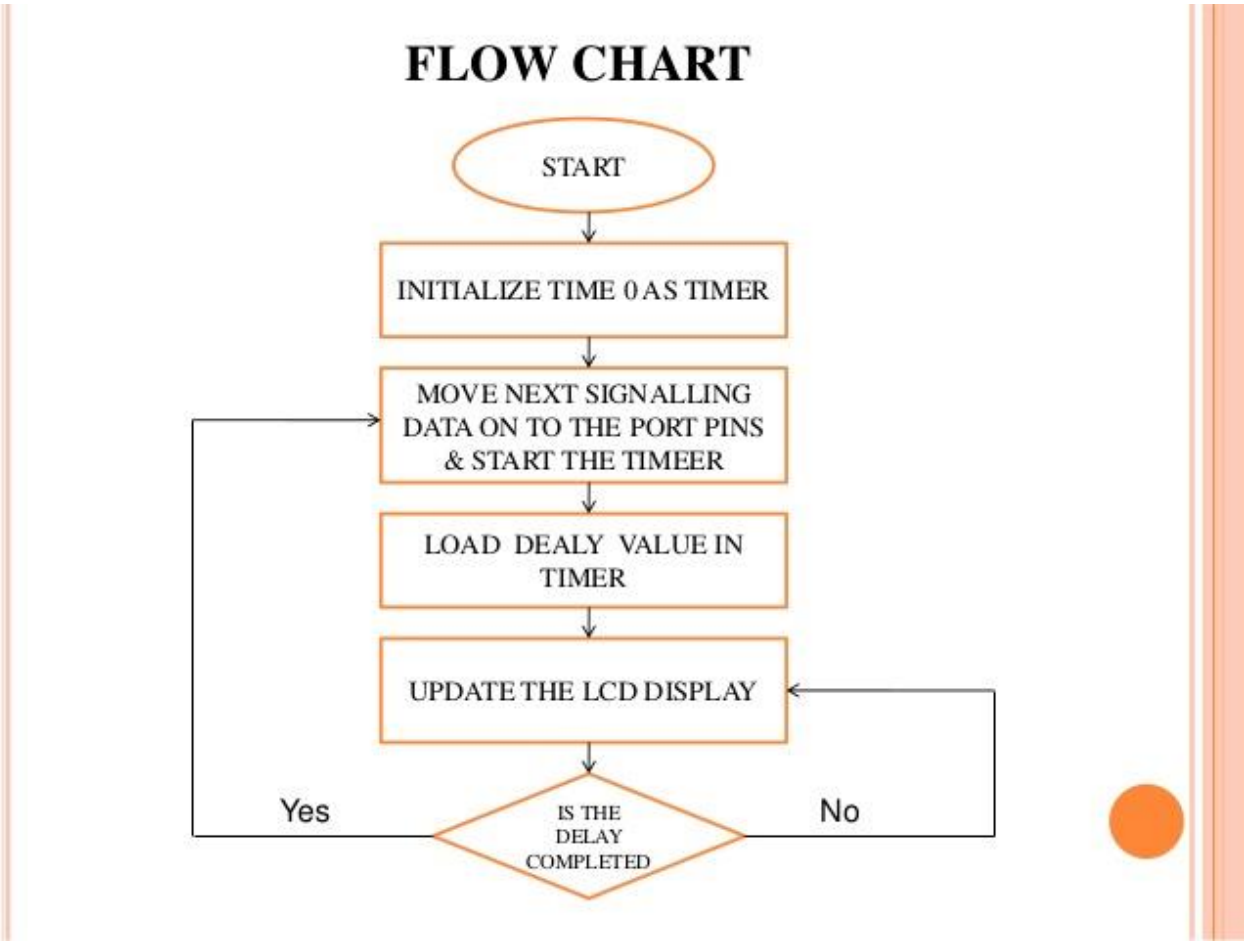


Block Diagram



Traffic Lght Control System Using 8051 Microcontroller

In this project, 8051 Lab Trainer kit is proposed to smooth the progress of learning and developing designs of MCU from Intel and NXP. It has the facility to connect PC's 101/104 keyboard , to enter user programs in Assembly languages. Serial communication achieved using 8051 .It also supports C and assembly language in standalone kit (P89V51RD2). It is designed as to facilitate on-board programmer for NXP 8051 MCU through ISP on serial port. The pins of the various input output ports of the microcontroller are connected directly to the given leds. The 8051 is programmed in a manner that the respective Leds glow by setting the required bit using assembly language and a certain amount of delay is provided depending on the user.



Flowchart of Traffic Lght Control System Using 8051 Microcontroller

Results :

Traffic control system using Microcontroller designed to reduce traffic Problems, in general the four sides of the road at a signal point are controlled using Switches. Based on our analysis of the present traffic control system, the following assumptions became necessary in order to develop a feasible system: Traffic only moves from the North to South and vice versa at the same time; and at this time the traffic from the east and west is stopped. In this case, the controller considers the combination of all the waiting densities for the North and South as that of one side and who's of the east and west combined as another side

Summary:

Designing of a system to control automatically the traffic lights on a four-way signal was the main concern. This circuit is designed by 8051 microcontroller. The pins of the various input output ports of the microcontroller are connected directly to the given leds. The 8051 is programmed in a manner that the respective Leds glow by setting the required bit using

assembly language and a certain amount of delay is provided depending on the user . The use of Embedded technology has proved to be very beneficial in present Traffic Light Control System and that will minimize waiting time of vehicle.

Advantages:

It will reduce the normal recurring. Significantly it will enhance operational tools congestion to effectively manage traffic incidents. It will improve Public Transport service. Reduce the emergency response times and safer travel. Similarly it will improve traffic guidance and traffic flow and reduce fuel consumption.

Limitation Of The Study:

Traffic Congestion is a serious problem despite costly effort to create an integrated method of traffic control system. The number of private automobiles used mainly by people with middle class for income,has increased faster than any form of transportation in India and this has increased a demand of expansion of roads,parking space and improved automatic traffic light control system.

Conclusion:

In this project I have implemented switching based, counter based. Traffic Light control system. The hardware equipment is tested and result is obtained. This project is cost effective. Implementation of this project in present day will effectively solve the traffic congestion which is a severe problem in many modern cities all over the world. Automatic Traffic control system is based on a very effective way of optimizing traffic, with redefinition of threshold values for a real time application. This works to control traffic on four way roads according to traffic control barricades which is functioned by ICs. This proposed system will be able to build a developed country with less traffic jams and it will also help the emergency vehicle to reach in time to the destination. So, this intelligent system will help us to control traffic in more autonomous way. In practice presently in India we are following time based control on traffic signals and we are experiencing a heavy traffic jams all over which in turn consumes lot of time and fuel. We hope this method will be adopted as soon as possible so that the limitations we are experiencing with present method can be overcome.

Future Scope:

As the systems take care of few drawbacks of the existing system, there is scope for further improvement and expansion of this work. The system can be expanded with smart traffic light control and congestion avoidance system during emergencies emergency cars such as fire

engines and ambulance and have priority over other traffic. This system gives highest priority to emergency vehicle to pass them.

REFERENCES:

R. Gaonkar Microprocessor Architecture , Programming and Application with the 8085, PRI ,Sixth Edition.

B.Ram Fundamentals of Microprocessors and Microcontrollers, Dhanpat Rai Publications , 8th Edition .