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Implementation of Traffic Density Reduction

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Abstract:
The aim of the project is to solve traffic congestion, by designing a framework for a dynamic and signal based on density of area covered automatically. It is developed where the traffic load is continuously measured by sensors connected to a microcontroller based system which is also performs all intersection control functions. A junction road is taken as the scenario for demonstrating this system. In this signals are acting as the response to those density levels of the four sides. Each of the side is observed individually and a common processing system will analyse all the probabilities to give sufficient time for a heavily dense side. If the traffic density will be high on a particular side more priority is given for that side. These sensors continuously keep sensing density on all sides and the green signal is given to the side on priority basis, where the sensors detect high density. The side with next priority levels the first priority level. By using this system traffic can be cleared without irregularities and time delay. It helps the traffic inspector to implement the traffic rules efficiently. It is the main application at present days.

Keywords: microcontroller; interfacing with LCD; IRsensors

I. INTRODUCTION

A steady increase in metro-city population, the number of automobiles and cars increases rapidly and metro traffic is growing crowded which leads to the traffic jam problem. Nowadays, controlling the traffic becomes major issue because of rapid increase in automobiles and also because of large time delays between traffic lights. So, in order to rectify this problem, we will go for density based traffic lights system. This article explains you how to control the traffic based on density. In this system, we will use IR sensors to measure the traffic density. We have to arrange one IR sensor for each road; these sensors always sense the traffic on that particular road. All these sensors are interfaced to the microcontroller. Based on these sensors, controller detects the traffic and controls the traffic system. The main heart of this traffic system is microcontroller. IR sensors are connected to the PORT C (PC0, PC2, PC4, and PC6) of the microcontroller and traffic lights are connected to PORT A and PORT B. If there is traffic on road then that particular sensor output becomes logic 0 other wise logic 1. By receiving these IR sensor outputs, we have to write the program to control the traffic system. If you receive logic 0 from any of these sensors, we have to give the green signal to that particular path and give red signal to all other paths. Here continuously we have to monitor the IR sensors to check for the traffic. We have to place these IR pair in such a way that when we place an obstacle in front of this IR pair, IR receiver should be able to receive the IR rays. When we give the power, the transmitted IR rays hit the object and reflect back to the IR receiver. Instead of traffic lights, you can use LEDs (RED, GREEN, YELLOW). In normal traffic system, you have to glow the LEDs on time basis. If the traffic density is high on any particular path, then glows green LED of that particular path and glows the red LEDs for remaining paths.

II. INTELLIGENT TRAFFIC CONTROL SYSTEM

The design of intelligent traffic control system is an active research topic. Researchers around the world are inventing newer approaches and innovative systems to solve this stressful problem. Models based on mathematical equations are applied to estimate the car waiting time at a junction, the number of cars in the waiting queue, the extension of the waiting cars along the lane, the optimal timing slots for green, yellow, and red lights that best fit the real and veritable situation and the efficient combination of routing. In fact, the mutual dependencies between nearby intersections lead to a complicated formulation with cumbersome parameters. These parameters are accidental, hazardous, dependent, and the worse point is the variance of these parameters with time. Thus, finding a dynamic, consistent, and convenient solution is quite. impossible. Researchers from different disciplines are collaborating to explore feasible solutions that reduce traffic congestion. Therefore, various methodologies are constantly proposed in the literature and many techniques are implemented profiting from the technological advances of microcomputers, recent manufactured devices and sensors, and innovative algorithms modeling, as much as possible, the complication of traffic lights. The IR sensors are employed in numerous traffic systems.

The IR transmitter and the IR receiver are mounted on either sides of a road. When an automobile passes on the road between the IR sensors, the system is activated and the car counter is incremented. The collected information about the traffic density of the different roads of a junction is system. If you receive logic 0 from any of these sensors, we have to give the green signal to that particular path and give red signal to all other paths. Here continuously we have to monitor the IR sensors to check for the traffic. We have to place these IR pair in such a way that when we place an obstacle in front of this IR pair, IR receiver should be able to receive the IR rays. When we give the power, the transmitted IR rays hit the object and reflect back to the IR receiver. Instead of traffic lights, you can use LEDs (RED, GREEN, YELLOW). In normal traffic system, you have to glow the LEDs on time basis. If the traffic density is high on any particular path, then glows green LED of that particular path and glows the red LEDs for remaining paths.

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IV. LITERATURE SURVEY

K.Vidhya, A. Bazila Banu use the Density measurement byusing open tool as software for image processing by just displaying the various conversion of image in the screen and finally surrounding the box on the vehicle in the given image, the number of vehicle is calculated. They can calculate the density of the vehicle by using mat lab tool by comparing the four side of the image which is given as a input. they can simulate the result of the four given input image but this cannot be used in real time applications as it is very slow and the software is not free of cost like open to overcome this disadvantage of mat lab, open software is used which is very easy to install and is open source software and can be used in real time application in a quick manner. In this paper they have shown the density measurement in the signal by using open in the System.

G. Kavya, B. Saranya Density Based Intelligent TrafficSignal System Using PIC Microcontroller, the optimization of traffic light controller in a City using IR sensors and microcontroller. By using this system configuration tried to reduce the possibilities of traffic jams, caused by traffic lights, to an extent and successfully gets the results. No. of passing vehicle in the fixed time slot on the road decide the density range of traffics and on the basis of vehicle count microcontroller decide the traffic light delays for next recording interval. The recorded data can be downloaded to the computer through communication between microcontroller and the computer.

V. PROBLEM DEFINITION

The high volume of vehicles, the inadequate infrastructure and the irrational distributions of the development are main reasons for increasing traffic jam. The major cause leading to traffic congestion is the high number of vehicle which was caused by the population and the development of economy. Traffic congestion is a condition on road networks that occurs as use increases, and is characterized by slower speeds, longer trip times, and increased vehicular queuing. The most common example is the physical use of roads by vehicles. When traffic demand is great enough that the interaction between vehicles slows the speed of the traffic stream, these results in some congestion .As demand approaches the capacity of a road (or of the intersections along the road), extreme traffic congestion sets in. When vehicles are fully stopped for periods of time, this is colloquially known as a traffic jam or traffic snarl-up. Traffic congestion can lead to drivers becoming frustrated and engaging in road rage in order to avoid the congestion in the traffic.

OBJECTIVE

During our literature survey we come across many journal papers in which traffic is control with the help of microcontroller. In this manuscript, I am controlling traffic signal using microcontroller. It is density based traffic signal system. Here I am utilizing the concept of IR sensor and control the density of traffic. In this project with the help of command we control the microcontroller.

VI. BLOCK DIAGRAM OF PROPOSED SYSTEM

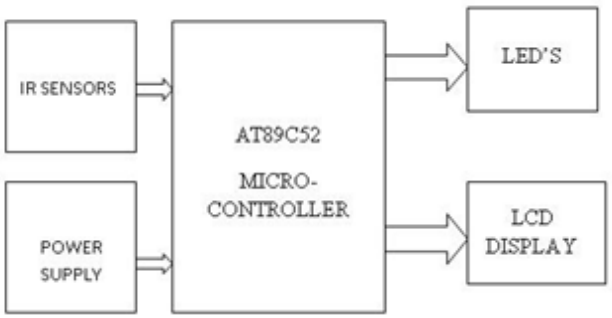


Figure.1.Block diagram of proposed system

A prototype of traffic signal control system can be made using IR sensors along with microcontroller and LEDs which can be prove a worth for a real time application controlling traffic signals based in the density of traffic shown in below fig. 1. The junction considered here is a four side junction with traffic flow in each side in only one way. In this system consists of the following three main units:

Display Unit

It consists of three LEDs green, red, and yellow in each side of the junction, with an all total of 12 LEDs.

Detector Unit

It consists of an arrangement of photodiode and IR LED combination at each side of the junction which detects presence of vehicles by detecting change in resistance.

Controller Unit

It consists of a microcontroller which receives the IR sensor output and accordingly controls the glowing of LEDs.

VII. HARDWARE COMPONENTS

A. Microcontroller

The microcontroller generic part number ctually includes a whole family of microcontrollers that have numbers ranging from 8031to 8751 and are available in NMOS and CMOS construction in a variety of package types. The pin description of AT89C52 is shown in below fig. 2 The device is manufactured using Atmel's high density non- volatile memory technology and is compatible with the industry standard MCS-51 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 Flash on a monolithic chip, the Atmel AT89C52 is a powerful microcomputer which provides a highly flexible and cost effective solution to many embedded control applications. 8051 is the name of a big family of microcontrollers. The device which we used in our project was the 'AT89C52' which is a typical 8051 microcontroller manufactured by Atmel™. The block diagram provided by Atmel that showed the architecture of 89C52 device seemed a bit complicated. A simpler architecture can be represented below.

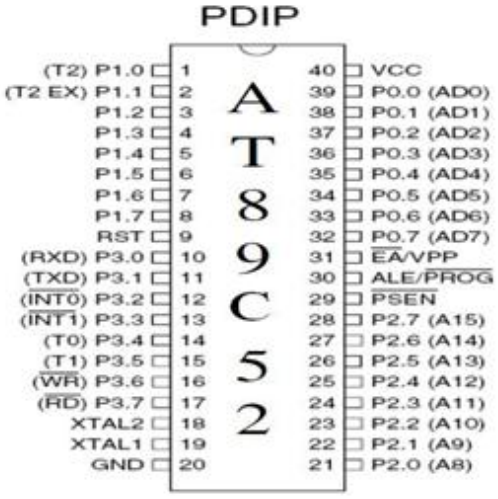


Figure.2. Pin Diagram of AT89C52

The 89C52 has 4 different ports, each one having 8 Input/output lines providing a total of 32 I/O lines. Those ports can be used to output DATA and orders do other devices, or to read the state of a sensor, or a switch. Most of the ports of the89S52 have 'dual function' meaning that they can be used for two different functions. The first one is to perform input/output operations and the second one is used to implement special features of the microcontroller like counting external pulses, interrupting the execution of the program according to external events, performing serial data transfer or connecting the chip to a computer to update the software. Each port has 8 pins, and will be treated from the software point of view as an 8-bit variable called 'register', each bit being connected to a different Input/output pin.

B. IR sensors

IR (INFRARED) sensor is based on LM 358 IC which is an Operational amplifier acting as comparator. The comparator compares the analog voltages of potentiometer and the voltage generated by the photodiode. The two voltages are applied on the two terminals of the IC and correspondingly it generates a digital output on the output pin that is indicated by a Red Led. In this below fig. 3 shows how to sense the object will be detected or not. The IR sensor is compatible with various microcontroller boards like 8051, Arduino, PIC etc. This shield is based on the working of a circuit comprising op-amp, an IR led and photodiode the output generates by the sensor is due the comparator action of the op amp (LM358). It compares the two voltages that are generated by the photodiode and the potentiometer. When the value of voltage V generated by photodiode is greater than the voltage set on the potentiometer, the output is HIGH and vice versa.

Figure.3.IR Sensors

C. Resistance

The electrical resistance of an electrical conductor is the opposition to the passage of an electric current through that conductor. The inverse quantity is electrical conductance, the ease with which an electric current passes. Electrical resistance shares some conceptual parallels with the notion of mechanical friction. The SI unit of electrical resistance is the ohm (Ω), while electrical conductance is measured in Siemens (S). An object of uniform cross section has a resistance proportional to its resistivity and length and inversely proportional to its cross-sectional area. All materials show some resistance, except for superconductors, which have a resistance of zero.

D. LED

It is a semiconductor diode having radioactive recombination. It requires a definite amount of energy to generate an electron hole pair. The same energy is released when an electron recombines with a hole. This released energy may result in the emission of photon and such a recombination. Hear the amount of energy released when the electro reverts from the conduction band to the valence band appears in the form of radiation. Alternatively the released energy may result in a series of photons causing lattice liberation Hence GaAs LED has much higher efficiency interms of Photons emitted per Carrier. The internal efficiency of GaAs LED may be very close to 100% but because of high index of refraction, only a small fraction of the internal radiation can usually come out of

the device surface. In spite of this low efficiency of actually radiated light,

E. POWER SUPPLY

The power supply is a primary requirement for the project work. The required DC power supply purpose centre tapped secondary of 12V transformer is used. From this transformer we getting 5V power supply. In this +5V output is a regulated output and it is designed using 7805 positive voltage regulator. This is a three pin voltage regulator, can deliver current up to 800 milliamps.

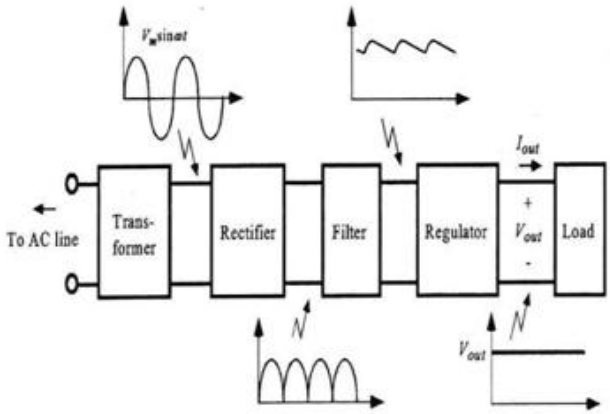


Figure.4. Block Diagram of Power Supply

AC powered unregulated power supply usually uses a transformer to convert the voltage from the wall outlet (mains) to a different, nowadays usually lower, voltage. If it is used to produce DC, a rectifier is used to convert alternating voltage to a pulsating direct voltage, followed by a filter, comprising one or more capacitors, resistors, and sometimes inductors, to filter out (smooth) most of the pulsation. Rectification is a process of rendering a alternating current or voltage into a unidirectional one. The component used for rectification is called 'rectifier'. A rectifier permits current to flow only during positive half cycles of the applied AC voltage. Thus, pulsating DC is obtained to obtain smooth DC power additional filter circuits required.

F. LCD DISPLAY

To understand the operation of an LCD, it is easiest to trace the path a light ray from the backlight to the user. The light source is usually located directly behind the LCD, and can use either LED or conventional fluorescent technology. From this source the light ray will pass through a light polarizer to uniformly polarize the light so it can be acted upon by the liquid crystal matrix.

Figure. 5 .Interfacing to the microcontroller

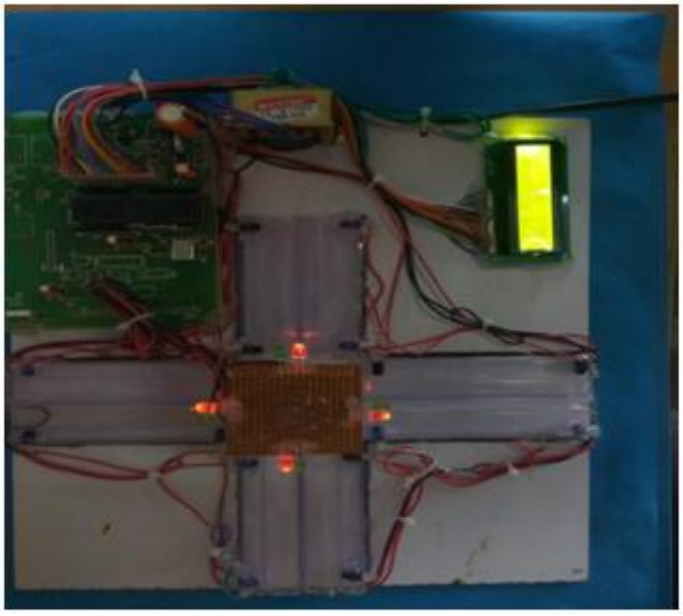
This does not use the bi- directional feature found on newer ports, thus it should work with most, if not all parallel ports. It however does not show the use of the status port as an input. A 16 character X 2 lines LCD module is interfaced to the parallel port. These LCD modules are very common these days, and are quite simple to work with, as all the logic required running them is on board.

SOFTWARE DETAILS

In this project we are using the keil software for programming and Willar software for dumping.

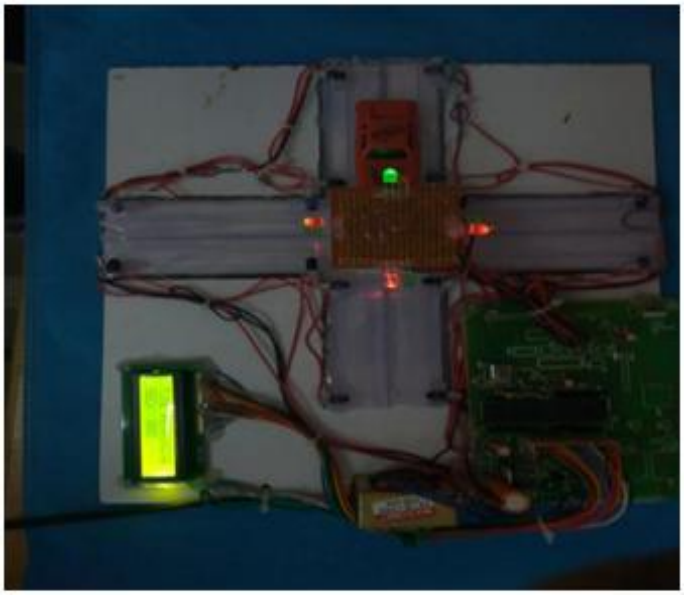
VIII. RESULTS

We have measured 5V, 12V DC at the output of power supply. The LCD Display displayed the basic project Information. We are given a self test for checking of all LEDs ON/OFF states, once during the ON. We observed Red LEDs blinking along then there is no traffic among all four roads.



Figur.6. At initial stage

The more timing is allotted for high traffic areas (10 sec), less timing for low traffic areas (5 sec). The automatic change over occurred when there is no traffic. Now if you place any obstacle in front of any IR sensor, then the system allows the traffic of that particular path by glowing GREEN light. Finally, turn off the board power supply.



Figur.7. At low density side

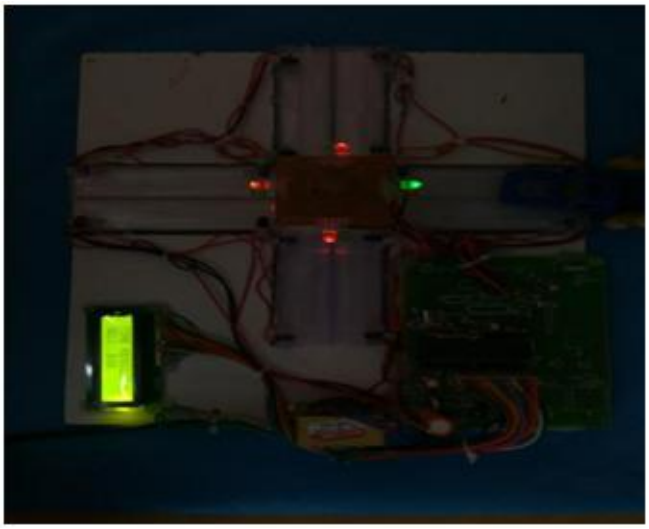


Figure.8 At high density side

IX. CONCLUSION

In this project, density based traffic signal system was implemented using microcontroller. 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 .Consider a scenario of highly congested area where many vehicles such as personal transport, public transport and emergency vehicles (Ambulance, Fire brigade, VIP cars and other rescue vehicles) have to wait for long for the change of traffic signals at intersection points. This leads to the wastage of precious time especially in case of rescue vehicles for emergency conditions It is possible to propose dynamic time-based coordination schemes where the green signal time of the traffic lights is assigned based on the present conditions of traffic. This is achieved by using IR sensors across the road to monitor the length of vehicles blocking the road traffic. The signals from the IR receivers are fed to the microcontroller to follow the program with the time as desired. With a slight modification this project can be implemented in a nearby area.

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