INTELLIGENT TRAFFIC LIGHT CONTROL SYSTEM (ITLCS)

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Abstract: If we saw today's Intelligent Traffic Light System (ITLS), then we observe that are lot of limitation on that system. This System are not on real time basis. This System are based on microcontroller and microprocessor. These ITLCS have limitations because it uses the pre-defined hardware, which is functioning according to the program that does not have the flexibility of modification on real time basis. Due to the fixed time intervals of green, orange and red signals the waiting time is more and car uses more fuel. To make traffic light controlling more efficient, we exploit the emergence of new technique called as "Intelligent traffic light system ". This makes the use of Sensor Networks along with Embedded Technology. This project also includes analyzing traffic of each road along the signals and assigning time period to glow the respective light. This time slot may vary according to the traffic. The older system uses integrated highway management system based on the radio frequency identification (RFID) technology in which it will be tracking vehicles and Electronic toll collection system will be implemented. But it has one major disadvantage that each vehicle has mount a one metal plate so cost of this system is very high. For that purpose we use sensor based ITLCS system.
The timings of Red, Green, Yellow signal are based on fixed timing. The timings of Red, Green lights at each crossing of road will be intelligently decided based on the total traffic on all adjacent roads. Thus, it is optimize traffic and prevent traffic congestions.

Keywords: ITLCS, Sensor Network, Traffic Congestion, Microcontroller System.

I. INTRODUCTION

Aim: Our project aims to eliminate the delay on roads by reducing traffic on road automatically using embedded system. It determines traffic on each road by using sensors. Using that traffic information we can manage the signal time and handle the traffic on road. On each road we place IR sensors which detect the vehicle and give current traffic information on each road. The timing of signal is adjusted according to traffic level on each road. The road which has level more than other road then this road assign green signal and for others have red is assign. It is also provide the additional functionality of release the emergency vehicle on its occurance that means when emergency vehicle occure.
In our project we focus on optimization of traffic light controller in a city using IR sensor and developed system using microcontroller AT89c51.
We present this paper because to reduce traffic congestion which results in long waiting times to turn signal green, loss of fuel and money. For national development it is necessary to reduce traffic congestion.
The problems are occure due to traffic congestion are:

1) Heavy traffic jam

Because of heavy traffic jam it waste time as well as fuel also and it happened at the main junctions when people have emergency such as before office hour, morning and after office hours, evening.

2) There is no traffic but still need to wait

Sometimes there is no traffic at certain junctions, and people have to wait. Because of the traffic light remains red for the present time period, the road users should wait until the light turn to green. If they run the red light, they have to pay fine.

3) Emergency vehicle stuck in traffic congestion

Due to traffic jam, the emergency vehicle such as ambulance, fire brigade and police will be stuck at the traffic junction and that's why emergency vehicle can't move due to congestion. This is because the road users waiting for the traffic light turn to green. This is very critical problem because it can cause the emergency case become complicated.

4) User's have lack of traffic information

Present traffic systems unable to provide traffic information on congested roads and also fail to provide information about alternate roads when traffic congested on roads.

II. CIRCUIT IMPLEMENTATION

In our project model the basic operations are implemented using MicrocontrollerAT89c51**.**

1) Microcontroller AT89c51

The heart of the system is microcontroller AT89c51
This microcontroller is fall under 8051 microcontroller. It has chip ROM which is in form of flash memory. After some time flash memory can be erased which provide fast process. We are selecting this microcontroller AT89c51 because it is easy of programming, sufficient number of input output lines, manageable size of RAM and ROM and simple architecture. System program and application program are stored using RAM and ROM. The block

diagram of ITLCS consists of the microcontroller, input switching matrix, Real Time Clock 1307, Clock circuit, Relay Driver ULN 2003, LED interfacing circuit.

2) IR Sensor:

This IR sensor detects vehicle and also detect the emergency vehicle. Thermal radiation is emitted by all the objects in the infrared spectrum. The infrared sensordetects this type of radiation which is not visible to human eye.

Advantages

· Easy for interfacing

· Readily available in market

Working

The basic idea is to make use of IR LEDs to send the infrared waves to the object. Another IR diode of the same type is to be used to detect the reflected wave from the object[6]. For example, when emergency vehicle come like ambulance, police etc is come which have already set sensor that time sensor detects this emergency vehicle and sender, receiver sensor send signals to each other. When IR receiver is used to infrared light, a voltage difference is produced. At less voltage which is produced can be hardly detected and therefore operational amplifiers (Op-amps) are used to detect low voltages accurately.

The signals generate from sensor will be applied to input switching circuit. These input signals which generate from sensors will be in the form of digital signals that indicate to presence or absence of a vehicle. These digital signals from each road will be given to the input port of microcontroller, where the microcontroller will determine the length of vehicle at each road and counts the length of each road and decide to on which road which signal is glow[7]. This information is the input to microcontroller to determine the various timing signals where the ON and OFF time of the four junctions will be calculated by microcontroller, in order to keep the waiting time minimum and these signals will be applied to two relay drivers which consist of ULN 2003[4,5].

3) Relay Driver ULN 200

These relay drivers are level shifters and current amplifiers. The output of relay driver is applied to Red, Green and Orange LED at each junction.

4) IC 24C6

IC 24C61 is one type ofIC used for I2C interface. There is one LCD display is provided to each signal. LCD Display will indicate the time left for the signal to become green i.e. it indicates the time for a vehicle has to wait at a particular junction. We can use a good contact LED displays which will be visible from a longer distance.

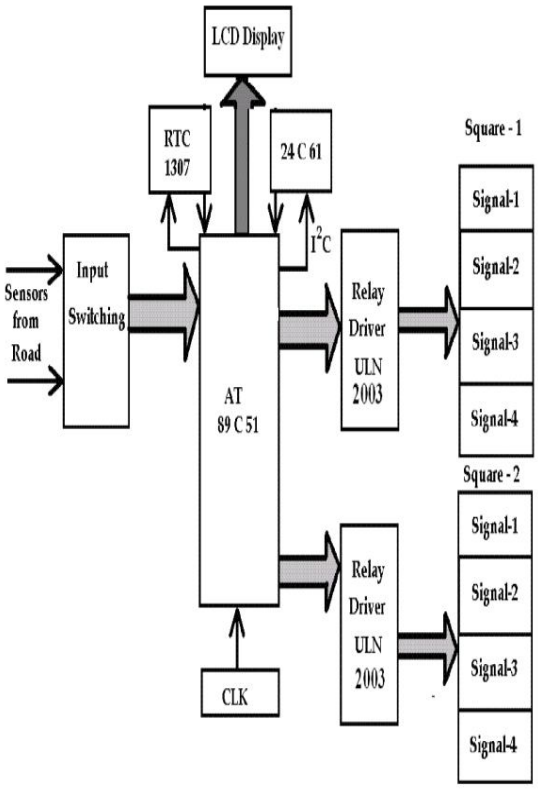

Fig1: Block diagram of ITLCS

III. SYSTEM ARCHITECTURE

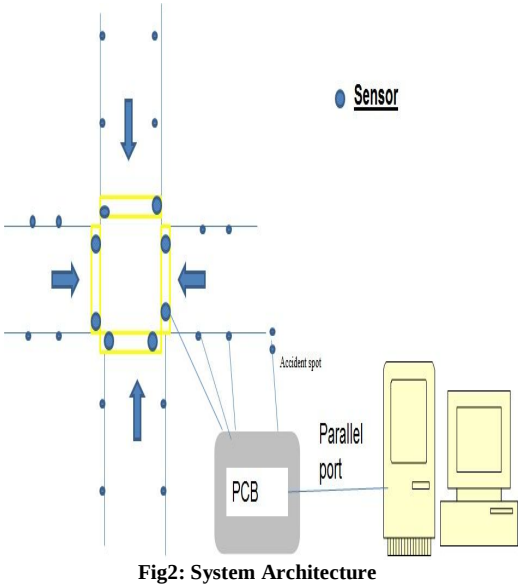

Fig2: System Architecture

Methodology:

1. Sensor Send the current traffic information to microcontroller.
2. Microcontroller analyze the sensor &it's way.
3. Microcontroller decides the traffic level of each road.
4. Then Microcontroller take decision of glowing signals.
5. Then system store the traffic information

In above Fig.2 shows system architecture of ITLCS in which sensor send traffic information to PCB in the binary form. PCB will store this information in the form of hexadecimal and send this traffic information to the system. System stores this information in the decimal form so that user can easily read this information and control the traffic congestion.

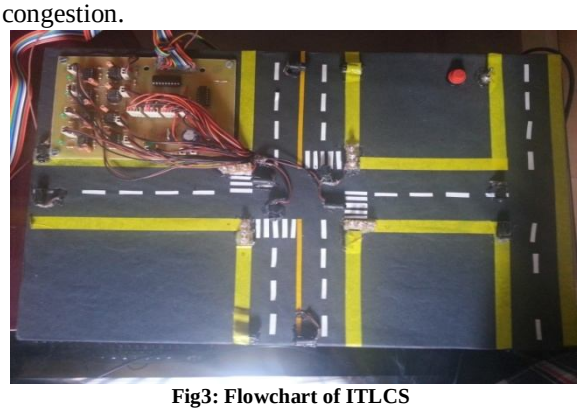

Fig3: Flowchart of ITLCS

Steps to handle system:

1. Log into System
2. Select control type
3. If Automatic mode select then go to step 4th else go to step 8th
4. If Automatic control activated
5. Assign time period for green, yellow signal
6. If emergency vehicle isoccure then go to step 4
7. If rally come then go to step 8
8. Manual control activated
9. Assign time period for green, yellow signal according to that particular road
10. If emergency over then go to step 4

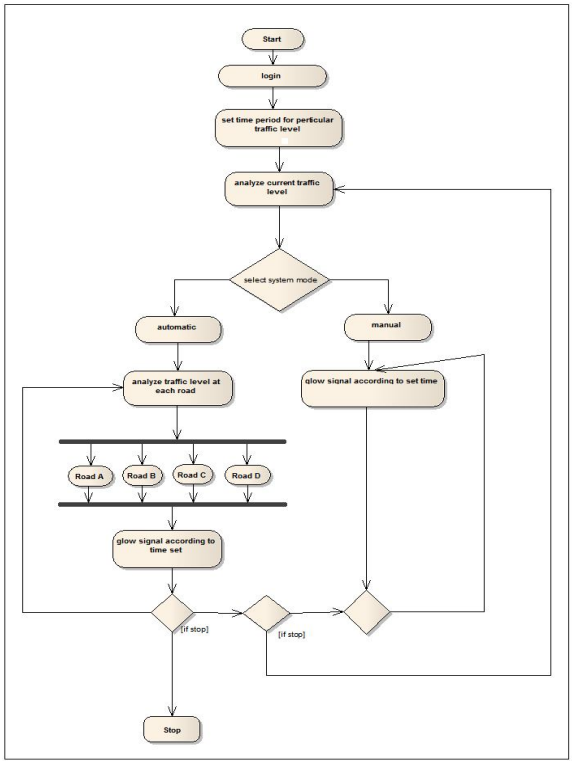

Fig 4: Track of Intelligent Traffic Controller System

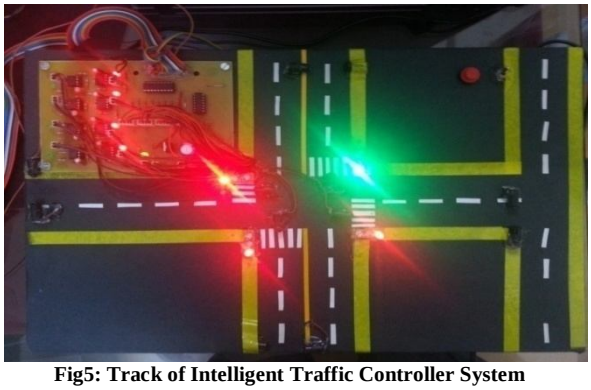

Fig5: Track of Intelligent Traffic Controller System

IV. SOFTWARE IMPLEMENTATION

In this project the admin plays an important role for setting time to particular signal, so the rights of admin must be preserved .It can be done with the help of authentication that means by providing username and password.

So password must be the combination of alphabets and numbers with the minimum 6 characters. In case of absence of admin, person other than admin cannot modify the process of assigning time-slot to signal without permission of the admin.

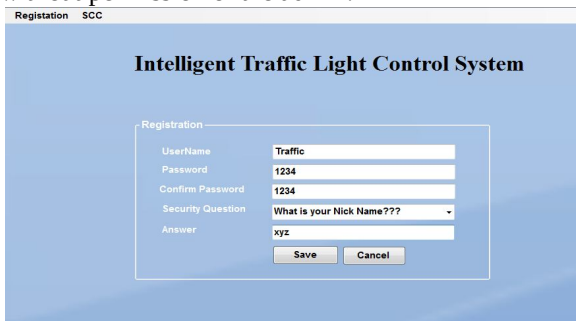

Fig6: User Registration Form

Fig7: User login form

Fig 8: Intelligent Traffic Controller System

Expected Outcome

The expected outcome of our system is to solve congestion problem on junction without human in automatic mode and with human interaction in manual mode. Our system provides control on traffic using automatic and manual mode(for example if any rally comes then set manual mode by setting time).
So even if any emergency vehicle detect by sensor then give path to these vehicle and set traffic system as it is. So traffic problem is easily solved by using Intelligent Traffic Light Control System.

V. ADVANTAGES

1. Simplicity, user friendly, Easily programmable
2. This system reduces the overheads on the database server, by deleting the data after every 4 hours automatically.
3. This system is highly responsive that means it gives a quick response to change in traffic.
4. This system reduces the waiting time as traffic signal's light will change according to current traffic density. So it also reduces traffic jams.

CONCLUSION AND FUTURE WORK

- In this project we introduced sensor based technology for traffic control. We conclude that it provides powerful solution to improve existing system with the new intelligent traffic light controller.
- This project has two major phases

1. Blinking of traffic signal light according to the traffic level present on the road.
2. This system manage traffic when any emergency vehicle come. For example ambulance, fire bridged etc.

- Proposed system will have wider future scope that user can get traffic information on mobile phone.

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