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Smart Traffic Controller Using Embedded System

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***Abstract*— The Traffic Light Controllers are generally based on microcontrollers and microprocessors but it uses predefined hardware and hence it does not have flexibility of modification on real time basis and due to fixed time intervals of signals it causes more time and fuel. To avoid such problems we exploit the emergence of new technique called as "Smart Traffic Controller". It uses sensor network along with embedded technology. This system will increases road capacity and traffic flow and prevents traffic congestions. The performance of Smart Traffic Controller is more efficient than conventional one and also it has more simple architecture, fast response time and scope for further expansion.**

***Index Terms*— Traffic Light, Smart Traffic Controller, Embedded System.**

I. INTRODUCTION

It is necessary to improve the road safety and traffic flow Of the current transportation system and for that we have to apply automation and smart methods to roadside infrastructure. As there are limited resources provided by current infrastructure, smart traffic control will become important issue in near future. In current transportation system there are problems like Heavy Traffic Jams and if there is no traffic still need to wait because of fixed signal timings.

In this project we will design a software and implement hardware useful for real time implementation of smart traffic controller.

II. WORKING OF SMART TRAFFIC CONTROLLER

The operations of Smart Traffic Light Controller are shown in Figure1. The Infrared Sensors are used to detect vehicles . This acts as an input to the TLC unit. The ITLC unit generates output signals for Red, Green and Orange Signal. The basic operation of this traffic controller is performed by using embedded system. It has many advantages of simplicity, user friendly and easily programmable. In this model the basic operations are performed by using Microcontroller89c51AT. Microcontroller has sufficient number of input output lines, manageable size of RAM and ROM and simple architecture. In our model The heart of the system is microcontroller AT89c51. For communicating with the external signals additional ports and multiplexers are used. Additional RAM and ROM are used for application program.

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The block diagram of Traffic controller consists of the microcontroller, input switching matrix, serial communication interface, Real Time Clock 1307, Clock circuit, Relay Driver ULN 2003, LED interfacing circuit.
The signals from sensor will be applied to input switching circuit. These input signals will be in the form of digital signals. These signals corresponds to presence or absence of a vehicle. These digital signals will be given to the input port of microcontroller, where the microcontroller will determine the traffic at each lane. Based on this information microcontroller will decide the timing signals. The on and off time of the four junctions will be calculated by microcontroller, to keep waiting time minimum. These signals will be applied to two relay drivers. The output of relay driver is applied to Red, Green and Orange LED at each junction. IC 24C61 is used for I2C interface. One LCD Display will be provided with each signal. LCD Display will indicate the time left for the signal to become green i.e. it indicates the time a vehicle has to wait at a particular junction.

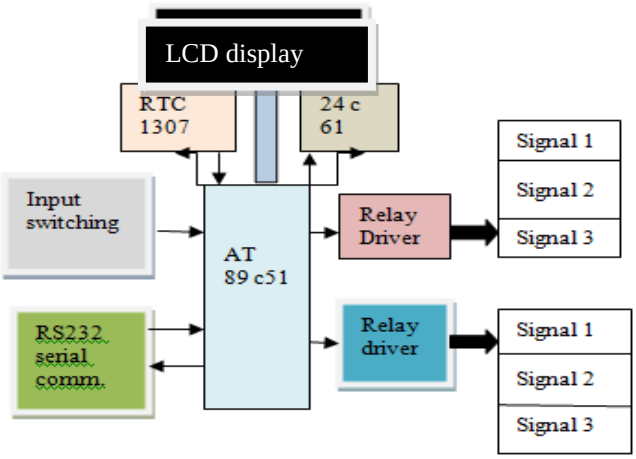

Fig. Block diagram of Smart Traffic Controller

III. USE OF DATA MINING IN TRAFFIC CONTROL

Analyzing, interpreting and making maximum use of data is very difficult because of large amount of data stored in a database. Therefore Data mining appears as a very powerful tool to access the data. Data mining is nothing but to extract data as per need. Traffic control system is one of the various areas, where critical data about the well-being of the society is recorded and kept. Transportation system includes sensors that collect enormous quantities data to provide information for the support and improvement of signal timing operations.
Traffic is a changeable factor. It depends on the certain part of the day or specific days. In traffic controller we will use the data mining to create graphs according to the traffic at a particular junction. So it will be a very easy to understand the

traffic flow during busy and non-busy hours. These graphs will be generated based on the data stored in the database. Data will be automatically saved in the database while updating the signal timings. Operator can access the data anytime and check the traffic flow.

IV. ADVANTAGES OF TRAFFIC CONTROLLER

A. AVERAGE WAITING TIME OF A VEHICLE

Each vehicle has to wait at particular junction but it indicates that the average waiting time is less for smart traffic controller during busy and non-busy hours as it senses the physical presence of a vehicle and based on that it will update the signal timings. So there will be less wastage of time.

B. MORE SIGNAL SWITCHING FREQUENCY

In Smart traffic controller signal switching frequency will be more as compared to fixed traffic controller system. It is a dynamic system because switching frequency will be changed according to the traffic as it continuously update signal timings.

V. CONCLUSION

The improvement of traffic is mostly depend on the modern ways of traffic management and control. The smart traffic controller introduced in this project has powerful hardware interface and functions. It also uses Data Mining to access data. It is observed that the proposed smart Traffic Light Controller is more efficient than the conventional controller in respect of less waiting time, more switching frequency. Moreover, the designed system has simple architecture, fast response time, user friendliness and scope for further expansion.

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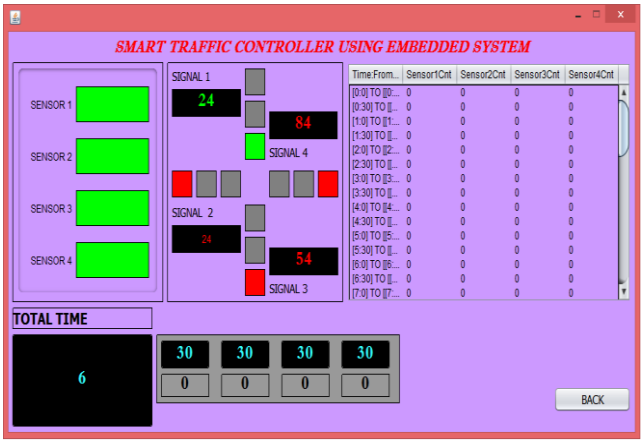
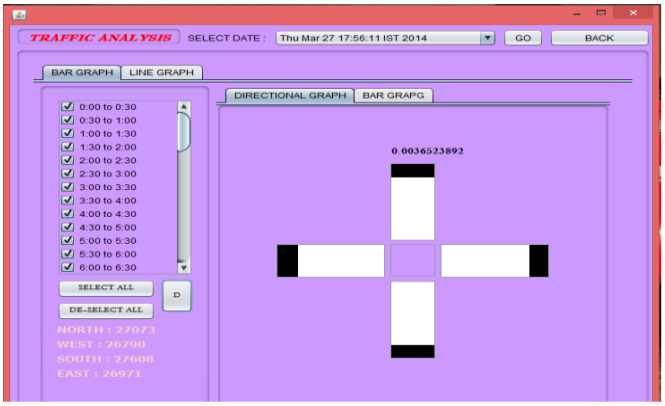
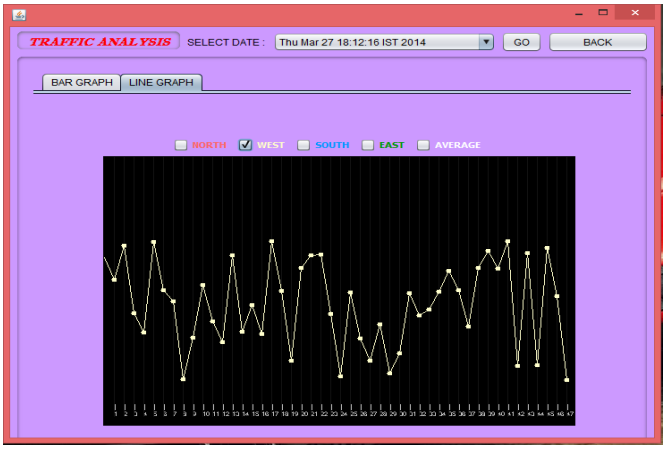
OUTPUT:



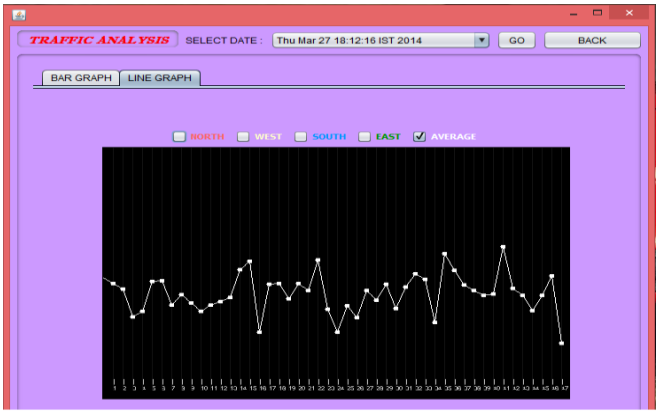
Signal timing shown in the above screenshot is the real time output of our project. It updates signal timing automatically as per count of vehicles.



As Data mining is used in this project, it extracts the traffic data from database and generates bar graph for user convenience.



This is the line graph of traffic in a particular area i.e. west.



This is the average line graph of traffic in all directions.