Iot based Smart Traffic Control using IR Sensors

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Abstract: Traffic Congestion is a major problem in many cities in India and other countries. Signal failure, lax regulation and traffic management have contributed to congestion of traffic. Some of the key issues with Indian cities is that the new network cannot be expanded further and that thus the only option left is better management and living standards It is therefore high time the issue of traffic congestion is to be dealt effectively Traffic control approaches include video data processing, infrared cameras, inductive loop tracking, wireless sensor network, etc. In our study, we use an infrared sensor that can be paired with the existing signaling network that can act as a portal to intelligent traffic management. Additionally, a smartphone application is connected to a centralized system that communicates with the local rescue department about a fire explosion site for further action. There's also a software application to provide the smart city's higher authorities with valuable information in graphic formats, which is helpful in future road planning. Automated traffic control and surveillance are essential for the use and maintenance of the highways.

Keywords: Traffic management, Infrared sensors, Iot, Wireless sensor network.

I. INTRODUCTION

Each day human beings develop new technology to simplify and make life more comfortable. People are emerging from their homes with new wings of ambitions to increase living standards. Which is why, day by day traffic congestion is on the road. As a consequence, there are two key problems: No noise, but still wait. High traffic congestion, these issues occur due to the continuous traffic control. The meaning of Fixed Control On Traffic is that we are not controlling the traffic according to the density, but in manner of programming which is already fixed in the system. To address this problem with a fixed traffic light control network, we are introducing a density-based traffic management network to allow traffic flow. This is called 'Intelligent Traffic Control Network focused on Density'. Intelligent traffic control system based on density includes a device which can modulate itself by vehicle number. Here we render a traditional traffic control system, an intelligent traffic control system, using IR sensors.IR sensor includes in house IR transmitter receiver.

These IR transmitters and IR receivers are placed at a particular distance on either side of the road. With these IR sensors the IR sensor will identify the vehicle and forward the information to the microcontroller. Based on the vehicle density, the microcontroller will count the number of vehicles, and give LED blinking time. If the density is higher, LED glows higher than average time, or vice versa. The platform is an IoT based device that flags moving lights by thinking about vehicle thicknesses. To do so we use sensors. The sensors measure the thickness of the activity and insulate it into low, medium and high classifications. The signs are updated in light of the result. This role contributes to the preparation of an IoT based system in which motion signals are subsequently tested and monitored by the use of sensors. The main advantage of this method is that it reduces vehicle wait times. Since we know that time is now day's most important item, so many people break traffic rules just to get to their destination at the time. The justification for the violation of traffic rules is to wait indefinitely, whether traffic is present or not. The Suggested system would also reduce this dilemma of people and thus decrease the amount of incidents happening on the road every day.

II. LITERATURE SURVEY

Rongrong Tian, Xu Zhang[13] suggested using the TRANSYT traffic modeling software to identify the optimal fixed signal plan and VISSIM microsimulation software to verify and check the TRANSYT model and help to decide the optimal signal plan; construct an adaptive frame signal plan and optimize and evaluate the plan using VISSIM with VS-PLUS simulator. Via microsimulation it was demonstrated that the delay in adaptive signal control was greatly reduced compared to that in fixed time regulation.

Jianhua Guo et al[7] applied a new method for area-wide signal timing optimization under consumer equilibrium traffic. The optimization model was developed as a multidimensional search problem with the objective of achieving a minimized product of the overall travel time associated with the urban street network and the variance of travel time per unit travel distance. A genetic algorithm was developed for deriving model solution. A simulation management protocol implemented in the PARAMICS software platform capable of conducting field micro simulation is introduced to construct the logic frame and function module of the region traffic signal management network. His findings revealed that mobility improvements are accomplished after applying the proposed model along with the genetic algorithm for area-signal timing optimization, calculated by an extended power ratio and decreased movement delays through and through, as well as average and variance of travel time per unit distance..

Gustav Nilsson Giacomo Como[4], based on a generalized proportional distribution law, centered on a dynamic traffic signal control class.

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It results in a differential inclusion for which there is proof of existence and the uniqueness of continuous solutions by a generalization of the principle of reflection in the special case of orthogonal phases. Stability is then shown by defining the generalized proportional allocation controllers as reducing a certain entropy function that is then used as a Lyapunov function for the closed-system.

Junchen Jin and Xiaoliang Ma[8] suggested a group-oriented signal control system that would be able to make decisions based on their experience of intersectional traffic. The control problem is built using Multiagent system's automated stochastic control approach, in which each signal group is modeled as an intelligent agent. The new method is supposed to adhere to current signaling network. Offline parameter optimization using a genetic algorithm. Work on simulation showed that the proposed adaptive group-based control system outperforms the enhanced GBVA control system mainly due to adaptive, real-time learning capabilities to respond to traffic demand changes.

III. EXISTING SYSTEM

A radio frequency identification network (RFID) is made up of sensors for the RFID and RFID tags. The RFID system consists of an interrogator on RFID. To connect with the RFID tag using this questioner. The RFID transmitter then extracts the interrogator's received signals / data. Messaging intrusion is used to send out control system commands and data messages. Inside the RFID controller is a system heart. Depending on the configuration, the controller core listens to the interrogators; The Controller Center can perform RFID tag read/write operations, or can perform both listening and executing operations. To connect with other GSMs, the RFID controller must have a serial port / GPRS devices to create a dual radio system. RFID tags are electronic sensors that use electromagnetic fields of radio frequency to transmit data used to mark and track objects. Active and passive are two types of RFID tags. Active RFID has a battery mounted and does not have the passive RFID. Passive RFID has to rely on external source to function. Data about tags may be stored in a nonvolatile memory. Tag consists of a receiver and a Radio Frequency transmitter. One specific serial number can be assigned to each tag.

A. Disadvantages in existing system

i) Traffic congestion
ii) There is no way of detecting congested traffic
iii) The number of accidents gets increasing as the traffic congestion is not detected.
iv) The existing system cannot be controlled remotely.
v) There is no way of identifying congested traffic
vi) It is less economical

B. Iot in Traffic Management

Traffic management is one of the main infrastructure challenges facing developing countries today. Developed countries and smart cities also use IoT to reduce traffic related problems, to their benefit. It is common for people in most cities to opt to drive their own cars irrespective of how good or poor public transport is or how much time and money it would take to reach their destination.

IV. PROPOSED SYSTEM

To address congestion problems, we proposed a system that uses simple electronic components such as LED as an indication of traffic light IR sensors to detect the number of vehicles and a microcontroller to determine the density-based traffic light time period. The wireless sensor nodes composed of sensors are the first and principal part of this network. The sensors communicate with the real world meaning the presence or absence of cars when the local processor sends the data to the central microcontroller. This device comprises the 4*2 collection of sensor nodes in every way. It means 4 traffic levels and 2 lane in each direction. Ultrasonic sensors relay status dependent on the position of a nearby vehicle. At specified time intervals the sensor nodes transmit to the central microcontroller at each intersection. The Microcontroller detects the signal and decides the route and direction to select based on the amount of traffic. The computed data from Microcontroller is then transmitted to the local server through Wi-Fi connectivity. The controller makes use of the collected data to perform the Intelligent Traffic routing. The primary objective of this program is to collect information about moving vehicles based on WSN in order to provide them with a clear path before their destinations and traffic signals are automatically synchronized to give such vehicles a clear path

Fig. 1 IOT based smart traffic control using IR sensors.

A. Advantages

i) The proposed system reduces the number of accidents.
ii) The proposed system Reduces fuel cost and saves time.
iii) The cost of the proposed system is less.
iv) The project is easy for implementation and also for maintenance.
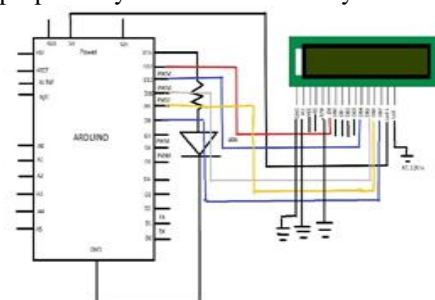v) The proposed system can be remotely accessed.

Fig.2 Arduino Circuit Diagram

V. SYSTEM OPERATION

A. Traffic Rate Computing:

Traffic density is subdivided into 3 groups. The three traffic rates are Low, Medium, High. The data from the three IR sensors are used across lane to calculate traffic speeds. When the sensors absorb reflected IR waves, the output of the sensor will be taken as '1' or the output will be taken as '0.' An '1' result means that a car is present at that position, while '0' means that the lane at that position is vacant. Traffic signal lights are allowed under the following conditions:

LOW: (IR Sensor1 = 1 ,IR Sensor2 = 0,IR Sensor3 = 0) or (IR Sensor1 = 0,IR Sensor2 = 0,IR Sensor3 = 0)

MEDIUM: (IR Sensor1 =1,IR Sensor2 =1,IR Sensor3 =0)

HIGH: (IR Sensor1 = 1,IR Sensor2 = 1,IR Sensor3 = 1)

Based on the levels of traffic a timer is fixed for each level in the program code. The timer is set as

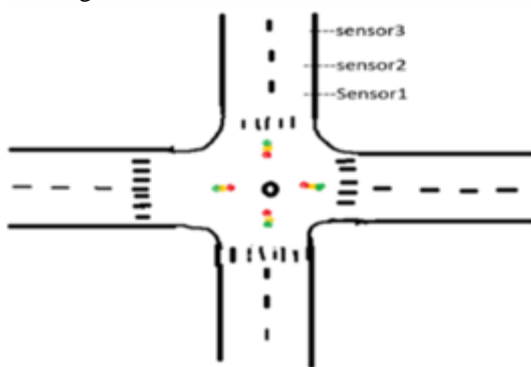Low: 5secs
Medium: 20 secs
High: 30secs

Fig.3 List of Sensors

VI. TECHNOLOGIES USED

A. Hardware Components

1. Arduino: Arduino is a mini-computer that can be used for numerous software and hardware based projects as a development tool. The Arduino is a family of microcontroller boards for designers, programmers, but also many professionals to simplify computer programming, prototyping and experimentation. The Arduino connects via USB to your device, where you can program it in a simple language. If enabled, the Arduino will run back to your device, or stand-alone without it, using the USB connection.

2. LEDs: LEDs are used for the purpose of signaling according to the condition.

3. IR Sensor: IR Sensor is used for counting on-road vehicles.

4. Jumper Wires: The components are connected to one another.

B. Software Requirements

1. Arduino IDE: The Arduino Enhanced Development Environment (IDE) is a cross-platform application written in Java (for Windows, MacOS and Linux) programming language. The Arduino IDE uses special code structuring rules to support the C and C++

languages. The Arduino IDE provides a program library for the Wiring project, which offers many common input and output procedures.

2. Proteus Design Suite: The Proteus Programming Suite is a proprietary technology set which is primarily used for electronic programming automation. Electronic design engineers and technicians primarily use the device to create schematics and computer prints for the manufacture of printed circuit boards.

VII. RESULT AND ANALYSIS

The proposed system assists in better time based tracking and thus has some benefits over the existing system such as minimizing number of accidents, lowering fuel costs and being remotely controllable etc. The suggested program is structured so that traffic flow can be managed and the number of vehicles monitored. The administrator of the system can access local server in order to maintain the system.
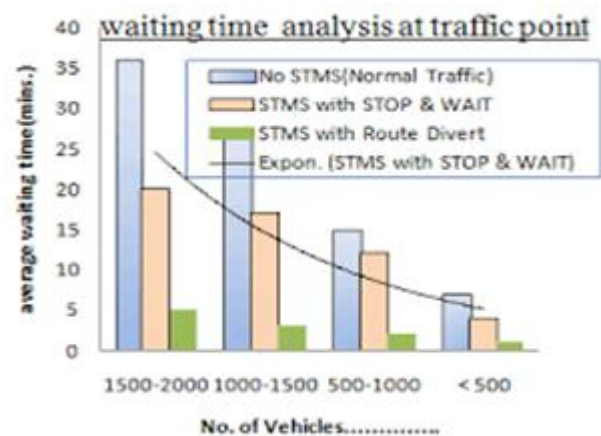

Fig.4 waiting time analysis

VIII. FUTURE SCOPE

Through the potential advancement of this TMS, a model ambulance will connect with all base stations through order to provide an simple free path to enter the hospital on time for the poor. And with its arrival timetable these situations are immediately removed. For upcoming cars, IR sensors can be connected to the number plate and can be communicated with this sensor with signals and the direction to deliver an warning message using GSM modem.[17]

IX. CONCLUSION

A traffic light network with proper integration of both the hardware and software was planned and built. The infra-red sensors were interfaced with the microcontroller. So in this way, apart from operating the signal manually or by keeping them constant, the signal can be monitored and traffic can be controlled using the sensors and by measuring the density of traffic. Even, instead of clearing the traffic by the traffic police, the green will be signaled automatically, to give way for the ambulance by clicking the button provided. We can count the vehicles that pass through that lane by evaluating the number of times the IR rays have been obstructed.

We have used IR sensors in this system but instead of the other sensors such as ultrasonic sensors or any other powerful sensors may be used to make the device function more effectively. The well efficient sensors can distinguish between one obstacle and another. In India running system is time based to control the traffic signals and people experiencing a heavy traffic jams all over which in turn consumes lot of time and fuel [16].

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