Smart Traffic Management System

Introduction:

A smart traffic management system utilizing sensor data, communication and automated algorithms is to be developed to keep traffic flowing more smoothly. The aim is to optimally control the duration of green or red light for a specific traffic light at an intersection. The traffic signals should not flash the same stretch of green or red all the time, but should depend on the number of cars present. When traffic is heavy in one direction, the green lights should stay on longer. Due to traffic jams in large cities, emergency vehicles like ambulances are also affected, as a result many people could lose their life. The traffic light system has also been given an emergency mode, which gives ambulances priority to pass through traffic lights.

Motivation:

The motivations for using intelligent traffic light controllers are to implement hardware which is suitable for real life implementations. They include minimizing the delay or waiting time on road, design of safe and efficient traffic flow, assigning the right way and avoiding the overhead of traffic police.

- To manage the traffic in the road, one or more traffic police are appointed there to service the people from congestion in the road. But it's difficult to manage.
- Reducing congestion and energy consumption at intersection.
- Ensuring immediate clearance for emergency vehicles. Facilitating safer and shorter commute time.
- There is a need for a signal that directly closes once there are no more vehicles on the road in an intersection and opens the next road to avoid unnecessary waiting until the constant timer expires.
- There are many other drawbacks of the traditional traffic management systems due to the inability of the traditional traffic signals to help provide dynamic and adaptive services.

Literature Survey:

- Sanjay Kumar Sahu, Atul Basant, Taman Vasudev, Kusagra Khati, Nikhil Lawrence published a paper on Traffic Management System using IoT (2021). Working on the basis of IoT and its embedded network and it is taking real time data as the input to track the traffic management system and giving output in terms of time assigned to traffic lights on the basis of density.
- A Review of IoT Application in a Smart Traffic Management System by Md Khurram Monir Rabby, Muhammad Mobaidul Islam and Salman Monowar Imon (2019). This research presents an IoT-based control system uses real-time traffic information for controlling the traffic loads by changing the traffic signals. The mounted sensors and

cameras at strategic traffic junction collect vehicle density of the roads and divert the vehicle direction by changing the traffic signals frequently.

- Syed Arshad Basha, Deep Rakesh, Chirag, Mahesh, Prof. Satish Kumar published a journal on Smart Traffic Control using Arduino UNO and RF module. It is developed with integration of all hardware components Utilizing an IR sensor and RF technology, to effectively reduce the delay time for emergency vehicles.
- Harshal Gunda, Rishikesh Waghunde, Suraj Malwatkar, Aditya Desai, Pallavi Baviskar, Smart Traffic Management System Using Arduino and RFID Tags (2018). Using this system, there will be fewer chances for disobeying of traffic rules and number of accidents. Also, time delay for vehicles of emergency services to reach their destination will be less.
- Pendurthy Bhavana, Pediredla Likhitha, Chiluvuri Manoj, Lakshmi Sutha Kumar published a paper on IoT based Dynamic Road Traffic Management System (2022). In this paper, road traffic management system is designed using the IR sensors, Arduino Uno, 74HC595 and traffic lights. The system is simulated in the Proteus software. The sequence and duration of the GREEN signal is varied based on the density of the roads which is measured with the help of 4 IR sensors.

Advantages:

- Minimize number of Traffic
- Low Budget
- Easy Implementation
- Remotely Controllable
- Automation and Control

Disadvantages:

- Traffic Congestion
- Number of accidents are more
- It requires more manpower

Implementation Details:

Components Used:

- Arduino UNO: Based on the Microchip ATmega328P microcontroller, the Arduino UNO is an open-source microcontroller board. A variety of expansion boards (shields) and other circuits can be interfaced with the board's sets of digital and analog input/output (I/O) pins.

- IR Sensors: Based on the Microchip ATmega328P microcontroller, the Arduino UNO is an open-source microcontroller board. A variety of expansion boards (shields) and other circuits can be interfaced with the board's sets of digital and

analog input/output (I/O) pins. It also used to detect the object using in the Infrared radiation. The IR sensor contains a transmitter section that continuously transmits IR rays to be received by an IR receiver module. Depending on how well the receiver receives IR rays, its IR output terminal changes.

- RF Transmitter and Receiver Module: RF module operates at Radio Frequency. Using an RF transmitter and receiver, two devices can easily communicate over radio waves. The transmitter, and receiver (TX-RX) in the RF module are used in the proposed system's emergency mode to create a wireless remote connection that can be used to drive an output from a long distance.

- 7805 voltage regulators: The voltage regulator is one type of electrical part used to keep the voltage across any electronic device stable.

- LEDs: LEDs are used for the purpose of signalling according to the traffic condition.

There will 4 sensors across the 4 lanes with each lane having 2 sensors each, to give the data how much dense the lane is. In Normal mode, the system will work normally means the lanes sequence will be first A lane then B lane, then C lane and at last D lane. But in case if any of the lane gets more cars or gets denser than the other 3 lanes then that specific lane will open then the other with the second highest denser, then the same order continued to the other 2 lanes. If in case all the lanes have same number of vehicles then all the lanes will open in same order i.e. A, B, C, D.

In Emergency mode, the radio frequency signal is transmitted by activating switches. When the switches are turned on, a specific voltage of signal that is generated is encoded (converting parallel data into serial data), along with a few address bits, which adds security to the transmission of data. In order to establish serial communication between the transmitter and receiver, this encoded data is finally delivered to the data pin of the RF transmitter. To detect the in which lane the emergency vehicle is coming we has used IR Transmitter when the IR receiver on the road catches the IR signal from emergency Vehicle it changes the signal to green in that particular lane. As a result, when an emergency mode is engaged, it turns that direction's signal green while turning red for all other roads or directions that are approaching the Junction. So, in emergency mode traffic lights will be controlled by received data.

Gaps Identified:

Dealing with traffic is common among all the papers mentioned. Along with this we are going implement a model which will provide less congestion, and high priority for the emergency vehicles (Ambulance) which will allow to reach the destination on time.

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