International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 05 Issue: 09 | Sep 2018 www.irjet.net p-ISSN: 2395-0072

IOT BASED TRAFFIC CONGESTION MONITORING AND MANAGEMENT SYSTEM

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Abstract - *In today's world, traffic jams during rush hours is one of the major concerns. During rush hours, emergency vehicles like Ambulances, Police cars and Fire Brigade trucks get stuck in traffic jams. Due to this, these emergency vehicles are not able to reach their destinations in time, resulting to loss of human lives. An IOT based system has been developed to provide clearance to any emergency vehicle with aid of employing RFID technology by turning all the red lights to green on the path of the emergency vehicle. In addition to the green wave path, the system will track a stolen vehicle when it passes through a traffic light with help of RFID. By the proposal of this system an decrease in usage waiting time for traffic clearance is achieved. Drivers have a less stress to handle vehicles and can reduce accident rates to a greater extend. The proposed method can be a great relief to the traffic control department to handle traffic in a great way. This RFID & IOT employed detecting system is economically effective and perform as a superior system.*

Key Words: RFID, IOT, Traffic, Emergency vehicles, Green Wave.

1. INTRODUCTION

Traffic congestion is said to occur when the number of vehicles on road is greater than the capacity of the road. Traffic congestion on roads is the slower speed or halt of vehicles causing longer trip times and increased queues. Traffic congestion has become the newly generated conundrum in metropolitan cities of India. IoT refers to a system that involves all the physical objects around us and their communication with each other over the internet. The main motive of IoT is to simplify the day to day life of human beings. The increase in vehicle usage per head also leads to traffic congestion. Moreover, it has been seen that the conventional ways of curbing traffic congestion by signalling system with predefined set time for signals using microcontrollers was not efficient and is failing to achieve its objectives. Many researchers have come up with a model to deal with traffic congestion in a real-time scenario. The traffic management system is the only way one can address the problem of traffic congestion in Indian cities where the scope for augmenting road infrastructure is very minimal. IoT can help in altering traffic signal patterns, providing real-time traffic information and alerts to the drivers. RFID technology has a minimal security risk factor. The number of vehicles and their speeds is provided by sensors to a backend server to alter the traffic signal pattern as a traffic decongestion strategy. Hence, the idea to make the traffic signalling system adaptive depending upon vehicle density on the road was chosen to enumerate these issues and take necessary remedies to aid these serious problems.

1.1 Causes for Traffic Congestion

Most of the Indian cities still have poor public transport systems. Increasing population density puts a giant pressure on already existing transport infrastructure, affecting its quality. People now a days use their own transport due to the inconvenience of public buses or rails. Improvement on public transport and extra schemes like BRT. The Bus rapid Transport is enforced in some cities like Pune and it can be very helpful if implemented correctly. People ought to attempt to use carpooling and bike pooling to a larger extent as possible. Use of bicycles for smaller distances conjointly improves individual health together with reducing pollution and road congestion.

2. INTERNET OF THINGS

The internet of things (IoT) is the network of physical devices, vehicles, buildings and alternative things embedded with physical science, software, sensors, actuators, and network property that modify these objects to collect and exchange data. In 2013 the world Standards Initiative on internet of Things (IoT-GSI) outlined the IoT as "the infrastructure of the data society. The IoT permits objects to be detected and controlled remotely across existing network infrastructure, creating opportunities for heaps of direct integration of the physical world into computer-based systems, and ensuing in improved efficiency, accuracy and economic benefit. When IoT is increased with sensors and actuators, the technology becomes an instance of the a lot of general category of cyber-physical systems, that conjointly encompasses technologies like sensible grids, smart homes, intelligent transportation and smart cities. Each factor is unambiguously diagnosable through its embedded

automatic data processing system however is in a position to interoperate among the present internet infrastructure. Experts estimate that the IoT can incorporate virtually fifty billion objects by 2020.

3. EXISTING SYSTEM

The previous and existing system tend to offer a higher traffic congestion due to traditional methods. As of now only timing based traffic clearance is being followed regardless of high traffic areas. Due to this clearance becomes a tedious process. So to maintain a highly innovative and enhanced mode of transport, it is necessary to adopt a different method. As of now we knew maintaining a seamless traffic route is impossible without changes. Taking over bridges, subways and alternate routes may be effective in only some cases, but it doesn't work in a regular daily life. This issue not only affects an individual routine but creates a overall delay in entire activities. So upgrading and enhancing the present traffic clearance is a very necessary need.

3.1 Drawbacks of Existing System

- In existing method, automatic traffic management based upon vehicle type is difficult.
- There is no wireless technology available for monitoring.
- There is no support for detection of theft vehicle.
- Clearance of traffic is tedious.

4. LITERATURE SURVEY

Road Traffic Congestion Management Based On A Search-Allocation Approach By Al Qasemi Academic College Baqa El Ghabia, Israel published in the year 2017

Implementation of On road sensors were used to detect the density of traffic. In this way, the vehicles passing on the road over the sensors creates a change in inductance. This change in inductance creates a count of vehicle, but during peak hours the vehicles pass on a much faster rate and the interval of change in inductance cannot be recorded precisely. Creating the use of such sensor based environment needs a lot of investment and much manual works.

4. PROPOSED WORK

In the proposed system we are going to monitor the traffic system, emergency and theft vehicles easily by using cloud database by the combination of RFID and IoT technology. This system can deal with the improved monitoring of theft vehicle and traffic clearance in emergency conditions which is detected using the RFID reader and monitored using IoT.

In the proposed system to improve the existing system a new Green wave system is developed ,in which the traffic signal management for emergency vehicle is included. To make the proposed system to work, each and every vehicle going for registration is provided with a RFID tag. In which information like vehicle's unique registration number and vehicle type is stored. The vehicle type is mentioned as E (For Emergency) and N (For Normal) in the tag. These data are stored in the database in the Transport office. To read the information in tag a RFID reader is installed in the Traffic control unit. Whenever the vehicle passes through ,the signal reader gets the vehicle type and gives it to the controller unit. In which if any E (Emergency) type vehicle is found, that lane is made green with respect to the other lanes. To upgrade further more theft vehicle detection method is used. To find a theft vehicle, the user has to contact the Transport office to update the database of the vehicle with T (for Theft). So whenever a vehicle is passed through the traffic signal, the Control unit picks up the tag details and sent to the Transport office via IoT unit. From the obtained value the PC in the Transport office has to check with the database. If any theft vehicle is found, the control unit in the Transport office will send to Police station about the vehicle passing through the particular signal. Thus the police able to intercept the vehicle in the next possible path.

4.1 Block Diagram

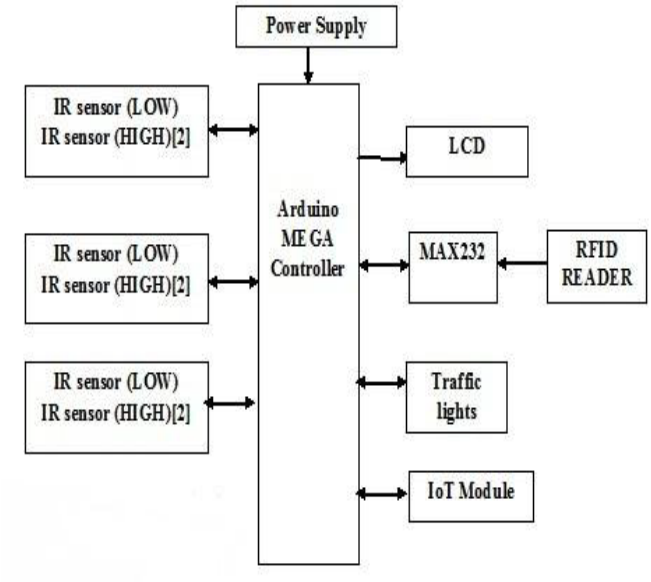

Fig 4.1 Block Diagram of Proposed Model

In the proposed system The Mega 2560 is a microcontroller board based on the ATmega2560 which acts as the brain of the model. This controls the entire functioning of the model. This receives the input from the IR sensors and RFID module to calculate the traffic rate.

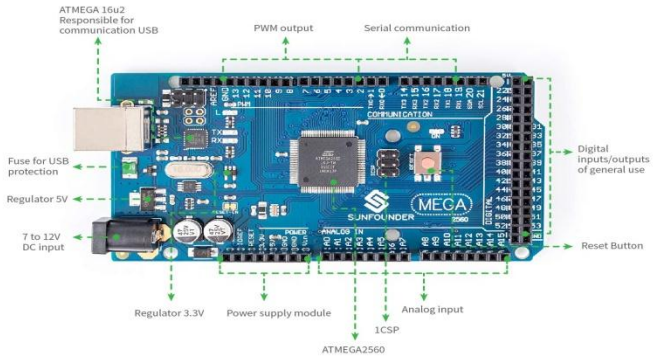

Fig 4.2 Arduino Mega 2560

A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs which displays the rate of traffic level to the public which has the minimum Vs maximum traffic.

A Light Emitting Diode (LED) is one of the latest inventions and is extensively used these days. From your cell phone to the large advertising display boards, the wide range of applications of these magical light bulbs can be witnessed almost everywhere.

An infrared sensor is an electronic device, that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measures only infrared radiation, rather than emitting it that is called as a passive IR sensor. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations.

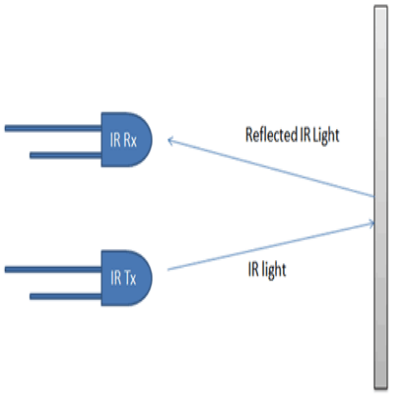

Fig 4.3 Working of IR sensor

4.2 Flow Chart

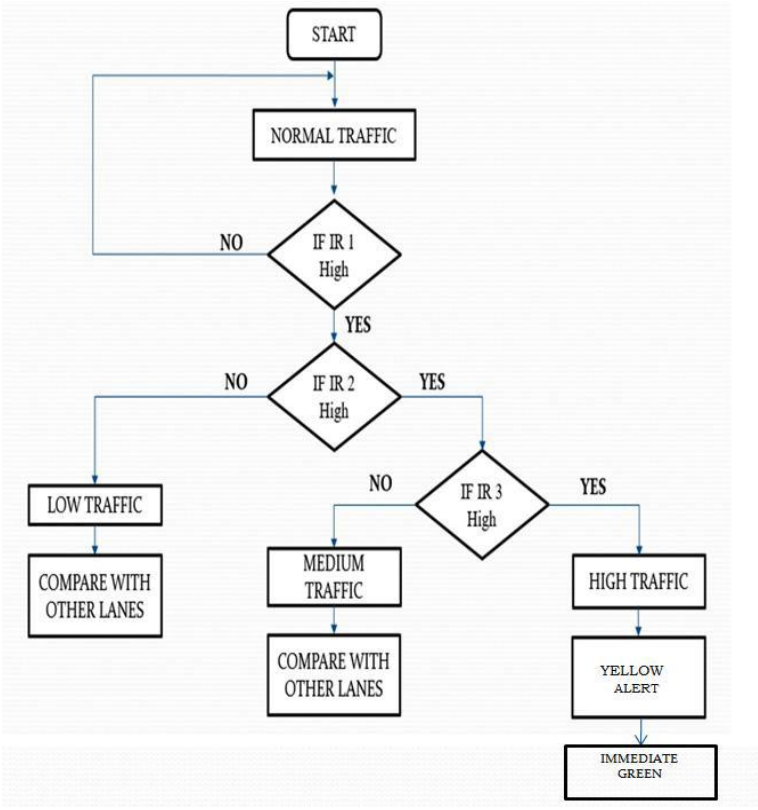

Fig 4.3 Flow of IR and switching of traffic signals

Here the density of the traffic is compared with the lanes in the priority of 'LOW', 'MEDIUM' & 'HIGH' using the IR sensor and the lane with high traffic is cleared first according to the algorithm.

For instance if lane 1 is of High Traffic IR detects and sends the information to the microcontroller and this information is processed and that particular lane is made green to clear the traffic by the priority.

As the lane with high traffic is made green the low traffic lane is made to wait with a RED signal and the vehicles are stalled.

When an emergency vehicle is about to enter the traffic ,the lane is cleared stalling other lanes to give way for the emergency vehicle.

Controversy to the emergency vehicle when an theft vehicle enters the lane in the same way the RFID reads the tag and sends the information to the microcontroller, the microcontrollers detects the Theft vehicle immediately the lane is made to stall using RED signal so the Theft vehicle can be easily recovered.

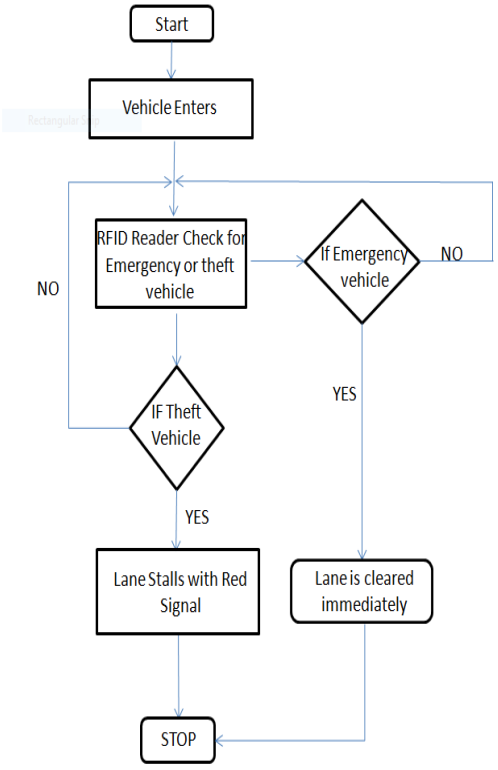

Fig 4.4 RFID Detection for Theft & Emergency Vehicle in Lane

Here the vehicle on entering the lane is readily scanned by the RFID reader in the junction.

When the vehicle ID is identified as either Theft or Emergency Vehicle the Following Cases are Applied

CASE 1: Theft Vehicle entering the Lane

Here when there is an entry of Theft vehicle the Predefined ID given to the Vehicle is readily scanned by the reader and given to the micro controller. The Microcontroller readily which has an active scan for the vehicle ,Controls the traffic signal and turns the signal to RED which halts the signal and displays the theft vehicle presence which can be easily retrieved. Here this helps in a faster recovery of the theft vehicle.

CASE 2: Emergency Case or Ambulance entry in the Lane

Incase when there is an emergency to clear the traffic or if suppose when an ambulance enters the high densely traffic routes the RFID tag given to those vehicles is similarly scanned in the same way and informed to the microcontroller and in turn the microcontroller takes necessary action to clear the traffic as soon as possible. The microcontroller changes the respective lane to GREEN and the vehicle can pass the traffic with less waiting time.

5. RESULTS

These are the results obtained from the proposed system.

5.1. High Traffic

In high traffic conditions the three IR sensors placed are on HIGH state condition and as per the priority the lane with highest traffic density is cleared first whereas the other lanes are stalled with a GREEN signal.

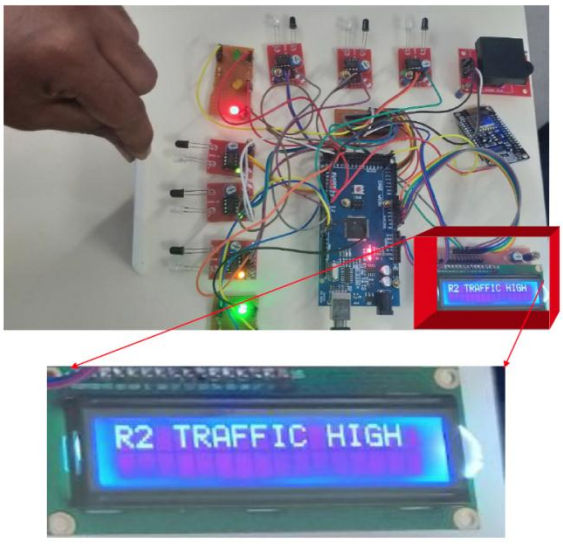

Fig 5.1 High Traffic Congestion Management

5.2. Emergency Vehicle

Here the Emergency vehicle which is given an identity tag of 12 digit numbers On reaching the traffic can be easily detected by the RFID tag which is indicated in the above figure. The information from the RFID is given to the AT-MEGA microcontroller which clears the traffic.

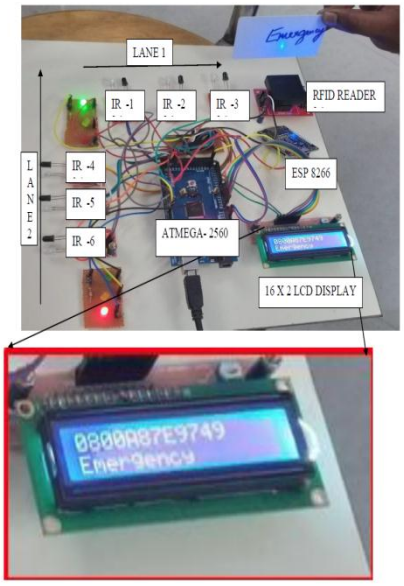

Fig 5.2 Emergency Vehicle Management

5.3. Theft Vehicle

As in the case of the Theft Vehicle the lane is stopped to identify the theft vehicle. Here the aim of the microcontroller is to recognize and stall the theft vehicle. So once the theft vehicle enters the RFID containing lane in the way which emergency vehicle was recognized the theft vehicle with unique ID is also recognized ad given to the microcontroller. Once the microcontroller recognizes the vehicle as a theft vehicle, the lane is turned to RED signal and the lane is stalled. This stops the passage of theft vehicle and can be retrieved.

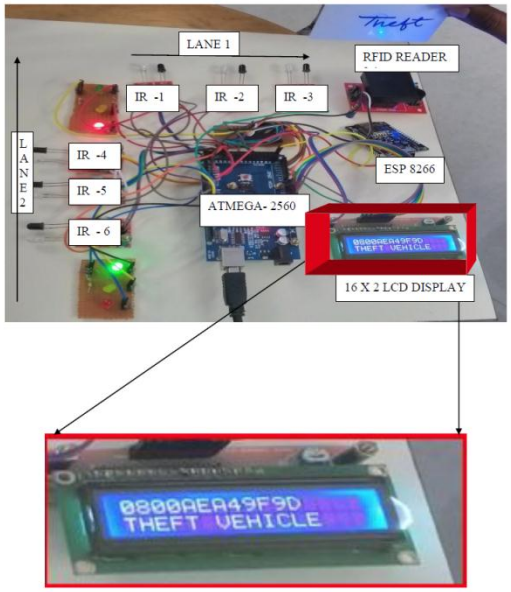

Fig 5.3 Theft Vehicle Detection

5.4. IOT Monitoring section

Integration of IOT information on density of traffic gives a great hand to public. So by the information from the cloud server the details of information on density of the traffic can be easily informed to the users so public could take alternate routes and avoid traffic. This not only helps individual to escape traffic but also entry of new vehicles in an already dense traffic routes.

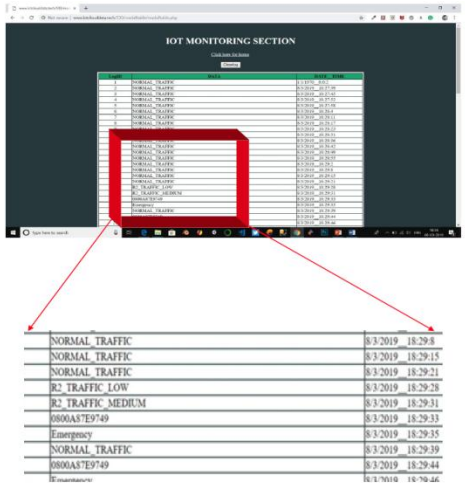

Fig 5.4 IOT Live Monitoring

6. CONCLUSION

Thus the vehicular assistance with sensors and advanced IoT tracking can be helpful in creating a safer experience for the travelers. By implementation of this method many lives could be saved in an efficient manner. On time medication failure is the main cause for the loss of many lives, so such a negative case could be avoided. Loss of vehicles can be a serious loss to a common man,

Tracking and retrieval of such vehicles can avoid a great economical loss.

Such vehicular information can also be useful for Legal cases and investigation to the Police department as easy steps can be made with ready information available from the cloud server and the rate of crime can also be reduced to a greater extend.

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