CHAPTER 1

INTRODUCTION

Internet of Things (IOT), also called Internet of Everything is the network of physical objects or “things” embedded with electronics, software, sensors, and connectivity to enable objects to exchange data with the production, operator and/or other connected devices. The Internet of Things allows objects to be sensed and controlled remotely across existing network infrastructure, creating opportunities for more direct integration between the physical world and computer-based systems, and resulting in improved efficiency, accuracy and economic benefit. Each thing is uniquely identifiable through its embedded computing system but is able to interoperate within the existing Internet infrastructure. Experts estimate that the IOT will consist of almost 50
billion objects by 2020.

Nowadays new technologies are emerging for high resolution traffic monitoring based on either mobile or fixed wireless-interconnected sensing devices. Traffic management is becoming an increasingly serious concern due the rapid rate of increase of vehicles. The growth and scale of vehicles today makes management of traffic a recurring problem. Increasing width of highway roads comes with a high premium of cost, time, effort and disruption of vehicle movement. The basic traffic architecture is shown in fig. 1.

Traffic Congestion is a major concern in metropolitan cities. The existing system works based on a timing mechanism, meaning an equal time slot is provided for each junction. There is some modern traffic signal where timing are controlled manually. Though uniform timing is a good mechanism when all routes have the same number of vehicles to cross the junction it does not necessarily mean that it works equally efficiently when there is non-uniform flow of vehicles in each route. Hence there is a need for a system which is adaptive in nature. Routes should have an option of being granted more time slots depending on the requirements for the given route. Here we are going to propose a traffic congestion control system which would be adaptive in nature and provide time slot to each route based on traffic density.

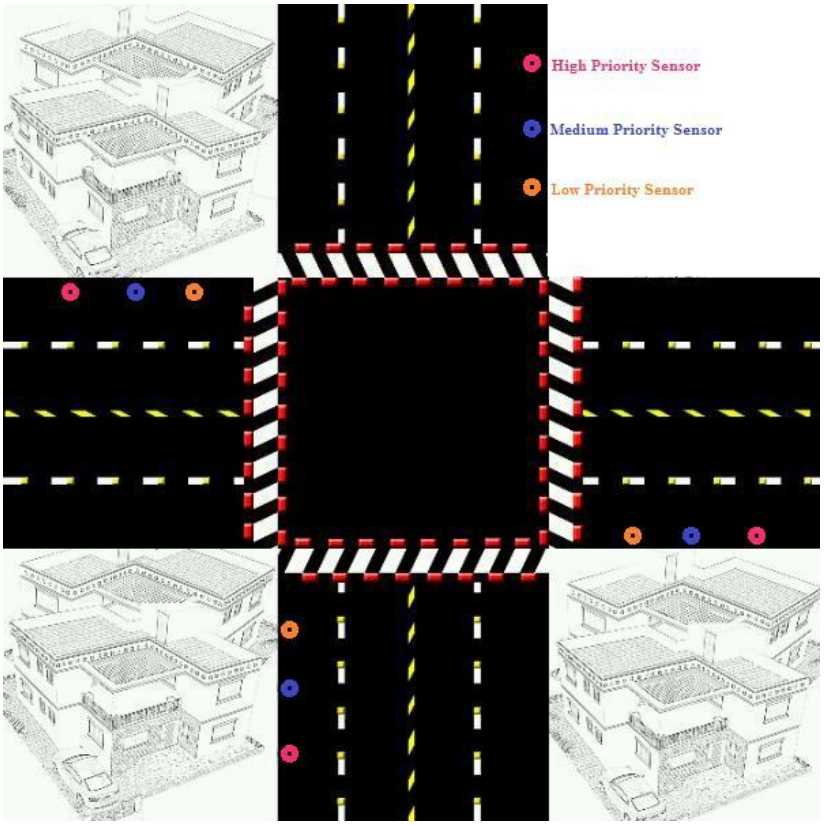


Fig-1: Basic Traffic System Architecture

In this paper, we are going to propose a traffic congestion control system which would be adaptive in nature and provide time slot to each route based on traffic density.

1.1 Problem Statement

The purpose of this project is to develop a series of systems model for traffic passing through a 4-way intersection, controlled by traffic light. We will assume that arrangement of traffic lights and road lanes is fixed and that the lights switch from red to green to amber in a regular repetitive pattern. Moreover, we assume that driver behavior is constrained by the road rules and the desire to avoid vehicle collisions.

1.2 Objective

- The main objective of this paper is to build a vehicle traffic monitoring system and controlling system based on priority using IOT platform.

1.3 Scope

- The current Indian traffic condition works on the signal and clock based traffic monitoring system.
- The lack of sensors and traffic control causes wastage of money and fuel which also omits amount air polluters like carbon monoxide every year, so we find that with the help of IOT, The road traffic problem can be solved on basis of the Internet of Things concepts.
- Our system is implemented on 2-lane road and we will also implement this approach on 4-lane road or on Highway.

CHAPTER 2

LITERATURE REVIEW

In this chapter, critical evaluation & summary of all research papers that were read related to project are given. For existing systems advantages and disadvantages are mentioned below.

2.1 CRITICAL EVALUATION OF JOURNAL PAPERS

Paper 1: PLC based Traffic Density Control using Sensors.

Sultane Shubham,Chawda Harshraj, Karani Kinjal,Gajjar Ashini and Miss. Bhagirathi Dodiya had develop a system after doing the research which will control traffic using sensor. The scope of this paper is to present the initial steps in the implementation of a traffic light control system using PLC and SCADA. The SCADA with PLC logic ladder is used for monitoring the system and helps in improving public transport services that also improve traffic guidance. The system developed by setting the appropriate duration for the traffic signals to react accordingly. The critical timing operation is required to be carried out under the existence of heavy traffic conditions. The system for traffic control system must contain low power consumption, low project cost, increases safety. The PLC checks the status of the sensors. The system resolution is dependent on the output provided by the sensors, then PLC checks the priorities and then provide output signal to the traffic light poles for ON or OFF the red, yellow or green lights and ON time is dependent on the specific priorities. The new timing scheme that was implemented promises an improvement in the current traffic light system and this system is feasible, affordable and ready to be implemented especially during peak hours, off hours and pedestrians. The PLC checks the status of the sensors. The system resolution is depend on the output provided by the sensors , Then PLC checks the priorities and then provide output signal to the traffic lights poles for ON or OFF the Red, yellow or Green lights and ON time is depend on the specific priorities. The roads are opened in that manner that east road, west road, north road and then south road is open.

Paper 2: Density based traffic light control using arduino.

S.Sundara Mahalingam and S.Arockiaraj they had both work had decided for the traffic control system. Traffic congestion is a severe problem in many major cities across the world and it has become a

nightmare for the commuters in these cities. Traffic can be controlled in several main junctions by incorporating either automatic traffic light control or traffic police. But conventional traffic light system is based on fixed time concept allotted to each side of the junction which cannot be varied as per varying traffic density. At some times, priority of traffic light needs to be changed based on more number of vehicles waiting in same road, VIPs vehicles and Ambulance vehicles etc. We propose to design and develop a density based traffic signal system. The signal changes automatically on sensing the traffic density at the junction. The prototype model was developed using IR sensors and Arduino. We use Arduino to write programming according to our requirements due to its simplicity and economy and IR sensors is used to measure the traffic density in a particular road. IR sensors may have limitations that it will work in normal light also. As a result, traffic light works in improper way. In future, it may be improved by using some suitable sensors. IR sensors are arranged on each road in accurate manner to detect traffic density properly; these sensors always sense the traffic on that particular road. All these sensors are interfaced to the arduino. Based on these sensors, controller detects the traffic and controls the traffic system. The controls of traffic light depend on number of vehicles available in the road. Density of the road is calculated using IR sensors. IR sensors are used to detect the number of vehicles based on the IR sensor, the traffic light is operated.IR sensors are less cost and more effective. This project can be extended by using Sound sensors, priority can be given to the sound sensor than the IR sensor and this will indicate the presence of ambulance and fire engine.

Paper 3: IOT Based Traffic Signalling System.

Ashok. P.V, SivaSankari.S, Vignesh Mani and Suresh Sankaranarayanan made a effective system which control traffic signal using IOT. we still rely on Traffic police towards regulating the traffic signaling system based on traffic density. There has been some research work carried out in automating the traffic signals by employing image processing, Infra Red sensor and in some places prioritization in traffic signaling towards emergency vehicles based on fuzzy logic. The challenge with all these system is that it is very expensive while employing camera for capturing the traffic for regulating the traffic signal. In employing Infra Red sensor, the proximity of vehicle and sensor need to be very close for calculating the density for controlling the traffic signal. So to obviate the above mentioned drawbacks and with the upcoming of Machine to Machine Communication leading to IoT, we here have developed an IoT based Traffic Signaling system where ultrasonic sensors deployed at every 50 meters of road which would capture the traffic density and communicate to Arduino for changing the traffic signal accordingly. This information sent to Pi3 using Wifi Module where analysis made on Heavy

traffic and less traffic with date and time and the same communicated to Web page of cloud which can be viewed by the Traffic police authorities for further analysis. So accordingly with the upcoming of Machine to Machine Communication employing IoT, we here have developed IOT Based Traffic Signaling System where ultrasonic sensor deployed on sides of road every 50 meters to count the number of vehicles. The traffic density information is sent to Arduino microcontroller where based on the condition the traffic signal changed accordingly by allotting more time for heavy traffic and less time for normal traffic. This information sent to Raspberry Pi3 where analysis traffic been done as heavy and normal traffic based on number of vehicles with date and time. This information sent to Webpage of cloud server. The system so developed is not fully complete as we have developed a prototype only for controlling density. In future, we propose to extend the system for of alleviating traffic congestion by capturing the traffic density information. In addition the traffic density information need to be secured while transmitting the information for controlling the traffic signal.

PAPER:4 IOT Based Traffic Light Controller in Smart City

Dr.Sanjeev Sharma,Vaishnavi Giradkar,Aarti Sanap and Snehal Sarolkar had tried to build a system in which they are going to built iot based traffic controller in smart cities. Nowadays Traffic congestion has become major problem in rapidly expanding cities of India which drastically increase air pollution, Fluid consumption as well as vehicular density. This necessitates to find a new way for controlling traffic system. This has been managed through real time traffic density management using IOT.An intelligent traffic management system has been designed to control traffic system which includes components consisting of raspberry pi, IR sensor, LCD display.Raspberry pi is the key component which is used to control all performance multitasking.IR sensor is used to monitor the density of traffic.The corresponding data are then made available on website in order to display the traffic status so that people will get early update and can avoid the traffic jams. IOT is the network which controls the physical devices though internet. This network provides precise, quick and exact outcome. IoT system is designed to store all database in computer. This storage is done mainly via internet. Further this database is used accordingly as per their requirements and applications.IoT system thus enables the components to be accessed from far distance which ultimately reduces human work or his interference. This make it more economical system. Thus, various protocols can be used accordingly to respective domain in IOT. The major communication form on the internet is human-human, but in future there will be everything i.e.the object will have a unique identification number. The communication form will extend to from human-human to human-thing and also to thing-thing. This

will enable through various sensors connected via internet. Fundamentally, IOT is connecting different application devices to each other through internet. This is possible because of sensors which aids to transmit a wide variety of data, location. Traffic congestion has become critical problem in crowded cities of India because of its highly growing population.Thus there is needs to obtain a solution to this problem.Therefore, IOT concept has been used to solve this problem.If traffic lights works depending upon the vehicle number in a lane/road, then time management for traffic lights can be done and congestion could be reduced dramatically.

PAPER:5 IOT based smart traffic signal monitoring system using vehicles counts.

Senthil Kumar Janahan1,M.R.M. Veeramanickam,S. Arun, Kumar Narayanan, R. Anandan, Shaik Javed Parvez made system which control traffic using vehicle counts.Traffic signal management is one of the major problematic issues in the current situation. Such scenarios, every signal are getting 60 seconds of timing on the road at a regular interval, even when traffic on that particular road is dense. As per this proposed model in this article, which will be optimized the timing interval of the traffic signal purely depends on the number of vehicles on that particular roadside. The major advantage of this system is that it can able to decrease the more waiting time for the drivers to cross road signal. In this model, we are using the clustering algorithms model which is based on KNN algorithm. Using this algorithm new model will be liable to determine expected required timing as per provided inputs to the signal which is vehicles count. The input of these systems is vehicles counts on each side of the road from crossing signal.This input will be determined on much time is to be provided. Case studies on this system are traffic network and real-time traffic sub-networks are organized to get the effectiveness of the proposed model. Traffic Monitoring Signal timing has been developed by using multiple features of hardware components in IOT. Traffic optimization is achieved using IOT platform for efficient utilizing allocating varying time to all traffic signal according to available vehicles count in road path. TMS will helpful to client user to know timing arability and traffic flow count in any area of their nearby locality of any regions.

Paper 6: Intelligent Traffic Monitoring System

Satya Priya Biswas, Paromita Roy, Nivedita Patra, Amartya Mukherjee and Nilanjan Dey they had decided to new way for controlling traffic using ITS model. A model is proposed which uses infrared proximity sensors and a centrally placed microcontroller and uses vehicular length along a length to

implement intelligent traffic monitoring system.Apart from surveying various research works on ITS, this system proposes a model which follows a simple algorithm based on the length of traffic on each lane. The length of traffic on the other lanes affects the time allotted to the current lane. Proximity sensors instead of WAN are to be used to determine the length of the traffic. It also manages the occurrence of any emergency vehicles such as ambulance, fire brigade, etc. in any lane and also provides the mechanism to detect the route of a vehicle. They used methodology in this model, infrared proximity sensor and RF modules have been used to design the system. The infrared sensors will be used to collect data from the lane and fetch the collected data to the microcontroller. The advantages of this system is that provide priority based signaling. Disadvantage of this system is very time consuming because of less avaibility of sensor.

Paper 7: IOT Based Traffic Light Controller in Smart City

Dr.Sanjeev Sharma, Vaishnavi Giradkar, Aarti Sanap, Snehal Sarolkar they had decided to a new way for controlling traffic system. This has been managed through real time traffic density management using IOT. An intelligent traffic management system has been designed to control traffic system which includes components consisting of raspberry pi, IR sensor, LCD display. The corresponding data are then made available on website in order to display the traffic status so that people will get early update and can avoid the traffic jams. IOT is the network which controls the physical devices though internet. IOT system is designed to store all database in computer. This storage is done mainly via internet. IOT is connecting different application devices to each other through internet. This is possible because of sensors which aids to transmit a wide variety of data, Location. The research had built this system based on IOT concept has been used to solve traffic problem. If traffic lights works depending upon the vehicle number in a lane/road, then time management for traffic lights can be done and congestion could be reduced dramatically. The researcher had developed this system by using methodology like webpage. There are number of vehicles on the road which are sensed by the sensors. Road side unit contains raspberry pi. Congestion measurement is done through the raspberry pi. Time of traffic light will be reduced for that road so that traffic congestion problem will be reduce data. The advantage of this system is that they had built system which is provide density based timing and also reduce pollution and fuel consumption. Disadvantage is that this system not provide activity for emergency vehicles.

Paper 8: Smart Traffic Management System Using Internet of Things

Sabeen Javaid, Ali Sufian, Saima Pervaiz, Mehak Tanveer they had work a smart traffic management system using the Internet of Things (IOT) is proposed in this system. A hybrid approach (combination of centralized and decentralized) is used to optimize traffic flow on roads and an algorithm is devised to manage various traffic situations efficiently. The system takes traffic density as input from a) cameras b) and sensors, then manages traffic signals. Another algorithm based on Artificial Intelligence is used to predict the traffic density for future to minimize the traffic congestion. Besides this, RFIDs are also used to prioritize the emergency vehicles such as ambulances and fire brigade vehicles during a traffic jam. The proposed system manages the traffic on local and centralized servers by exploiting the concepts of IOT and Artificial Intelligence together. The representation of traffic data in statistical form can also be helpful to authorities for real-time controlling and managing traffic. This system is also capable of managing emergency situations like if the smoke and fire are detected on the road. In case of fire on the road, which is detected by flame sensors and extensive smoke through smoke sensors. They used methodology in system is divided into three layers. Data Acquisition and Collection layer, Data Processing and Decision-making layer, Application and Actuation layer. The advantage of this system is that show daily, weekly, monthly, yearly data of traffic jam. And also reduce pollution and fuel consumption. Disadvantage of this system is that priority based signalling is not provide. The system also provides useful information to higher authorities that can be used in road planning which helps in optimal usage of resources.

Paper 9: An IOT Based Traffic Signal Monitoring and Controlling System Using Density Measure of Vehicles

Dr.B.Prakash, M.Naga Sai Roopa, B. Sowjanya, A. Pradyumna Kumar they had decided to make a framework where IR sensors are incorporated with an Arduino to work the paths which measure the movement thickness. This incorporated arrangement of movement is Internet of Things (IOT) based which likewise empowers to clear the activity for emergency vehicle by giving a catch in rescue vehicle so the activity gets cleared on that side. The framework is an IOT based framework which flags the movement lights by thinking about the vehicles thickness. To do the they utilize sensors. The sensors will quantify the activity thickness and isolate it into low, medium and high classifications. They used methodology using Arduino, IR sensor, LED, GSM. Arduinos (they utilize the standard Arduino Uno) are worked around an AtMega microcontroller basically an entire PC with CPU, RAM, Flash memory, and

information/yield sticks, all on a solitary chip. IR sensors work by utilizing a particular light sensor to recognize a select light wavelength in the Infra-Red (IR) range. A GSM (Global System for Mobile correspondences) is an open, advanced cell innovation utilized for transmitting versatile voice and information administrations. The data collected from the IR sensor is used to generate vehicles density. The information regarding the density is sent to the server time to time using GSM. The advantage of this system is that provide activity for clear emergency vehicles and also easily remove traffic congestion using IOT based traffic monitoring system. Disadvantage of this system is that Based on traffic, timer is already set Low: 3 secs Medium: 50 secs High: 1 min

Paper 10: Density Based Smart Traffic System with Real Time Data Analysis Using IOT

Nikhil Nair, J.John Paul, Sheena Mariam Jacob, Naga Harsha .J they had decided work in order to calculate the density of traffic various sensors can be used to make system more efficient. In this proposed system Ultrasound Sensors are used along with Image Processing(using live feed from a camera) that works on a Raspberry Pi platform and calculates the vehicle density and dynamically allots time for different levels of traffic. This in turn allows better signal control and effective management of traffic thereby reducing the probability of a collision. By using Internet Of Things(IOT) real time data from the system can be collected, stored and managed on a cloud. This data can be used to interpret the signal duration in-case any of the sensing equipment fail, and also for future analysis. This proposed system aims to calculate the density of traffic by using a combination of ultrasound sensors and a camera to find the level of traffic in a lane. These levels are classified as low, medium ,and high and is dependent on the length of the road and the density of traffic in that area.This system contain three ultra sound sensors are placed at fixed locations having equal distances(calculated based on the length of the road, and the traffic density in the region) on the road. The first sensor is for low, second for medium and third for high density of traffic. A camera is used to view the traffic on the road, and the images collected from it are processed using suitable algorithms. The advantage of this system is that this system reduce pollution and fuel consumption and also easy to implement. Disadvantage of this system is that this system is not adaptable to support traffic during an unexpected situation or during an accident.

Paper 11: IOT based Smart Traffic Light Control System

Anna Merine George, V.I GEORGE has found that Traffic Congestion and traffic monitoring is one of the important problems all over the world. This work uses IOT and Adaptive Neuro Fuzzy Inference System (ANFIS) to improve traffic conditions. An ANFIS traffic light controller with inputs as waiting time and vehicle density is developed using MATLAB SIMULINK environment. A camera is used to capture the traffic scenes and this image is transferred to the cloud using Arduino UNO and Thing Speak Platform. The image is then analyzed in the server using ANFIS controller and appropriate control signals are sent to the traffic signals. Image Processing and Intelligent controls are applied to traffic data to optimize the flow of random traffic volumes. This enhances the vehicular throughput and minimizes delays in roads. The steps involved in the work include: 1) Developing an Adaptive Neuro Fuzzy traffic light controller based on traffic density and waiting time of vehicles using MATLAB SIMULINK environment.2)Transferring images to cloud using Thing Speak Platform and Arduino UNO.3) Providing appropriate signals to traffic light based on the control action. An image sensor is used to identify vehicles in a traffic lane. The data from camera sensor is sent to cloud for analysis. The traffic data is extracted from the image using image processing techniques. Day time vehicle detection methods cannot be used for Night time vehicle detection due to poor illumination conditions at night. The method used for night time vehicle detection is Ostu's method of image thresholding. Here the image is segmented such that variance between the foreground class and background class is maximized. Using blob analysis the vehicle headlights are obtained as blobs and traffic density for a lane is obtained by dividing the total count by 2. Hence, the conclusion of this paper is that IOT based road can improve travel time, road safety and reduce traffic congestions. It will enable police officers to view real-time traffic condition. As a step ahead MATLAB can be linked to Thing Speak Platform to perform analyses of traffic data. Augmented reality used in traffic will increase safety and comfort for the drivers as well as pave the way for autonomous driving functions. With the help of augmented reality critical information such as speed and navigation path can be seen while looking at the road ahead.

Paper 12: An IOT Platform for Vehicle Traffic Monitoring System and Controlling System Based on Priority

Varsha sahadev nagmode, Prof.Dr.S.M.Rajbhoj has develop an IOT based traffic monitoring system. Due to increase population, size of cities expands, automatically number of vehicles increases in the major scale on roads. There are many problems such as travel time delay, fuel wastage, air pollution

and create issues related to transport. So traffic monitoring and controlling is the biggest challenge on traffic management authorities. We design and develop system for real-time traffic monitoring using Internet of Things (IoT) platform and sensing technology. In this system, Ultrasonic sensors are used to detect vehicle traffic levels at the lanes, this data is received at the controller and transmitted to web server through a Wi-Fi module. The monitored data is stored and analyzed in the server. In the proposed system array of ultrasonic sensors equipped at roadside for monitoring traffic levels. Roadside sensors are detecting vehicles and find the traffic level at that lane. Such levels are low, medium and high which mounted at the particular distance gap. The data sensed continuous and send to controller for detecting traffic levels. If the traffic level is high, then controller control signal timing at that lane and gives more time to pass vehicles. If low traffic level detects then controller control signal timing at that lane gives less time to pass a vehicle. So this system gives priority to emergency vehicle at a high traffic level. The controller communicates with the priority system through RF Transceivers. It is used to transmit as well as receive warning message or any traffic status from the controller unit to priority system. The same data displays on the Liquid Crystal Display (LCD) unit. The information about traffic levels and its time and date sent to server of authorized open source. This data analyzed by IoT analytics open source and stored in the server database for future analysis. Our country is ranked highest in the world for traffic related problems, thus there is the need to reduce traffic related issues such as long travelling time, fuel wastage, air pollution and transport related problems, this proposed system developed. Here developed system for real-time traffic monitoring using IoT platform which is reliable for users. This system also controls signal time, according to traffic levels at the lanes, gives priority to emergency vehicle. The proposed system is more reliable, easily operates by users and low cost system and easily equipped at any place.

Paper 13: Raspberry Pi Controlled Traffic Density Monitoring System

1Sk Riyazhussain, 2Riyazhussain, 3C.R.S. Lokesh, 4P.Vamsikrishna, 5Goli Rohan explains about a Raspberry Pi controlled Traffic Density monitoring system. Raspberry Pi is a single board computer which can be effectively used for multi-functionalities. Here is the one of the ways of using this for multiple purposes. It is used for traffic surveillance purpose where the traffic is continuously monitored and recorded. In addition to this, it is used for detecting the traffic density and gives the traffic report to the travelers. This traffic report is updated periodically and displayed on the screens installed at the public places. These screens can also be used for advertising purposes which is an additional advantage. Using Raspberry Pi one can manage the preference of advertising and displaying

traffic report. Here the system proposed by the author uses: Raspberry Pi, Traffic Density, Live Streaming, Advertisements, Traffic Surveillance. The main aim of the system is to estimate the traffic density and traffic surveillance. This is done by using Computer Vision Open CV is an open source computer vision library. The system consists of Raspberry Pi, Camera, Advertising screens. As already mentioned Raspberry Pi is a mini computer, it is installed with OpenCV module [5]. Camera is interfaced with the Raspberry Pi through USB port. Advertising screen is interfaced through HDMI cable of Raspberry Pi. After completing all installations, the system is mounted in the best place that fits the purpose. The system is powered on. Camera continuously monitors the vehicles travelling on the road and counts each vehicle. This count is given to database along with the camera id. The details will be stored in database. The traffic density of a particular road will be shown on the screen by retrieving data from database. The effect of density if shown in different colors like red for higher density or green for low density traffic. This TDM system can be widely used in public places which helps out people avoid traffic in emergency conditions. In addition, traffic surveillance can be done without any extra hardware. The advertising is extra feature which adds profit to our systems. As a whole this system serves multi-purposes. As an extension to this project the traffic density estimation can be displayed in a mobile application so that users can easily search for desired place traffic. Thus it becomes more user friendly.

Paper 14: An IOT based Intelligent Traffic Congestion Control System for Road Crossings

Pampa Sadhukhan,Firoj Gazi they both work on the issue realted traffic congestion control system.Traffic congestion is one of the major issues with the public transportation system in recent time. The traffic congestion has a negative impact on the productivity of a country. Hence traffic congestion control has become an important area of research. Among these, vehicle-to-vehicle(V2V)communication based approaches cannot accurately estimate the density of traffic congestion.on the other hand, the traffic signaling system having predetermined fixed operation time cannot manage the traffic volume changing overtime and thus, long traffic queues are generated at the road crossings To address the above mentioned issue, this paper proposes an internet-of-things(IoT)based intelligent traffic congestion control system that dynamically sets the signal operation time based on the measured values of traffic congestion density. Traffic congestion is one of the major issues with the public transportation system of all developing countries in recent time, as it not only increases the fuel consumption but also the air pollution as well as the risk of heart attack. This paper

presents an IoT-based intelligent traffic congestion control system in order to reduce the congestion delay via dynamic management of traffic signals at the road crossings. The proposed congestion control system dynamically sets signal operation time based on the estimated values of traffic congestion density and it also employs a novel technique of estimating the density of traffic congestion by using USN.

Paper 15: An IOT Based Automated Traffic Control System With Real-Time Update Capability

An automated microcontroller based traffic control system using sensors along with live web updates can be a helpful step in optimizing the traffic flow pattern in busy intersections. This intuitive design of the transport infrastructure can help alleviate the traffic congestion problem in crowded cities. This paper describes a system where ultrasonic sensors are integrated with the Raspberry Pi to operate the lanes of an intersection based on the density of traffic. The current condition of the intersection is updated on a user accessible website. This integration of traffic systems in an Internet of Things (IOT) fashion enables the addition of smart security and road safety devices. Ultrasonic sensors are used to detect vehicle traffic levels at the lanes, this data is received at the controller and transmitted to web server through a Wi-Fi module. According to that instruction are given to the signals. The components used in this system are as follow: Raspberry pi 3, MCP23S17, Ultrasonic Sensor HC-SR04, Buzzer , Light Emitting Diode (LED), Dual 7-Segment Display. The density of traffic is computed to three fixed levels called Low, Medium and High. Each lane uses data from three ultrasonic sensors to examine the level of traffic. If the distance calculated by using (1) is less than the threshold value, the output from that is sensor is taken as ‘1’, else the output is considered to ‘0’. An output of ‘1’ signifies that a vehicle is present at that location, while an output of ‘0’ signifies an empty lane at that position. A more efficient and safe traffic ecosystem has been developed which provide commuters with live update of the road condition in a website. In the fixed timer traffic system, the lane signals are operated one after another based on a fixed set timer. This causes traffic congestion on a high traffic lane due to wasted time on a low traffic lane, and this also restricts the use of new technology. The automated traffic system discussed in this paper can reduce the time spent by commuters on traffic signals and reduce traffic congestion on busy lanes caused by unnecessary signals on empty lanes. It can also ensure safety of pedestrians using the buzzer alert if vehicles block the zebra crossing. It can also help commuters reroute their destinations using the live traffic update from the website. This IOT based automated traffic system can be a significant step towards the development of future smart cities.

Paper 16: IOT based Traffic Light Control System using Raspberry Pi

Prof.S.D.Sawant, Elizabeth Basil they had decided to make a system where Congestion in traffic is a serious issue. In existing system signal timings are fixed and they are independent of traffic density. Large red light delays leads to traffic congestion. In this paper, IoT based traffic control system is implemented in which signal timings are updated based on the vehicle counting.This system consists of WI-FI transceiver module it transmits the vehicle count of the current system to the next traffic signal.Based on traffic density of previous signal it controls the signals of the next signal. The system is based on raspberry-pi and Arduino. Image processing of traffic video is done in MATLAB with simulink support. The whole vehicle counting is performed by raspberry pi.so basically this system is first read the camera image and than convert into the RGB to Gray conversion and then thresholding after that blob analysis and than counting vehicle and send data to wifi module of module of ardunio and than open the green signal after if the greater density then green signal or if law density than red signal. This paper discusses the IOT based traffic control system in which signal timings are updated based on the vehicle density on the road. The proposed system is implemented using raspberry pi and Arduino. MATLAB Simulink support package leads to easy implementation of the system. Density measurement is performed by raspberry pi. Proposed system gives good performance and helps to reduce traffic congestion. Results shows vehicle counting in real time.The proposed system is suitable for real time vehiclemanagement.

Paper 17: Smart Traffic Light Control System

Bilal Ghazal, Khaled EIKhatib, Khaled Chahine, Mohamad Kherfan. had develop a system after for traffic light system.Traffic light control systems are widely used to monitor and control the flow of automobiles through the junction of many roads. They aim to realize smooth motion of cars in the transportation routes. However, the synchronization of multiple traffic light systems at adjacent intersections is a com plicated problem given the various parameters involved. Conventional systems do not handle variable flows approaching the junctions. In addition, the mutual interference between adjacent traffic light systems, the disparity of cars flow with time, the accidents, the passage of emergency vehicles, and the pedestrian crossing are not implemented in the existing traffic system. This leads to traffic jam and congestion. We propose a system based on PIC microcontroller that evaluates the traffic density using IR sensors and accomplishes dynamic timing slots with different levels.Moreover, a portable controller device is designed to solve the problem of emergency vehicles stuck in the overcrowded roads. The system is capable of estimating the traffic density using IR sensors posted on either side of the roads. Based on this information, the time dedicated for the green light will

be extended to allow large flow of cars in case of traffic jam, or reduced to prevent unnecessary waiting time when no cars are present at the opposite route. The system is complemented by portable controller for the emergency vehicles stuck in the traffic .The proposed smart traffic system consists of a traffic light controller that manages the traffic lights of a "+" junction of mono directional roads. The system is capable of estimating the traffic density using IR sensors posted on either side of the roads. Based on this information, the time dedicated for the green light will be extended to allow large flow of cars in case of traffic jam, or reduced to prevent unnecessary waiting time when no cars are present at the opposite route. The system is complemented by portable controller for the emergency vehicles stuck in the traffic. By means of secure communication using XBee wireless system, the portable controller triggers the traffic master controller to the emergency mode and provides an open path until the stuck emergency vehicle traverses the intersection.

Paper 18: IOT based Road Traffic Surveillance and Accident Detection System

Rickin Patel, Vipul K. Dabhi, Harshadkumar B. Prajapati they had both work had decided for Road Traffic is one of the most vital problem in our hastily developing world. This paper presents of study of different aspects and issues related to the problem. This paper emphasizes on using prominent technology -Internet of Things(IoT) for developing smart system to monitor various parameters related to road traffic and using it for effective solution. The survey of the existing systems and concerned techniques related to the problem area are discussed. Different issues like vehicle detection, occlusion detection, lane projectile detection, accident detection and related methods to solve these issues are explored.We propose our ”IoT based traffic monitoring and accident detection system” consisting of Raspberry pi, and pi camera as hardware which will use live video as input and process it for gathering information about the live traffic. The systemgenerates information regarding the traffic such as number of vehicles, emergency accident situations, and improper projectile of vehicle. The generated information can be used to handle and divert the live traffic as needed to avoid the problems related to roadtraffic.

Paper 19: An IOT based dynamic traffic signal control

Anitha, K.N Rama Mohan Babu made a effective computerized traffic system With the ever increasing population in urban cities traffic management is becoming more difficult and hence it is additional essential to achieve a sustainable transportation setup. A fine traffic model be able to depict the traffic activities correctly and efficiently. The major goal of our project is to make traffic management system

work efficiently, dynamically using IoT. Using Arduino controller and IR sensors we regulate the traffic system to work efficiently. According to several scholastic studies, traffic lights are be answerable for nearly partially of the traffic jams. Thereby also lead to cause nearly half the pollution. Poorly managed traffic lights can cause not only tripling of the fuel consumption but also lead to CO2 emissions and various other pollutants emissions.This can happen easily when the traffic is too cluttered. We intent to implement the project for four junctions as “Proof-of-Concept” for this paper. IoT devices that we are using traffic lights, IR-sensors, Arduino microcontroller and a Central Server to coordinate all the activities of the traffic management. we have selected the Kerner three-phase traffic theory to implement a managed and synchronized system. It helps us in establishing a Dynamic and Intelligent Transport System that provides synchronized and automatic traffic management. This leads to reduced fuel consumption also. Our aim is to take advantage of the technology provided by Internet of Things to enhance ITS and vehicular communications, namely, the V2I and the V2V systems within towns and cities.

2.2 Summary of Research Paper

Sr. No.	Publication and Year	Author Name	Approach (Methodology)	Advantages	Limitation
1	Institute of Electrical and Electronics Engineer (IEEE) - 2018	Anna merine George,V.I George	Developing an Adaptive Neuro Fuzzy traffic light controller based on MATLAB SIMULINK, Transferring images to cloud using ThingSpeak Platform and Arduino UNO, Providing appropriate signals to traffic light.	Traffic Congestion and traffic monitoring is one of the important problems all over the world.so to reduce this.	The given system is dynamic but it does not work on density flow control. As it uses cloud storage the system depends on internet connection
2	Institute of Electrical and Electronics Engineer (IEEE) - 2018	Prampa Sadhukhan, Firoj Khan	It consists of two modules. These are traffic density monitoring module (TDMM) and traffic management module (TMM).	The main advantange of this paper is decrease in traffic congestion and saves times.	Design part of the proposed system is presented in the paper.No experimental result have been found.
3	Institute of Electrical and Electronics Engineer (IEEE) - 2017	Varsha Sahadev Nagmode, Dr.S.M.Rajbhoj	Ultrasonic sensors are used to detect vehicle traffic levels at the lanes, this data is received at the controller and transmitted to web server through a Wi-Fi module.According to that instruction are given to the signals.	The main advantage of this paper is to make priority vehicles reach their destinations without delay at signalized interaction.	Temperature fluctuation affects the speed of an ultrasonic sensors's sound wave. Due to this system maybe not able to give accurate result.
4	Institute of Electrical and Electronics Engineer (IEEE) - 2016	Sk Riyazhussain, Riyazhussain, C.R.S. Lokesh, P.Vamsikrishna, Goli Rohan	Here the system proposed by the author uses: Rasberry PI Traffic Density Live Streaming	Due to this traffic congestion decreases,saves times,saves fuel and reduce the	The memory of RasberryPI is limited.We can't expand the memory.

			Trafic Surevellance	air pollution.	
5	Institute of Electrical and Electronics Engineers (IEEE) – 2017	Mehal Zaman Talukder, Sheikh Shadab Towqir, Arifur Rahman Remon, Hasan U. Zaman	This paper describes a system where ultrasonic sensors are integrated with the Raspberry Pi to operate the lanes of an intersection based on the density of traffic.	Due to this traffic congestion decreases,save fuel and also saves the time.	The sensor used in the system are limited range and are fragile. due to this problem of different weather condtion & large traffic intersection A lot of wire have been use.
6	International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering (IJAREEIE) January 2018	Dr.Sanjeev Sharma, Vaishnavi Giradkar, Aarti Sanap, Snehal Sarolkar	Get sensor data Perform analysis Time Control traffic signal Send data to cloud Display traffic data on web	Provide density based timing Reduce pollution and fuel consumption	To make system more efficient various effective sensor required. There is no activity for emergency vehicles
7	International Conference on Advanced Communications Technology(ICACT) February 2018	Sabeen Javaid, Ali Sufian, Saima Pervaiz, Mehak Tanveer .	Data Acquisition and Collection Layer Data Processing and Decision-Making layer Application and actuation layer	Traffic jam reduce due to timing of signal light changes according to traffic density. It show daily, weekly, monthly, yearly data in graph.	In this priority is not given to each lane
8	Springer- 2016	Satya Priya, Biswas Paromita Roy, Nivedita Patra, Amartya Mukherjee, Nilanjan Dey	Hardware implementation of the model Prioritizing the Lanes	Traffic congestion reduce using Priority-based signalling	In this timing is not provide for traffic flow based on priority .

9	International journal of research April 2018	Dr.B.Prakash, M.Naga Sai Roopa, B.Sowjanya, A.pradyumna, Kumar	Arduino is a mini-computer that can be used as a development tool for different software and hardware based projects. GSM is an open, digital cellular technology used for transmitting mobile voice and data services IR Sensor LCD LED	Easily remove traffic congestion using IOT based traffic monitoring system.Easily clear activity for Emergency vehicles	Cost effective Based on traffic, timer is already set Low: 3 secs Medium: 50secs High: 1min
10	Institute of Electrical and Electronics Engineers (IEEE) 2018	Nikhil Nair, J.John Paul, Sheena Mariam ,JacobNaga Harsha .J	Ultrasound Sensor are locate at on road side. Camera is used to image processing for vehicles. Raspberry PI is used to collect information from sensors then signal timing will be provide.	Save time Easy to implement Reduce pollution and use of fuel	This system is not adaptable to support traffic during an unexpected situation or during an accident .
11	International Conference on Energy, Communication, Data Analytics and Soft Computing (ICECDS-2017)	Prof.S.D.Sawant, Elizabeth Basil.	Using the image processing the image will capture and count the number of vehicle and send it to the database and apply the condition for that.	It reduce the traffic congestion problem and also take less time to control the traffic.	Using this image processing approach if any small vehicle is hiding behind the big vehicle than it is creat traffic issues
12	International Conference on Innovations in Power and Advanced Computing Technologies [i-PACT2017]	Rickin Patel, Vipul K. Dabhi, Harshadkumar B. Prajapati	This approach is work on the rasberry pi and with the pi camera. Also VIRAT video data set and MIT traffic video set will be use.	The videos in the data set are recorded from stationary camera and contains ground nformation with mixture of humans walking and vehicles on the road.	Here if any vehicle wil not identify properly then it will creat traffic jam

13	Institute of Electrical and Electronics Engineers (IEEE) – 2016	Bilal Ghazal, Khaled EIKhatib, Khaled Chahine, Mohamad Kherfan	Using the Xbee wireless communication, IR sensor, Traffic density,	Setting up the network is very simple and easy. This will save cost of battery replacement as zigbee uses lithium battery which lasts long.	After the passing emergency vehicle it is not defines that the which side of road will open.
14	International Conference on Energy, Communication, Data Analytics and Soft Computing (ICECDS-2017)	Anitha, K.N Rama Mohan Babu	V2V and V2I system. Kerner three phase traffic theory. IR sensor,	Due to this traffic congestion decreases, save fuel and also saves the time.	This paper don't mentioned about the emergency vehicle.
15	Institute of Electrical and Electronics Engineers (IEEE) – 2016	Patan Rizwan, K Suresh, Dr. M. Rajasekhara Babu	This approach is using with the RFID and big data and also the use of GPS.	Here they use the storage as big data so there is no storage issues in compare of other.	This system is based on the RFID and they don't give the practical information about it.
16	Department Of Applied Electronics And Electronics 2017.	Smita Kumari, Sima Kumari.	RSLogix PLC Controller,SCAD, Actuator and Sensors been used for the system implementation. This would work on weight sensing using sensors whose output will be fed to a PLC,	Provide orderly movement of traffic. Interrupt heavy traffic at intervals to permit other vehicles or pedestrians to cross.	Excessive disobedience of the signal indications. Increased use of less adequate streets as motorists attempt to avoid the traffic signals.
17	Electrical and Electronics Engineering,Mepco Schlenk Engineering College-2018	S.Sundara Mahalinga, S.Arockiar.	The system is based on microcontroller. The system contains IR transmitters and IR receivers. Based on different densities of vehicles, the microcontroller decides the glowing time of the traffic lights.	Give real time and perfect solution.	IR sensors work only for fewer distances. IR sensors sometimes may absorb normal light also as a result, traffic system works in improper way.

18	International Journal of Applied Engineering Research-2017.	Ashok. P.V, Siva Sankri.S, Vignesh Mani, Suresh Sankaranarayanan.	Prototype model is design using raspberry pi and ultrasonic sensors. Sensor data pertaining to vehicle count are sent to Arduino which decide the conditionfor controlling traffic.	Infrared red sensors are affected to greater degree by fog and camera can not give effevtive survailence so this system is effective.	Image processing is used for count traffic density. if one of camera is not working than whole system will not work.
19	International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering-2018.	Dr.Sanjeev Sharma, Vaishnavi Giradkar, Aarti Sanap, Snehal Sarolkar.	In this module input is traffic density sense by the sensor and the output is digital data produced by the sensor. Raspberry pi is the key component used for control all multitasking performance.	Reduce fuel consumption and environmental cost. Increase economic productivity. Increase transportation system efficiency.	If traffic density is high than may not sense proper solution.
20	International Journal of Engineering & Technology 2018	Senthil Kumar Janahan, M.R.M. Veeramanickam, S. Arun, Kumar Narayana,R. Aandan, Shaik Javed Parvez	Neural networks and machine learning is used for best prediction. Road lanes are taken into consideration and traffic is predicted for given time interval	The proposed system can solve the traffic problem up to great extent without use of any man power.	It only helpful for short term traffic. It will not give effevtive solution. Slow system. Prediction may not give perfect solution.

2.3 Existing System

The existing system is work using the image processing. In this system, IoT based traffic control system is implemented in which signal timings are updated based on the vehicle counting.This system consists of WI-FI transceiver module it transmits the vehicle count of the current system to the next traffic signal.Based on traffic density of previous signal it controls the signals of the next signal. The system is based on raspberry-pi and Arduino.this system is first read the camera image and than convert into the

RGB to Gray conversion and then thresholding after that blob analysis and than counting vehicle and send data to wifi module of module of ardunio and than open the green signal after if the greater density then green signal or if law density than red signal.

2.3.1 Advantages

- Due to this traffic congestion decreases,saves times,saves fuel and reduce the air pollution.
- Traffic jam reduce due to timing of signal light changes according to traffic density

2.3.2 Disadvantages

- If any small vehicle is not visible behind the big vehicle than it read the wrong counting of vehicle.
- It is totally based on image processing.

CHAPTER 3

RESEARCH METHODOLOGY

This chapter deals with the research and methodology to do in the project work. It shows detailed and deep insights into the experimentation associated with the project. Project planning is represented in a Gantt chart. Also, future working of our project is presented.

3.1 Introduction of Research Methodology

In recent years traffic congestion is a major problem in our country, which affects modern city's daily life routine and disturb environments. Due to increase population, size of cities expands, automatically number of vehicles increases in the major scale on roads. There are many problems such as travel time delay, fuel wastage, air pollution and create issues related to transport. So traffic monitoring and controlling is the biggest challenge on traffic management authorities. We design and develop system for real-time traffic monitoring using Internet of Things (IoT) platform and sensing technology.

3.1.1 Working

This section presents a working theory of real-time vehicle monitoring and controlling system using IoT platform.In the proposed system array of ultrasonic sensors equipped at roadside for monitoring traffic levels. Roadside sensors are detecting vehicles and find the traffic level at that lane. Such levels are low, medium and high which mounted at the particular distance gap. The data sensed continuous and send to controller for detecting traffic levels. If the traffic level is high, then controller control signal timing at that lane and gives more time to pass vehicles. If low traffic level detects then controller control signal timing at that lane gives less time to pass a vehicle. So this system gives priority to emergency vehicle at a high traffic level. The controller communicates with the priority system through RF Transceivers. It is used to transmit as well as receive warning message or any traffic status from the controller unit to priority system. The same data displays on the Liquid Crystal Display (LCD) unit. The information about traffic levels and its time and date sent to server of authorized open source. This data analyzed by IoT analytics open source and stored in the server database for future analysis.

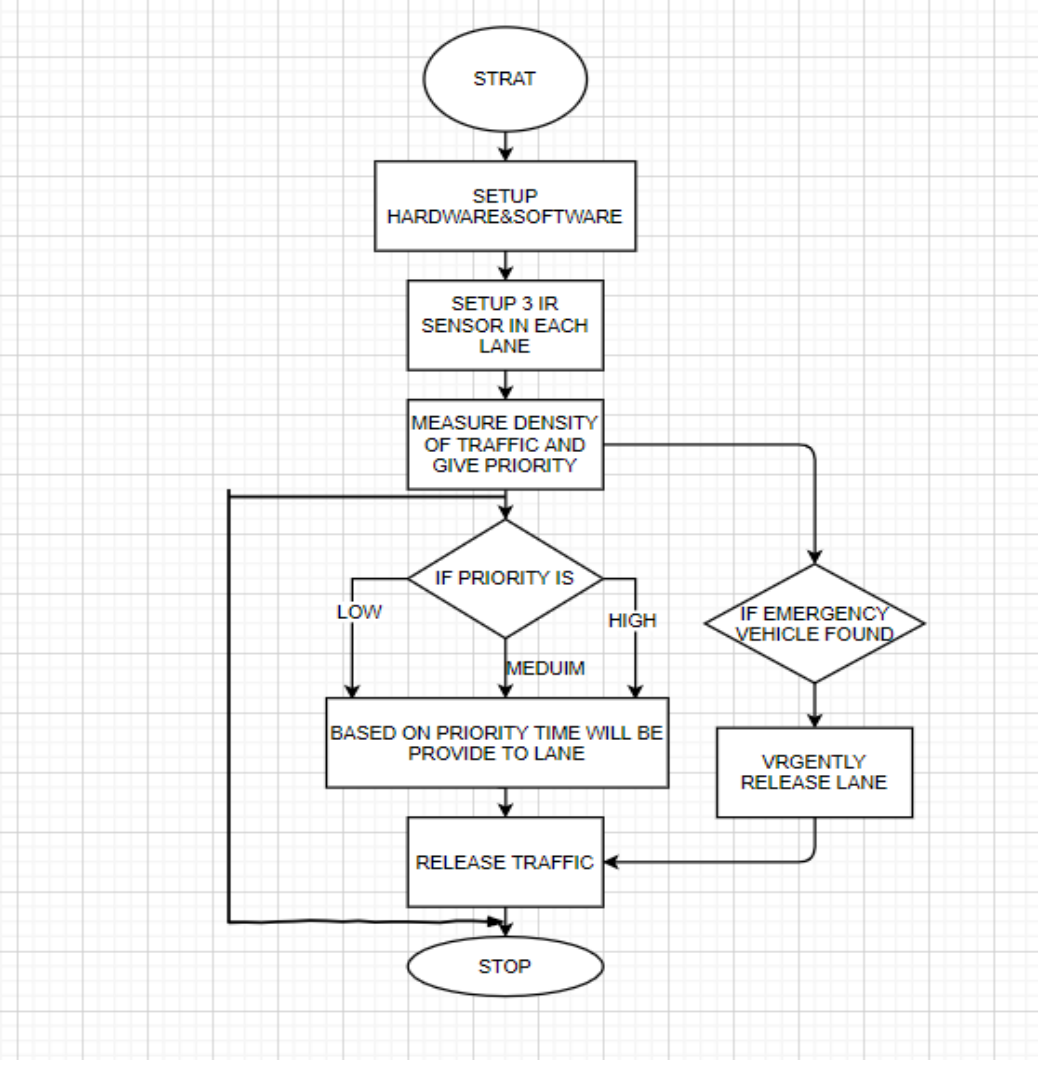
3.1.2 Advantages

- Provide for continous movement of traffic at definite speed along a given root.
- It is work on Real time system.
- Decrease in traffic congestion and saves times.
- They help in reducing the frequency of an accident of some special nature i.e. of right angles accidents.

3.1.3 Disadvantages

- Temperature fluctuation affects the speed of an ultrasonic sensors's sound wave.Due to this system maybe not able to give accurate result.
- If the prioxity sensors are blocked by animals or nonactive vehicles then the system won't work accurate.
- Excessive disobedience of signal indication.

3.1.4 Planning



3.2 Methodology

1) Node MCU:

NodeMCU is an open source LUA based firmware developed for ESP8266 wifi chip. By exploring functionality with ESP8266 chip, NodeMCU firmware comes with ESP8266 Development board/kit i.e. Node MCU Development board.Using such serial protocols we can connect it with serial devices like I2C enabled LCD display, Magnetometer HMC5883, MPU-6050 Gyro meter + Accelerometer, RTC chips, GPS modules, touch screen displays, SD cards.

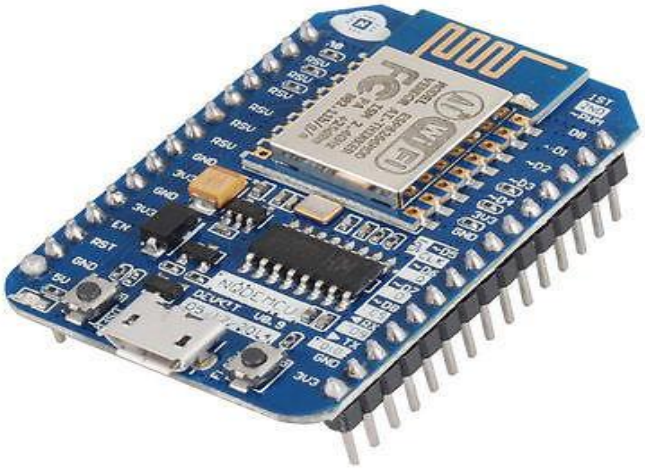


Fig 3.2.1 Node MCU

2) IR LED:

An IR LED, also known as IR transmitter, is a special purpose LED that transmits infrared rays in the range of 760 nm wavelength. Such LEDs are usually made of gallium arsenide or aluminum gallium arsenide. They, along with IR receivers, are commonly used as sensors.

Fig 3.2.2 IR LED

3) RF Transceiver:

RF A photodiode is a type of photo detector capable of converting light into either current or voltage, depending upon the mode of operationPhotodiodes are similar to regular semiconductor diodes except that they may be either exposed (to detect vacuum UV or X-rays) or packaged with a window or optical fibre connection to allow light to reach the sensitive part of the device.

Fig 3.2.3 Photo Diode

4) LED's signal:

This unit used here for road intersection. LED's signals are controlled by traffic signal control algorithm, which is given by the sensing data at levels from ultrasonic sensors.

5) LCD unit:

The 16*2 Liquid crystal display used to observe output data given by the controller. It displays traffic levels and LED's signal timing and messages from RF Transceiver.LCD display integrated with microcontroller for display output data.

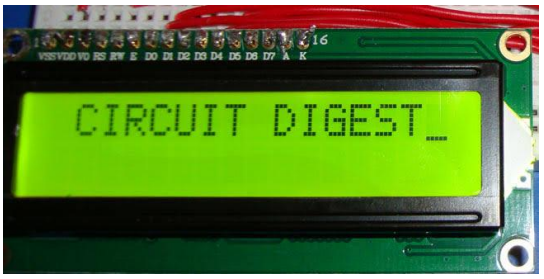


Fig 3.2.4 LCD unit

CHAPTER 4

IMPLEMENTATION

4.1 Implementation Environment

Arduino Instalation:

- Depending on your system, download and install the recent version of ARDUINO (1.8.12) from arduino's official site: https://www.arduino.cc/en/main/software.

Development:

Editors(IDE)

- Development of "Traffic Analysis System" has done with arduino. arduino is an integrated development environment used in computer programming, and is the most widely used for different controller.
- The Arduino Programmer is based on the processing IDE and uses a variation of the c and C++ programming languages.

4.2 Program/Modules Specification

- For every module we have given some limitations and taken care of its accesses, for any system to work well there should be different modules as modules divide any website or project in different aspects using its requirements and usages.
- So, we have separated over project Traffic Analysis System in two modules which are as below:
    1. Normal Traffic Congestion
    2. Emergency Vehicle

1. Normal Traffic Congestion:

- In this module the proposed system array of ultrasonic sensors equipped at roadside for monitoring normal traffic levels.
- Roadside sensors are detecting vehicles and find the traffic level at that lane. Such levels are low, medium and high which mounted at the particular distance gap.

- The data sensed continuous and send to controller for detecting traffic levels. If the traffic level is high, then controller control signal timing at that lane and gives more time to pass vehicles. If low traffic level detects then controller control signal timing at that lane gives less time to pass a vehicle.

2. Emergency Vehicle:

- This module gives priority to emergency vehicle at a high traffic level. The controller communicates with the priority system through RF Transceivers.
- It is used to transmit as well as receive warning message or any traffic status from the controller unit to priority system.

4.3 Coding Standards:

- Coding standards tells developers how they must write their code. As every developer as his/her own coding style.
- But when working on a big project with team the coding should be done in some standard as code written by one developer will be used by other and to understand every member coding style is tough thing.
- So, all developers need to follow some standard coding style so this will create better understanding of the code written.
- And by this project understanding of project code becomes easy.
- And also, we have taken care about the other standards like,
  - ✓ Giving meaningful names to functions and variables (Naming Convention),
  - ✓ Proper comments and simple too,
  - ✓ Modular, reusable, maintainable code,
  - ✓ Unit testing wherever needed, and many more.

4.4 Implementation of pages

Installation of ESP8266:

- Before you can start doing anything with the Arduino, you need to download and install the Arduino IDE (integrated development environment). From this point on we will be referring to the Arduino IDE as the Arduino Programmer.

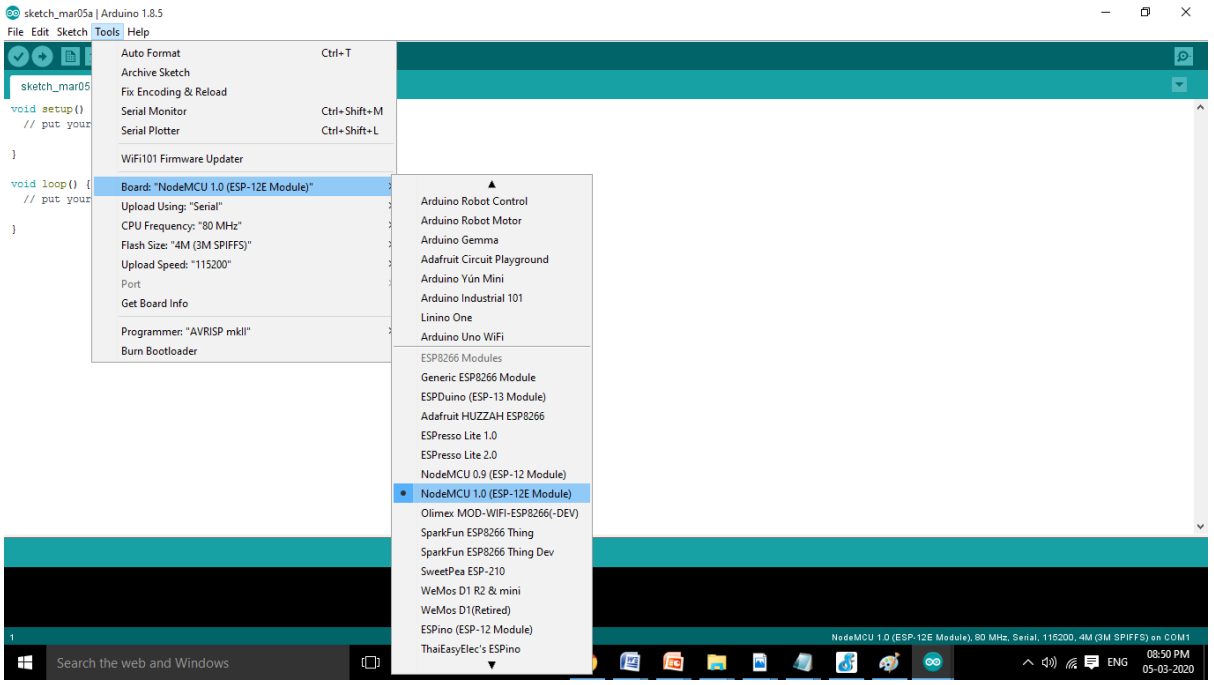


Figure 4.4.1: Installation of ESP8266

Prototype model of traffic analysis system:

- The below snapshot is the prototype of our system

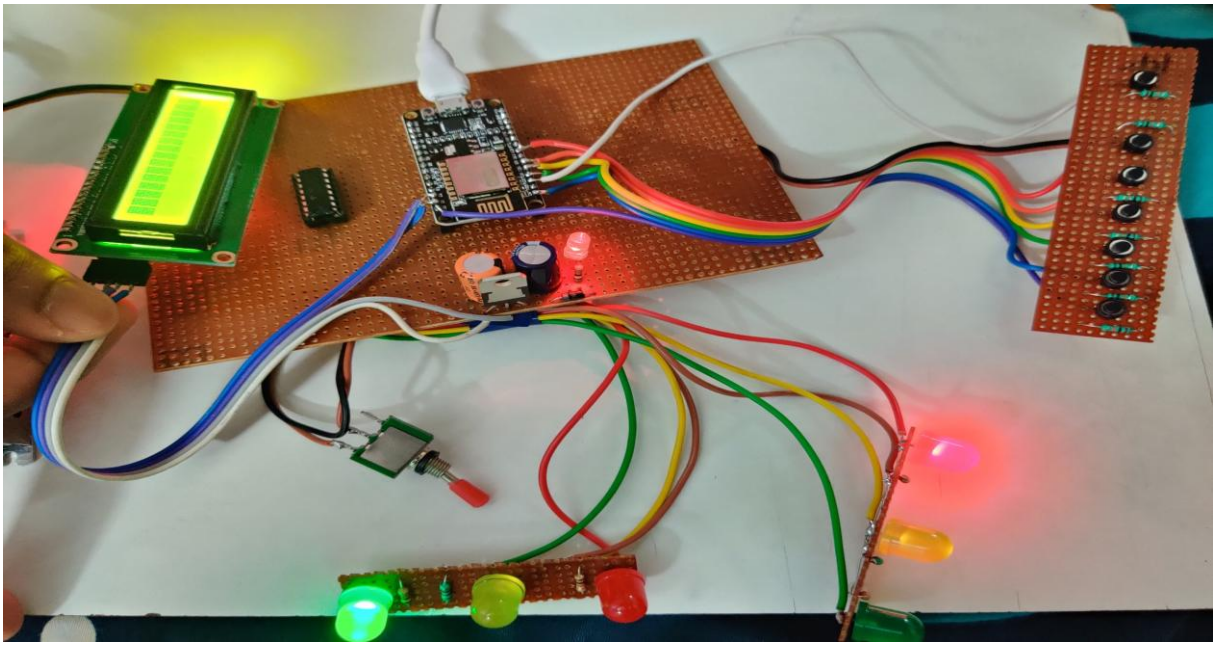


Figure 4.4.2: prototype

Snapshot of execution of code:

Figure 4.4.3: snapshot of code

Working of IR sensor:

- If any car is detecting than the red led is on and it is indicates that there is a car.

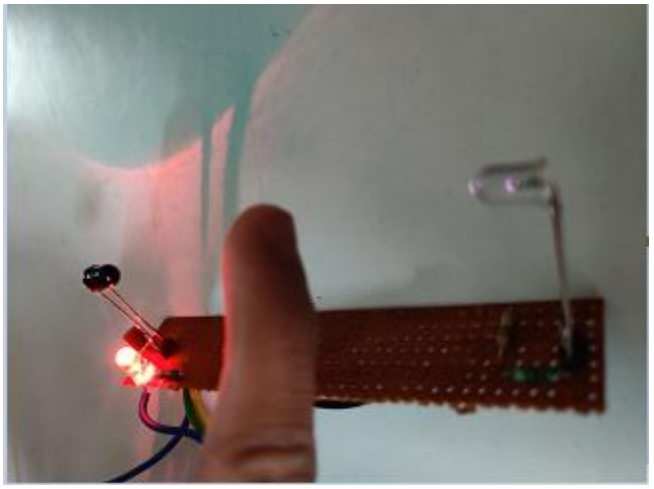


Figure 4.4.4 : Working of IR sensor

CONCLUSION

Our country is ranked highest in the world for traffic related problems, thus there is the need to reduce traffic related issues such as long travelling time, fuel wastage, air pollution and transport related problems, this proposed system developed. Here developed system for real-time traffic monitoring using IoT platform which is reliable for users.This system also controls signal time, according to traffic levels at the lanes, gives priority to emergency vehicle. The proposed system is more reliable, easily operates by users and low cost system and easily equipped at any place.

Future Enhancement

The current Indian traffic condition works on the signal and clock based traffic monitoring system. The lack of sensors and traffic control causes wastage of money and fuel which also omits amount air polluters like carbon monoxide every year, so we find that with the help of IoT, The road traffic problem can be solved on basis of the Internet of Things concepts. Our system is implemented on 2-lane road and we will also implement this approach on 4-lane road or on highways.

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