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AUTONOMOUS TRAFFIC SYSTEM FOR EMERGENCY VEHICLE

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Abstract:

Road traffic congestion has become a major issue for highly crowded metropolitan cities like Pune, Mumbai. This will create delay for the ambulance to reach the hospital in emergency case. The proposed system smoothens the ambulance movement by using RFID and an android app. This system creates an android app that connects both the ambulance and the traffic signal station using cloud network. This system uses RFID (radio frequency identification) technology to implement the intelligent traffic signal control. The basic idea behind this system is, if the Ambulance halts on the way due to a traffic signal, RFID installed at the pole near the traffic signal tracks the RFID tagged ambulance and sends the data to the controller. In case the RFID fails, the acknowledgment is taken from the user through the mobile app then the particular signal is turned to Green for some time interval and after the ambulance passes the original sequence of signaling is regained. Hence this system controls the traffic signal and can be very useful at emergency periods. All The information will send to App/server using wifi.

I.INTRODUCTION

Congestion in urban areas has given rise to the gradual increase in automobiles and vehicles due to the migration of people into urban settlements bringing about different pros and cons. One of such disadvantages is the increase in both human and vehicular movement which additionally leads to high traffic on major roads in a city and therefore prompts activity clog in urban zones. Traffic congestion occurs when the use of road network increases and it is characterized by bad roads in communities and increase in community population. Traffic jam occurs at a point when vehicles completely stop for a period of time. Extreme Congestion occurs mostly during workdays and rush hours (morning and evening). One of the principal reasons why congestion exists on the roads is due to the increase in the number of vehicles. That is, when the number of vehicles outnumber the capacity of the available infrastructure such as good roads, traffic light and road regulators. As population of urban settlers increases, the need to acquire personal vehicle for transport increases, and traffic congestion increases as the number of vehicles increases combined with an absence of proper infrastructure. The national government and councils neglect to follow up on the approaching danger of increased congestion until it eventually occurs. The roads of the city do not expand in size alongside an inexorably vehicle dependent populace. An example is a single street with one lane on each side before will probably not get developed in ten years after the population has expanded. The authorities frequently neglect to take this into consideration. The rapid increase in the number of vehicles without a rapid increase in road networks is the main cause of congestion which is a major concern in the society. While it may be difficult to totally tackle congestion, there are a few different ways to control its future rate of increment like: quick response to traffic-blocking incidence and accidents, removing mischances from major roads quickly by utilizing the service of roving vehicles run by Government Traffic Management Centers (GTMC); This is an incredible strategy for diminishing blockage delays, building of more roads in developing regions and improving on urban region road network, and car-sharing service which would reduce the need to own personal vehicles thereby

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reducing the number of cars on the road. Over the years, traffic congestion has been a cause for concern in the society due to its negative effects like stress to commuters, release of more toxic fumes into the atmosphere and loss of productive hours [1]. While trying to address this issue, diverse researchers have designed and executed certain techniques to help ease traffic in major roads. The first of such technique was actualized by a police officer in Detroit in 1912 and changed in 1920 by another policeman William Port making use of similar standards yet with different modifications. Without question, most traffic lights presently being used today have kept on serving the need for which they were produced. Nonetheless, a new method that will help to combat the issue of traffic congestion largely as automation is a trend which developed countries are imbibing in order to minimize accident and maximize efficiency [2-4]. Traffic light, which can also be called traffic lamps or traffic control signals, are devices that are stationed at strategic location like road intersections to control the flow of traffic. Traffic control signal shows the right of way to users at a particular time by displaying lights of standard color (red, yellow, and green). The red light is a clear caution to "stop" prohibiting any vehicle from moving further while the green light simply means "go". This is set to permit vehicular movement in the denoted direction. The yellow light warns the driver that the signal is about to change to red, it definitely does not mean full- throttle ahead but rather slow down and prepare to stop but most road users fail to adhere to this. This is one of the issues this study seeks to curb. Installing a traffic light at a crossway should be considered at a strategic location where the presence of the traffic signal will be of high impact rather than create problems. A properly installed and operating traffic signal helps in orderly movement of traffic, thereby reducing the occurrence of possible vehicle clashes. Therefore, before any traffic signal is installed, crash statistics should be analyzed, speed data should be studied, and most importantly road conditions should be examined. For a traffic light to serve its purpose, it must be properly designed, located and maintained regularly. Currently, traffic lights are set in different lanes with fixed time delays, following a specific cycle while changing from one signal to another making undesirable and unwanted congestion on one lane with alternate lanes stay empty. It is in view of this situation which often times results in the loss of productive time that the density-based traffic management system is proposed. Hence, mulling over the extremely bustling nature of our roads particularly amid peak hours, there arises a dire need for a more effective traffic management system. One which will reduce congestion in most bustling junctions [5-8]. It is in view of this challenge that this work is carried out to regulate traffic control and monitor speed limit with addition input that is absent in previous design. The method being proposed here is different from the current design that has a fixed time to control and monitor traffic irrespective of the traffic flow. The proposed design would depend basically on the density of each lane by optimizing the "go time" allocated to a lane. This is because it will be a waste of productive time and inappropriate time-sharing formula when a congested lane is allocated the same "go time" with a relatively less busy lane at a junction. The proposed design would provide the quickest possible clearance to congested vehicles in all directions at any junction. The design would reduce the frequent occurrence of accidents resulting from the lack of patience by road users. Furthermore, Over-speeding is one of the main reasons of accidents on our roads will also be curbed. The speed detector incorporated in the proposed system would help onroad police in tracking and detecting traffic defaulters.

Traffic congestion is a very common problem in large cities and traffic lights are typically used to control the flow of vehicles at intersections. Neither manual control by police officers nor using predefined timers has been proven effective, but they are still being used in many places. Without taking an account of real-time traffic data for consideration, it can happen that a „green light" is granted to an empty lane while a lot of cars are lined up at a „red light" on

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the other lanes because the same time interval of green lights are granted to every lane. Radio Frequency Identification (RFID) is a competitive technology for identifying, tracing, and counting real-life objects and in the same vein plays a key role in a research paradigm of IoT. The RFID technology has been used in many domains, and traffic management is one of those. Even though, there are a number of alternative technologies that are applicable to traffic management systems, [1] argues using non-RFID technologies has significant drawbacks such as erroneous image processing in jam-packed situations or line-of-sight issues in using sensor-based devices. The literatures discuss the application of RFID technologies to solve traffic management problems. [2] investigates the using of RFID technology to collect three traffic parameters which are an average speed of vehicle, average waiting time, and queue size to input Neural Network model to determine the percentage of green time and duration of its cycle for the best throughput. [3] proposes a system that can estimate the congestion level from vehicle speed. The system is also capable of tracing vehicle information to fire the predefined rule in response to certain actions. For instance, if a vehicle identified as a stolen car, the system identifies that vehicle on the map. [1] focuses on the study of generating dynamic sequence of traffic lights in order to improve a waiting time where RFID is used to capture the time-stamp of a vehicle at a certain location, while [4] investigates the practical aspect of using RFID system in collecting traffic information. The study explores the optimal points to install RFID readers to collect traffic information. In terms of the functions of the system, our research is the most similar to the work in [3]. However, the focus of this research is to put the concern on applying an Internet of Things (IoT) paradigm to solv more practical operation requirements for human-oriented traffic control. Simply put, IoT is a kind of system that enables objects to communicate with other objects for certain purposes. In this research, the „things" that communicate together are traffic lights. One traffic light communicates to its neighbours to report traffic situations. Police officers who are in charge of controlling signals can use that information for better sequencing signals at that junction. The paper contributes the experiences of implementing a laboratory- testbed system for traffic control and shares the insights and lessons learned on what needs to be implemented and investigated to deploy the system for real usage.

II.LITERATURE SURVEY

Traffic control system which is usually stationed at strategic location like road intersections to control the flow of traffic is dated as far back 1868. The history and evolution of traffic control system can be found in [9-14]. Traffic control signal shows the right of way to users at a particular time by displaying lights of standard color (red, yellow, and green). The red light is a clear caution to "stop" prohibiting any vehicle from moving further while the green light simply means "go". This is set to permit vehicular movement in the denoted direction. The yellow light warns the driver that the signal is about to change to red, it definitely does not mean full-throttle ahead but rather slow down and prepare to stop but most road users fail to adhere to this. This is one of the issues this study seeks to curb. Chinyere et al. (2011) proposed an intelligent system for controlling traffic which was designed by combining Structured Systems Analysis/Design Methodology (SSADM) and the Fuzzy-Logic- based Design Methodology. Two electromagnetic sensors were placed on the road with the second sensor placed behind the first sensor. While one sensor counts the number of cars that go past the traffic light, the other counts the number of cars coming from a distance and the difference between the two is evaluated. There is one state for each phase of the traffic light and the state machine controls the sequence of state of the fuzzy traffic controller and a state is skipped if there are no vehicles [5]. In [15], the authors proposed a system which uses a Raspberry pi as its microcontroller to provide the signal timing based on the traffic density i.e., the signal timing changes automatically on sensing the traffic density at the junction. The cameras

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were placed on top of the signals for a clearer view. The image captured in the signal was first processed then converted into grayscale image. Its threshold was calculated based on the contour which has been drawn in order to calculate the number of vehicles present in the image. After the calculation on the number of vehicles was done, the outcome helped to know which side the density is high based on which signals will be allotted for a particular side. An adaptive traffic light control was proposed in [16] using a wireless sensor network which is classified into three categories namely; the wireless sensor network, the localized traffic flow model policy and the higher level coordination of the traffic lights agents. Wireless sensors were stationed on the lanes going in and out of the intersection. The function of the sensors is to identify and detect car number, speed and some other variables; before sending the information to the nearest Intersection Control Agent who will decide on the flow model of the junction depending on the data from the sensor. Ganiyu et al. (2014) designed a system using Programmable Integrated Circuit (PIC) 16F84A microcontroller, power section, crystal oscillator and light emitting diode (LED). To control traffic effectively, the PIC was implemented via an integrated circuit (IC) programmer using a mikrobasic program which is written in Basic language. The sensing unit used is a pressure switch which detects the weight of vehicle that steps on it and sends a signal to the microcontroller. [17] improved on this work by including surveillance system. Many researches have thought of various models to manage traffic congestion and these models can be grouped under three categories- namely network, application and acquisition. The acquisition layer is made of sensors like infrared (IR), RFID among others while application category includes information collection and analysis. Network category is made of cellular mobile network, Bluetooth, Wi-Fi etc.

III. DESIGN OF HARDWARE

It discusses the circuit diagram of each module in detail.

ARDUINO:

The most common version of Arduino is the Arduino Uno. This board is what most people are talking about when they refer to an Arduino. The Uno is one of the more popular boards in the Arduino family and a great choice for beginners. There are different revisions of Arduino Uno, below detail is the most recent revision (Rev3 or R3).

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started.

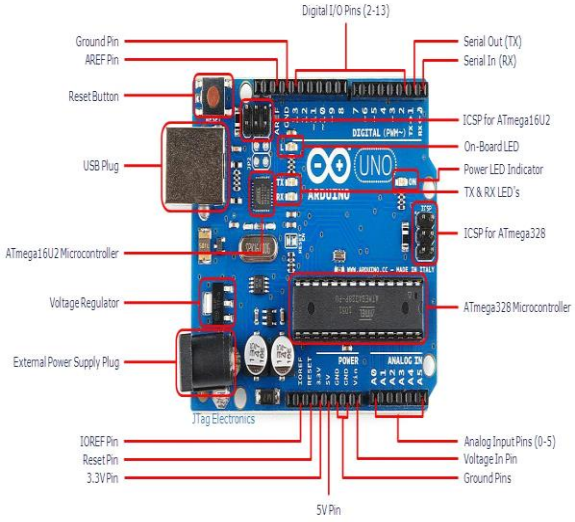

fig : ArduinoUno R3 Board

POWER SUPPLY:

The power supplies are designed to convert high voltage AC mains electricity to a suitable low voltage supply for electronic circuits and other devices. A power supply can by broken down into a series of blocks, each of which performs a particular function. A d.c power supply which maintains the output voltage constant irrespective of a.c mains

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fluctuations or load variations is known as "Regulated D.C Power Supply".

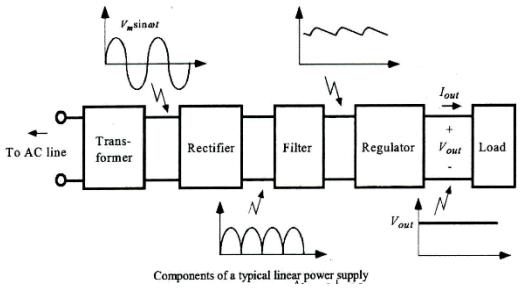

Fig:. Block Diagram of Power Supply

LCD:

A model described here is for its low price and great possibilities most frequently used in practice. It is based on the HD44780 microcontroller (Hitachi) and can display messages in two lines with 16 characters each. It displays all the alphabets, Greek letters, punctuation marks, mathematical symbols etc. In addition, it is possible to display symbols that user makes up on its own. Automatic shifting message on display (shift left and right), appearance of the pointer, backlight etc. are considered as useful characteristics.

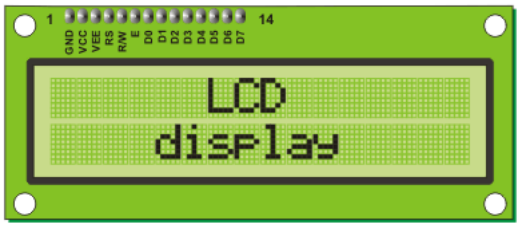

Fig: LCD

RFID (Radio-frequency identification)

Radio-frequency identification (RFID) uses electromagnetic fields to automatically identify and track tags attached to objects. The tags contain electronically-stored information. Passive tags collect energy from a nearby RFID reader's interrogating radio waves. Active tags have a local power source (such as a battery) and may operate hundreds of meters from the RFID reader. Unlike a barcode, the tag need not be within the line of sight of the reader, so it may be embedded in the tracked object. RFID is one method of automatic identification and data capture (AIDC).

RFID tags are used in many industries. For example, an RFID tag attached to an automobile during production can be used to track its progress through the assembly line; RFID-tagged pharmaceuticals can be tracked through warehouses; and implanting RFID microchips in livestock and pets enables positive identification of animals.

Since RFID tags can be attached to cash, clothing, and possessions, or implanted in animals and people, the possibility of reading personally-linked information without consent has raised serious privacy concerns.[2] These concerns resulted in standard specifications development addressing privacy and security issues. This work is done within ISO/IEC JTC 1/SC 31 Automatic identification and data capture techniques. Tags can also be used in shops to expedite checkout, and to prevent theft by customers and employees.

There is controversy regarding human applications of implantable RFID technology including concerns that individuals could potentially be tracked by carrying an identifier unique to them. Privacy advocates have protested against implantable RFID chips, warning of potential abuse. Some are concerned this could lead to abuse by an authoritarian government, to removal of freedoms,[52] and to the emergence of an "ultimate panopticon", a society where all citizens behave in a socially accepted manner because others might be watching.[53]

LED:

LEDs are semiconductor devices. Like transistors, and other diodes, LEDs are made out of silicon. What makes an LED give off light are the small amounts of chemical impurities that are added to the silicon, such as gallium, arsenide, indium, and nitride.

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When current passes through the LED, it emits photons as a byproduct. Normal light bulbs produce light by heating a metal filament until it is white hot. LEDs produce photons directly and not via heat, they are far more efficient than incandescent bulbs.

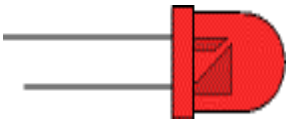


Fig : Typical LED

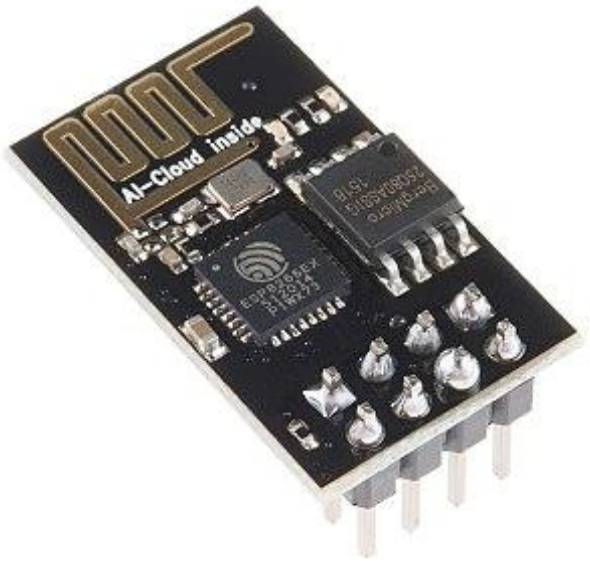
ESP8266 WIFI

The **ESP8266** is a low-cost Wi-Fi microchip with full TCP/IP stack and microcontroller capability produced by Shanghai-based Chinese manufacturer, Espressif Systems.

The chip first came to the attention of western makers in August 2014 with the **ESP-01** module, made by a third-party manufacturer, Ai-Thinker. This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands. However, at the time there was almost no English-language documentation on the chip and the commands it accepted.[2] The very low price and the fact that there were very few external components on the module which suggested that it could eventually be very inexpensive in volume, attracted many hackers to explore the module, chip, and the software on it, as well as to translate the Chinese documentation.[3]

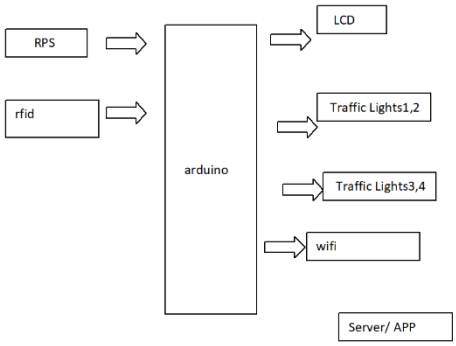
The **ESP8285** is an ESP8266 with 1 MiB of built-in flash, allowing for single-chip devices capable of connecting to Wi-Fi.[4]

The successor to these microcontroller chips is the ESP32.



IV. PROJECT DESCRIPTION.

BLOCK DIAGRAM:



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Working:

The construction of the project was done firstly on the breadboard before being transferred to the veroboard. The LEDs which are red (5 mm), yellow (5 mm) and green (5 mm) are connected in series with resistors of 220 Ω each connected to the negative legs of the LEDs. Figure 5 shows the connections of the LEDs and resistors. The connections of the LEDs and the resistors are created to represent traffic lights for each lane i.e. there will be four of these for each of the lanes. The Arduino is placed at the middle as the controlling system that will send the information for this operation to be effective. Figure shows the arrangement of the LEDs on the breadboard for each lane. The legs of each of the components are then wired to the digital input and output pins of the Arduino board. The LEDs at the lanes will be connected to the pins on the board between pins 3 and 53.

The solution we provide for Traffic management by reading the RFID tag of each car by a RFID reader at traffic junctions for real time traffic density calculation. It also concentration on changing the traffic lights according to vehicle tightness on the road, thereby intent at reducing the traffic congestion on roads. In turn, it'll reduce fuel consumption and waiting time. In case of emergency vehicle like ambulance Radio Frequency module will be used so that red traffic light signals will be turned to green in order to provide a clear way for the emergency vehicles. It will also provide significant data which can help in future road planning and analysis. It is also used to detect or track stolen vehicle. It also alerts the owner of the vehicle to top up the credit which is used in toll booth. In further time period multiple traffic lights are often synchronized with one another with an goal of even fewer traffic jam and free flow of traffic. The vehicles are detected by the system through RFID tag which is read by the RFID reader. RFID reader is present in some meters away from the signal and another RFID reader is placed alongside the traffic light. It will capture the number of vehicles in that particular lane. RFID is a better technique to control the state change of the traffic light since RFID is mandatory for all the vehicles in India. It shows that it can decrease the traffic jam and avoids the nonce wasted by a green light on an empty road. It is also more certain in estimating vehicle existence.

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

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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. • The traffic light is controlled manually. • A traffic light will not change automatically during the arrival of the ambulance. • Taking more time to reach the hospital. • Lack of information passing.

PROPOSED SYSTEM

When the ambulance enters the traffic signal area, the signal is controlled automatically. • The traffic level is monitored using an RFID. • The information is transferred to server page Using IoT. Advantage • Automatic traffic light control. • Anyone can see the traffic level from anywhere using IoT. • Life loss is reduced

V.CONCLUSION

The previous systems work efficiently to manage to manage the traffic but does not provide quality of service for additional emergency and stolen vehicles and use Hardware like ZigBee etc. and complicate the system. The Proposed system works effectively and with higher accuracy in managing the traffic at junction using RFIF AND IOT.

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