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# INTELLIGENT AND ADVANCED TRAFFIC MANAGEMENT SYSTEM

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**Abstract:** The world is changing fast. Cities are growing and urban population is rising day after day .The need for transport of people and goods are increasing but so is congestion, air pollution, road accidents and climate change. Therefore in this paper we are trying to implement a system which consists of electronic sensors and some loop detectors which helps in controlling traffic signals by allocating time, based on traffic density to have proper synchronization between traffic signals and in addition to that using cloud based frame works the data of traffic lights based on current traffic status will be located in cloud to amplify the performance of the ITMS. Also installing barricades on each signals to prohibit the jumping of red signals and stop driving wrong side.

## I. INTRODUCTION:

A BOUT 68 % of the world's population will be living in urban areas by 2050, according to a projection of the world urbanization, undertaken by the United Nations (UN) in 2018 [1]. The urbanization area phenomenon, once predominantly rural, has completely changed human interaction with the environmental. This unplanned city growth has caused detriment to the population, such as increased vehicular traffic, congestion, increased in environmental and noise pollution, as well as many insecurity aspects [2, 3, 4, 5, 6]. To sort out problems generated by urban growth, several forms of high-tech electronic devices have emerged around the world, each proposing to solve a certain complication of everyday life. Such technological applications are fruits of the dissemination of the so-called Internet of Things (IoT) [7]. Another key asset for the attainment of smart cities is the technologies relating to physical, electrical, and information and communication technologies (ICT) Among the application areas in smart cities, the field of smart mobility stands out for its ability to propose technological solutions, which reduce traffic congestion, accidents, environmental and noise pollution. According to Schrank et al., in 2014, congestion costed North Americans about an additional 6.9 billion hours of travel, consuming around 3.1 billion liters of extra fuel, resulting in a bottling cost of 160 billion dollars [11]. To collaborate with traffic light system modernization and to improve living conditions in future urban centers, the present work has developed a traffic control system remotely operated using wireless communication technology. The main improvements in traffic management would be: a) considering it is a wireless system, the installation of new traffic lights would be simpler, i.e, no communication cable installation would be necessary in intersections and throughout the city; b) Flexibility, i.e., with the proposed communication method, the system will operate not only at a crossing type, but also in several intersections types, from the simplest one (intersection with a single traffic light) to the more complex types (intersection with several traffic lights); c) real-time, i.e., since all traffic lights operating status are being carried out in real-time, traffic congestion situations caused by temporary traffic failure can be reduced, and a technical team can be immediately instructed to handle the traffic light faulty situation.

IATMS is a combination of advanced science and technology which includes information technology and data communication technology,sensor

technology,electronic control technology,Automatic control theory,operational research and artificial intelligence etc.,

It is effectively integrated in the transportation service control vehicle manufacturing to strengthen the link between three of vehicles,roads and users.

Then forms of security, improve efficiency, improve the environment energy conservation integrated transport system.

**Need of IATMs :**

The traffic congestion in urban areas is becoming one of the critical issues with increased population and automobiles in cities and hence causing extra delay and stress for the drivers but also increase the fuel consumption, transportation cost and increased pollution.

The traffic lights are one of the critical factors effecting traffic flow as the manual controlling system requires a large number of man power. Therefore this intelligent and advanced traffic management system aims to reduce the high traffic congestion scenarios through maintenance and providing prior information of traffic density through cloud.

## II. RELATED WORKS

The authors Megalingam et al. developed a traffic control system based on the information fed through a Wireless Sensor Network (WSN) nodes, not only to perform efficient traffic routing but also to track vehicles going at higher speed. However, in this case, the authors did not implement any real semaphore systems, only a system to exchanges data between WSN nodes and a Central Monitoring Station (CMS) [22]. Based on data found on WSN Rida et al. proposed a traffic light adaptive control method. Although the authors conclude the method reduces vehicle-waiting time, the system only operates in isolated intersections [23]. In their work designed to control multiple intersections, Zhou et al. developed a traffic light control based on the collection of many types of data through WSN [24]. Despite the work emphasizing the development of an algorithm capable of managing various intersections in real-time, the authors tested their method only for two-way (TW) intersections (both directions, that is, in TW/TW intersections). In the present work proposal, various intersections types of several intersection traffic lights would be simplified [24]. In many works proposed by Cunha [20, 25, 26, 27], a wireless communication system for traffic control and management have been presented. He has made use of ZigBee as the communication protocol information between the traffic lights. However, the communication between the intersections and management center was performed using a long-range communication protocol (LoRa technology). Silva have also used the ZigBee protocol in an intelligent traffic light system [21]. Although it presents several traffic light operational calculations, based on the number of vehicles circulating through the crossing, in his system, there were no vehicle detection sensors. Instead, he considered both random and deterministic values. His work addressed only one intersection type. There are many research areas to come up with emergency systems for accident intersections, according to [3]. According to Qi et al., a control strategy based on Petri Nets (PN) and the traffic lights system can control other facilities, including magnetic loop detectors and warning lights. In [28, 29, 30], an electronic system was designed for traffic lights and emergency vehicles communication, allowing them to control the intersection to prioritize ambulances and police vehicles. Instead of building an infrastructure to remain positioned next to a traffic light and exchange information with vehicles, as in [28], the present work proposes that the traffic light itself be able to communicate over a wireless network with a management center. Sundar et al. have designed a system to count vehicles by using Radio Frequency Identification (RFID) to estimate green light required time. In this case, he used a ZigBee protocol to exchange information about the walking distance

between the vehicles and the traffic lights, so police authorities could be activated in the case of a stolen vehicles detection [31]. Although the article details the RFID operation, Sundar et al. did not detail the communication system between traffic lights. Therefore, in the present work, despite direct intervention from the management center, specific safe routes could be created in case of a stolen vehicle detection culminated in a police chase.

## III.LITERATURE SURVEY:

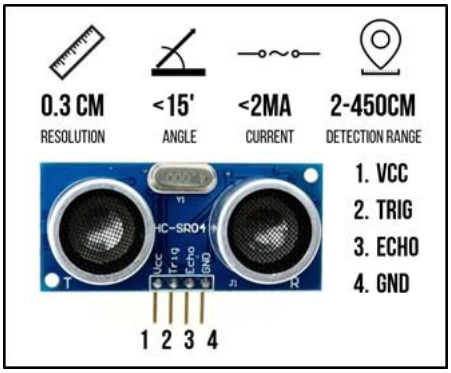
There are various existing theories about the topic which are accepted universally:

- APPROACHES FOR PREDICTION OF TRAFFIC PARAMETERS
- ESTIMATION AND PREDICTION OF REAL-TIME TRAFFIC FLOW
- ( by Diao, Meenakshi,Ruimin authors at Al.)
- ESTIMATION AND PREDICTING OF REAL-TIME TRAVEL TIME
- ( by B.AnilKumar, Dawn Woodard proposed a method, called “TRIP”)
- ESTIMATION AND PREDICTION OF REAL-TIME TRAFFIC DENSITY
- (developed by Chung and Keemin Sohn to count the number of vehicles on a road segment.)
- DETECTION, RECOGNITION, AND TRACKING OF TRAFFIC RELATED OBJECTS (Ali Zonoozi to predict crowd density.)
- SIGNAL CONTROL AND TRAFFIC LIGHT
- (Abu Zaid proposed an algorithm to control the traffic light based on number of vehicles on each traffic light.)
- CHRONOLOGICAL REVIEW OF INTELLIGENT TRANSPORTATION AND TRAFFIC MANAGEMENT SYSTEMS (In 2011, Baskar focused on IVHS to improve the traffic performance)

## IV.HARDWARE:

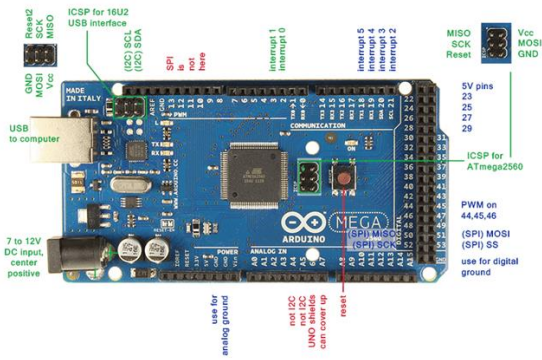
### Ultrasonic object Sensors

- This sensor will be used to detect traffic on road side




### Arduino mega

- This controller will perform all operations like traffic signal controlling and checking traffic density and then emergency vehicles and VIP vehicles checking and then road side barriers control



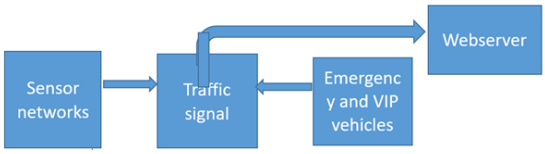

### Servo motors

- To open and close barrier servo motors will be used

**NodeMCU**

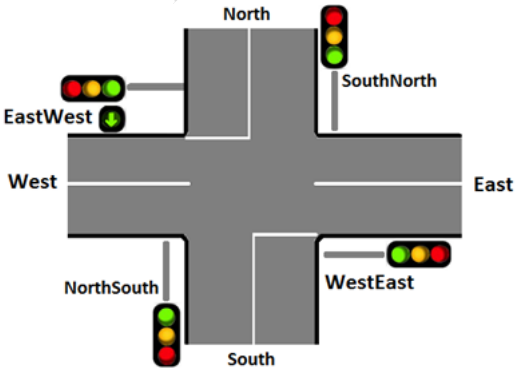
- This controller will send data on webserver about traffic signal and emergency vehicles

**FUNCTIONAL BLOCK DIAGRAM:**




**4.1. EXISTING MODEL:**

Nowadays traffic lights are set on in the different directions with fixed time delay, following a particular cycle while switching from one signal to other. This creates unwanted congestion during peak hours. This is a time consuming system.




**4.2 Problem statement:**

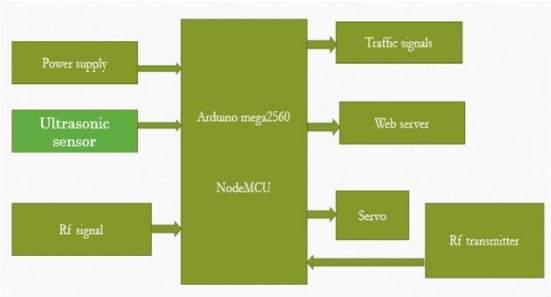
The problem with the traffic system is that for every minute the vehicles at the 4-way road will be heavy and the traffic lights shall be changed to each side for some fixed time. Even though there are no vehicles at particular side, the traffic signals will glow for given fixed time. Due to that there is time waste process. Due to this other side vehicles have to wait for the time to complete the process. So to reduce the wastage of time, we can implement the system that controls the traffic based on the heavy flow of vehicles at any particular side. With this system, we shall count the number of vehicles at each side at the junction and give the path to the particular side which has heavy flow of vehicles and keep remaining stop position.

**4.3 PROPOSED MODEL:**

Based on various approaches and techniques, our model mainly focuses on:

- Traffic flow density measurement
- Complete road side monitoring on a live web server
- Installing barriers(barricades) in all the four lanes

## V.HARDWARE BLOCK DIAGRAM:

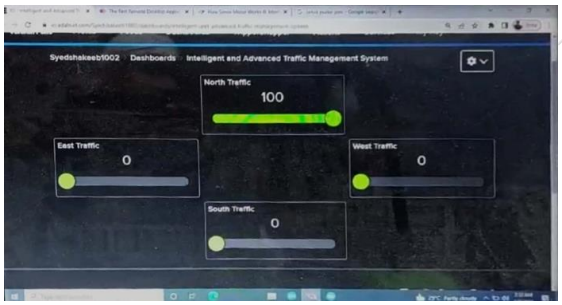


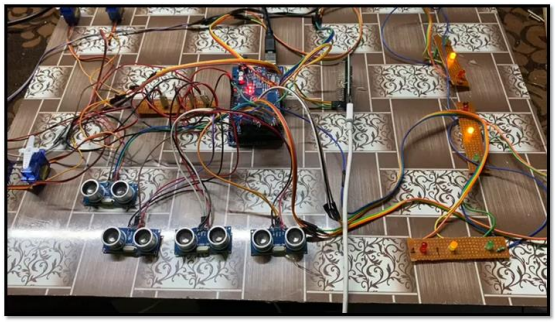

## Initial results:

| vehicle type | average error | median error |
|---|---|---|
| auto rickshaws | 9.3% | 5.4% |
| bus | 1.8% | 1.2% |
| car | 9.6% | 11.4% |
| two-wheelers | 13.8% | 15.0% |
| **all vehicles** | **10.9%** | **5.0%** |

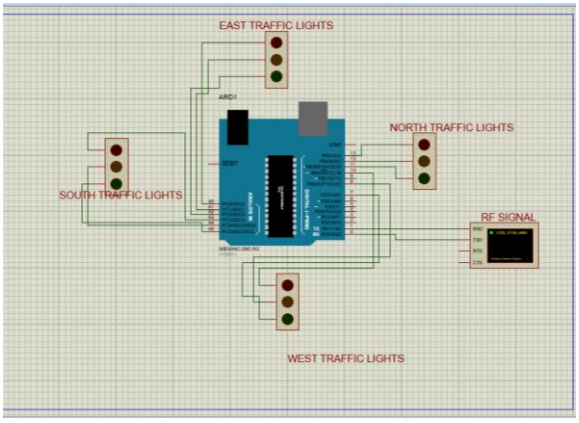
**Table 1: Density error rates per vehicle type. Densities represent corrected values, separately trained and tested for each row of the table, using the vehicle type(s) in the first column.**

## Final Results:



## Design and implementation :




## Working:

This circuit consists of 4 ultrasonic sensors, atmega8 microcontroller, 4 traffic lights.

We have to place these ultrasonic in such a way that when we place an obstacle in front of this ultrasonic ultrasonic should be able to receive the rays. When we give the power, the transmitted rays hit the object and reflect back to the ultrasonic.

Instead of traffic lights, you can use LEDs (RED, GREEN, YELLOW). In normal traffic system, you have to glow the LEDs on time basis. If the traffic density is high on any particular path, then glows green LED of that particular path and glows the red LEDs for remaining paths.

In normal traffic system, we allow the traffic for a time delay of 1 minute for each path.

## VI. CONCLUSION AND FUTURE SCOPE:

This study aims at improving and understanding of the state of art of traffic management technologies. Our study in this paper categorizes the studies of traffic parameters in real time measurement and approaches that work on vehicle density detection, priority for emergency and VIP vehicles, installation of barriers at each signal to prohibit the jumping of red signal and wrong side driving and the entire road side monitoring is done on a live web server.

Our future work will focus on proposing the below

**Approaches:**

 We can improve the barricades system from normal to tyre killers and also automatic barriers works by solar light panels with less delays.

 Using iot platforms ITMS may identify potential traffic jams/accidents and inform other vehicles travelling on the same route,enabling better descision making and improvement of navigation system and location of automated vehicles.

 Further in google maps providing data of traffic density at signal plus delay.

Therefore as our transportation system advances we are exploring how to address its impact on critical issues such as public health, job creation, social equity, and climate changes etc.

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