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Department of Electronics and Instrumentation Engineering, Adhiyamaan College of Engineering, Hosur, Tamilnadu, India

Dynamic Traffic Visualization Control Using IOT

S. Sujatha[1], M. Lourdufelix[2], P.Rimison[2]

Head of the Department, Department of EIE, Adhiyamaan College of Engineering, Hosur, Tamilnadu, India[1]

UG Student, Department of EIE, Adhiyamaan College of Engineering, Hosur, Tamilnadu, India[2]

ABSRTACT: The uprising usage of Internet of Things in all areas like business, industrial and home is utilized in this paper as a tool for the real time dynamic traffic visualization system. The growing and increasing use of transportation equipment create the congestion on the road and it is very difficult to avoid it. Even in big cities, cramming has become a common sight everyday which of course will reduce productivity. The development of transportation equipment rapidly increasing in one side, and the other sidefacility has to providefor appropriate transportation needs. The proposed idea in this paper provide a solution to avoid heavy traffic and reduce the traveling time by choosing proper path. A traffic congestion monitoring tool is developed and it provides the information about the state of the road by visualization to road users. Based on this information road users can take the decision or it will suggest the alternate optimized path to save the time.

KEYWORDSSonar Sensor, Traffic Information System, Intelligent Transportation System mobile APP, Think Speak

I.INTRODUCTION

The entire World is becoming more technological savvy and India is no exemption to this. With the tremendous growth in IT and other sectors, people have started to lead a comfortable living which includes Television, Air conditioner, Vehicles. So when it comes to transportation, people tend to use their own vehicles for going out rather than standing in crowd for catching public transport. Traffic congestion ensues due to high number of vehicles. Traffic congestion is a situation that occurs due to increase in number of user's vehicles and is characterized by slower speed, longer trip times and increased vehicular queuing.

As traffic demand increases, vehicle speed slows down the traffic stream resulting in traffic cramming. Traffic congestion can lead to drivers becoming unsatisfied and engaging in road rage. In traffic environment, Traffic Signals are used to regulate traffic condition in the roads. These signal systems are still needy on human for controlling it based on density of traffic of Traffic Signal currently in vogue is purely manual where Traffic police responsible in regulating the traffic signal system based on traffic density. This is a very weighty situation as most of the times the police personnel controlling the traffic signal leading to traffic congestion on the roads[10].

World's urban areas are facing several trials becauseof alarming trend of growing populations. Such colossal and multifaceted congregations of people results in various kinds ofdifficulties in waste management, scarcity of resources, airpollution, human health concerns, and traffic blockings. Theconcept of keen cities has been introduced to mitigate issuesrelated to growing urban population. There are severaldefinitions subordinate with smart cities as reported by Chourabiet al [1].

Drew definestraffic engineering as "the science of measuring traffic characteristics and applyingthis information to the design and operation of traffic systems". Early traffic flow "measurements"were rather subjective and involved visual assessments by police patrols and helicopter pilots. The realization occurred from this early experience that efficient system operation demanded objective assessments based on quantitative metrics. Surveillance of roads via CCTV (Closed Circuit Television) was first implemented in the U.S. in Detroit, Michigan, in 1961. Four years later, that system included traffic detection and measurement, variable speed signs, and lane and ramp control.

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Other projects on that time included the Chicago Area Expressway Surveillance Project (1961), the Port of New York Authority's Holland Tunnel (1963), and the Gulf Freeway Surveillance Project (1963). One of the traffic control schemes featured on the Gulf Freeway was a traffic merge control system that used a sonic sensor mounted above the road, in a side-fired configuration, and inductive loops embedded in the road. The sonic sensor measured vehicle speed and gap upstream of the merge area, the inductive loops detected vehicle presence and measured queue length on the frontage road and upstream of the merge area. Today there is a myriad of traffic control and management systems operating in the U.S. and around the world, with many more in the works. One thing remains constant in all of them, the need for sensors that provide quantitative measurements of traffic flow[10].

Another research on Density Based Traffic Signal System is based on image processing technique like edge detection to find the traffic density that regulates the traffic signals. The advantage of building Intelligent Traffic Control System is that it reduces congestion; operational costs and provide alternate routes to traveller and increases capacity of infrastructure[2].

This paper proposed traffic control system has been carried out employing PIC Microcontroller towards density based Intelligent Traffic Signal System. This system records total number of automobiles in the memory on real time basis based on user predefined interval. These data seized are sent to computer from the microcontroller. The overseer at the central station computer can access traffic conditions pertaining to any approachable traffic lights and nearby roads reducing traffic jamming. This system in future can let know the people about different place traffic conditions.
[10]
This paper comprises as follows: the second chapter proposed dynamic traffic visualization system, third chapter gives the design of intelligent traffic system, fourth chapter discusses the results and fifth chapter provides conclusion.

II. PROPOSED DYNAMIC TRAFFIC VISUALIZATION SYSTEM

Proposed mobile application system is based on visualizing the live traffic conditions through web application.As the ultrasonic sensors are used it gives accurate result of traffic conditions. The control unit as shown in figure 2.1 is developed and it is placed in the check post or toll. The ultrasonic sensors with different intervals is fixed in the lanes of the toll. The sensors will give the signal based on the vehicles in the lane queue. Based on this the number of vehicles are calculated by the micro controller. The output of the micro controller is sent to the mobile through wifi.

From the mobile APP the user can fetch the traffic data and decision can be taken accordingly for choosing the desired path with low traffic.Mainly this app is used in the emergency condition for giving the way to the ambulance at critical condition.IOT based traffic signal system is based on traffic density on road where the count of vehicles is done at each side of road by placement of sensor.

For example, in this system, three traffic lights i.eGreen,yellow and Red are placed on junction of road sides.Two pairs of sensor are placed across the roads which mark the distance for density zones. The ultrasonic sensors and ultrasonic receivers are placed opposite to each other. The Sensors are placed at 50 meters distance from one another. The logic behind is that, as the vehicles crosses the first pair of sensors, a digital signal is produced and accordingly sensor assumes that there is traffic congestion on the road. So based on the data gathered,nanomicrocontroller sends the timing signal output by comparing with adjacent road's traffic. As the vehicle crosses the second pair of sensors, Sensor assumes that it contains high traffic density respectively. For high density traffic, there will be more time allotment and for low density traffic normal time is given.

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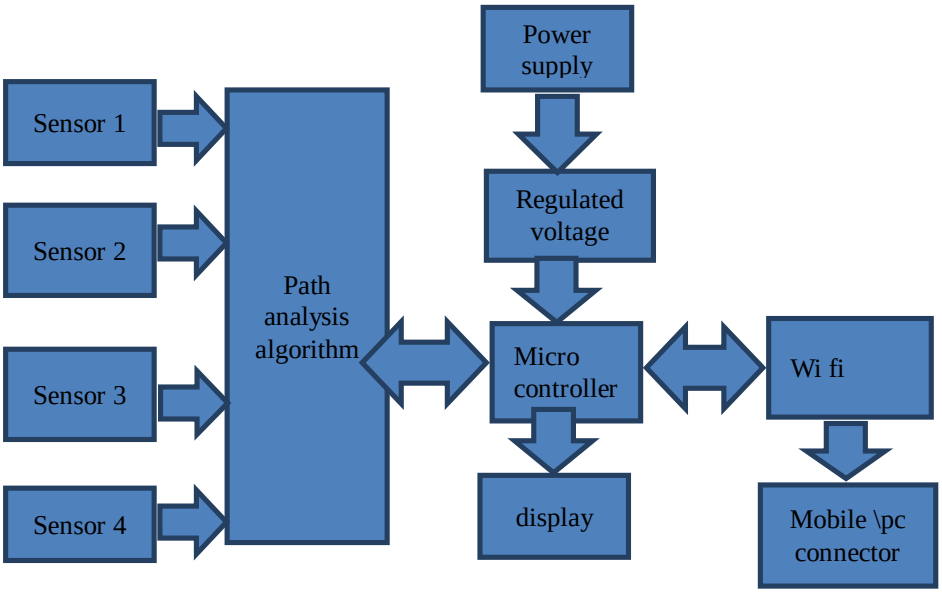

Fig 2.1 Control unit

The data on traffic density and traffic signal control can also sent wirelessly to where analysis made as Heavy traffic and Normal Traffic with date and time. This information is finally updated on Cloud webpage which can be used for further planning and analysis by Traffic department.

III. DESIGN OF INTELLIGENT TRAFFIC SYSTEM (MOBILE APP)

The control unit is act as a server and the mobile App is act as a client. It will get information from the control unit about traffic congestion. The mobile App software is developed with the name of THING SPEAK web server. After installing and clicking this APP the user get the window regarding the channel i.e the toll path as shown in fig 3.1. After entering the channel ID which is allotted for different toll based on the knowledge of the designer. Once the channel ID entered a popup window will come with details about the list of tolls or channels as shown fig 3.2. The plus symbols shows we can add the numbers of lanes in future.

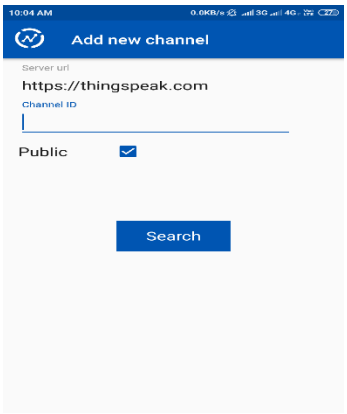

Fig.3.1 Screen shot of App window

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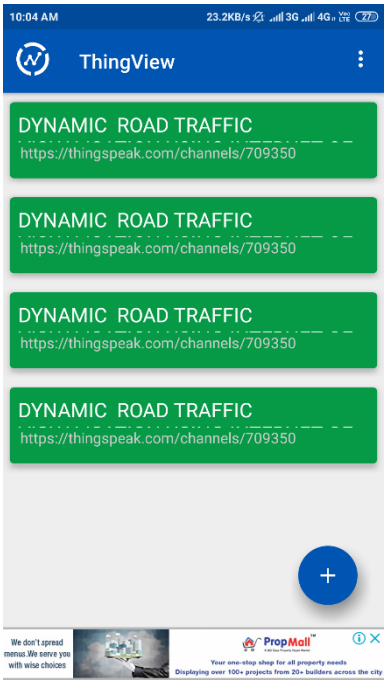

Fig 3.2 Number of lanes

Fig 3.3 Screen shot of number of vehicles in the track

After entering the channel ID in the app will also give the number of vehicles in each lane in that toll. Based on this the road user can decide the lane before entering into the toll or can change the path by seeing the other tolls traffic condition.

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IV. RESULT AND DISCUSSIONS

The developedhardware control unit is shown in figure 4.1 which is designed for the purpose of dynamic traffic visualized control.

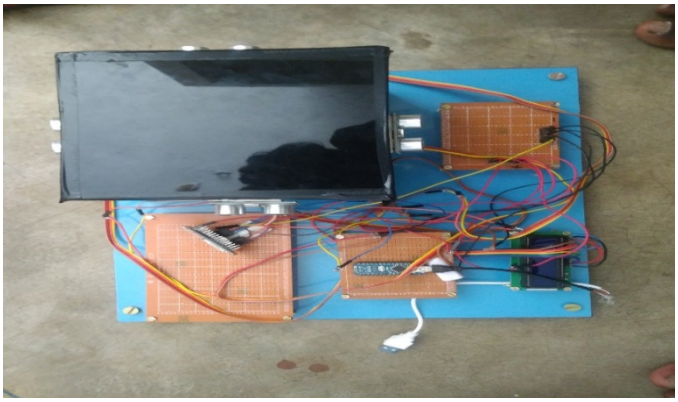

Fig 4.1 ControlUnit (proto type)

From the APP we can get the record of the traffic flow over a particular time or day as shown in fig 4.2.This record is used to analysis about the future expansion of tolls and path to the government infrastructure.

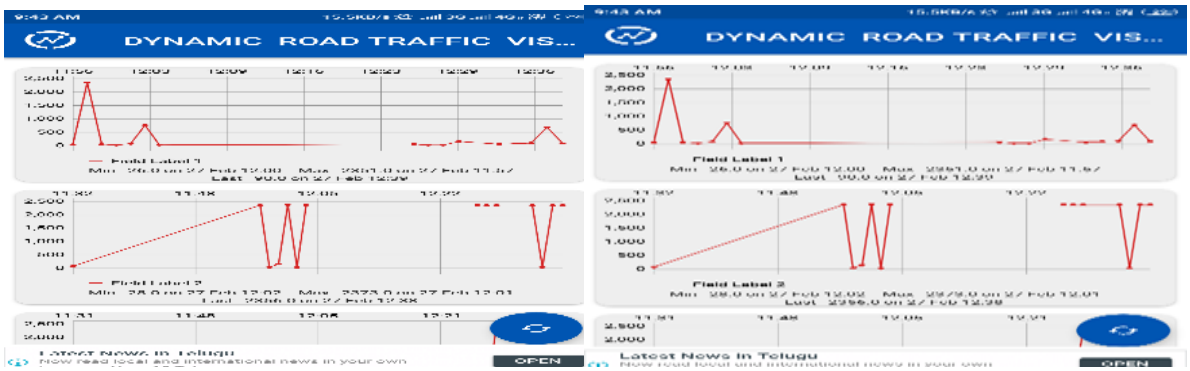

Fig 4.2 Screen shot of record of traffic flow in different time

To get knowledge of the traffic congestion some kilometres like 3km before, we can use the LIDAR sensor to increase the distance coverage. For effective implementation of this concept all the tolls has to be studied and the channel ID should be allotted. If all the details are loaded in the server then it is easy to fetch the information about the particular toll traffic. It can be mostly useful to the emergency situation like ambulance and fire service movement. And also used for the security purpose for the important persons. The other advantage is valuable time of the user is saved. Even it is used for critical police operations. The pollution level also calculated in that place.

V. CONCLUSION

Traditional Traffic Signal system relies purely on Traffic police for controlling the traffic signal for regulating the traffic based on traffic density. Lot of investigation been carried out in computing the density of traffic by employing Sensors for controlling the traffic light signals. Also some have hired image processing also for controlling the traffic signals too. This paper developed IOT Based Traffic SignalSystem as a mobile APP where ultrasonic sensor deployed

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on sides of road every 50 meters to count the number of vehicles. The traffic density information is sent to nano microcontroller where based on the condition the traffic signal changed accordingly by allotting more time for heavy traffic and less time for normal traffic. Analysis of traffic has been done as heavy and normal traffic and based on number of vehicles with date and time. This information sent to Webpage of cloud server. The system so developed is a prototype only for controlling density. If it is implemented in all the tolls and check post it will be more useful to the people.

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