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# Traffic Congestion Reduction, Automatic Accident Detection and Ambulance Rescue Alerts using Smartphone and WSN.

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Abstract: - Number of vehicles in our country has exponentially increased but the traffic control systems have not developed in that phase. Therefore it is the time to shift from fixed timer mode to an automatic system. In this paper, we are proposing a traffic congestion reduction system and an automatic ambulance rescue alert system. Taking into account that user is using smartphones with an internet connection. There is a good opportunity to put forth our architecture for WSN using Smartphones. This also aims at finding the place or location of the accident and reporting the location of the accident to the nearest ambulance. The vehicle's position in the form of latitude and longitude coordinates will be sent to road transport officials through the internet. The location spot is retrieved using "GLOBAL POSITIONING SYSTEM". This technology also helps to inform about the accident to nearby hospital/ambulance service immediately.

Keywords--- Wireless sensor, smartphones, GPS and GSM.

#### I. INTRODUCTION

Over the last century transport field has evolved to become a driving force for the global economy. To address the challenges congestion traffic in a city, to the environmental concerns, and to security and safety. Smartphone is one of the dynamic trends in communication. Each device node contains: sensor, processor, memory, radio and approach for congestion traffic detection. The main motivation behind our technical paper is to control traffic congestion. On the other hand, we also make the consideration for the energy efficient based on the interoperability between the WSN and smart phones of the citizen existing on street. One approach to eliminating the delay between accident occurrence and first responder dispatch is to use in-vechicle automatic accident detection and notification systems, which sense when traffic accidents occur and immediately notify emergency personnel. This technical paper aims at finding the occurrence of accidents and reporting the location through traffic signal and the ambulance reach the traffic signal and the ambulance driver controls the signal. This technical paper provides the result by smartphone accident detection system to prevent false positives. 2.

### **II. RELATED WORKS**

Al Sobky et.al.[1] Introduced new application for using smart phones to measure traffic density and speed. The proposed system consists of two smart phones and two cars, with observer to count vehicles between the two cars. This count is utilized with tracking data to give "measured" density and "measured" speed. The travel speed and manual traffic counts were used to derive "calculated" density. Yi Sheng Huang et.al.[2] Proposed a solution to regulate the problem of traffic congestion. For this purpose, their paper presents a dynamic control methodology is constructed by the alternation of PIC and ROC sub-models. The two submodels are successful in describing the dynamic situation. That is the GS can turn off to forbid incoming vechicles. And the GS can turn on when the traffic congestion is released. Calderoni et.al.[3] In this infrastructure it consist of a network of smart cameras operating over a outdoor public lighting thanks to power line communication technology and equipped with a vehicle counting and classification algorithm.



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# **III. FIELD APPLICATION OF SMARTPHONE**

The present study reviewed the literature related to factors. The smart phone sensing has grown; the range of applications has expanded as follows:

#### **Traffic Sensing Detection:**

We focused on the developed world, with its relatively simple traffic flow patterns. In fact, traffic flow in cities of the developing regions, which comprise much of the world, tends to be much more complex owing to varied road conditions. For example: Monitor in real time the number of vehicles passing for a certain point in highways and roads and detect average time of vehicle stance for traffic congestion prevention. The monitoring system can also be used to calculate the average speed of the vehicles which transit over a roadway by taking the time mark at two different points, etc. The Vehicle Traffic Monitoring is also another important application as understanding the flow and congestion of vehicular traffic is essential for efficient road systems in cities. Smooth vehicle flows reduce journey times, reduce emissions and save energy. Similarly the efficient flow of pedestrians in an airport, stadium or shopping Centre saves time and can make the difference between a good and a bad visit. Monitoring traffic whether road vehicles or people - is useful for operators of roads, attractions and transport hubs.



Fig 1: The road and traffic monitoring with WSN and Smartphone

### **IV. PROPOSED SYSTEM**

The proposed system consists of three modules.

1. Traffic congestion reduction module

2. Automatic Accident Detection and localization

#### 3. Ambulance Rescue

### 4.1. Traffic Congestion Reduction

Interfacing between Smartphone and wireless node: In this section, the smart phone is connected with the WSN by a sink or gateway node. This architecture solution exploits a single gateway, i.e. the smart phone (see Figure 2).



Fig 2: Interoperability between a wireless node and a smart phone

We will focus on the solutions based on: base station and overlay networks also considering possible improvements . The radio communication device will be equipped with two radio interfaces: Interface ZigBee for WSN and interface TCP/IP or ZigBee for smart phone communication direct. The system is proposed on two levels; hardware and software. At the hardware level, heterogeneous sensors are deployed for multi-activity and multi-events, these wireless nodes are configured with ZigBee Mesh topology and data is received by central coordinator node and collected by local home gateway computer or server[5]. The software modules are subdivided into different levels, such as data logging, data extraction, and data storage, in our models the data entry by Bluetooth or by WIFI. But their ultimate task is to forecast the change in activity and correlate it with the wellness of inhabitants in real time or near time. The software components installed on the smart phones including, the sensing Daemon, which is responsible for sensing, classification, data processing (e.g., privacy preserving audio processing) and uploading of sensor data, etc.



# International Journal of Engineering Research in Computer Science and Engineering (IJERCSE)

Vol 4, Issue 11, November 2017



# Fig 3: WSN for traffic monitoring

But such configurations bring a number of issues, such as how to detect paths to the Internet, which path to use, and how to redirect traffic from one path to another.

# 4.2. Automatic Accident Detection:

In proposed system if a vehicle has met with an accident, immediately an alert message with the location coordinates is sent to the control centre. From the control centre, a message is sent to nearby ambulance. Also signal is transmitted to all the signals in between ambulance and vehicle location to provide RF communication between ambulance and traffic section. The vehicle accident observed using vibration sensor and in the control section it is received by the micro controller and then the nearby ambulance is received from the PC and controller sends the message to the ambulance. The signal to the traffic signal section is transmitted through RF communication. Also if any fire occurs it is detected using fire sensors and an alarm message is directly sent to the fire station

### Vibration Sensor [4]:

According to our system, every vehicle should have a vehicle unit. The vehicle unit consists of a vibration sensor, Microcontroller, a user interface, GPS system and a GSM module. There is need to process the low level voltage signal properly given by vibration sensor. We can use multiple sensors for detection of accident to avoid any error in detection. These sensors can be installed in vehicle body at most vibration sensitive locations. A central system can be implemented inside vehicle to process the signal coming from sensors and to detect the accident from the signals coming from multiple sensors.

The predefined data i.e. Peak voltage level or crash waveform data are used to decide whether an accident is occurred or not. The vibration sensor used in the vehicle will continuously sense for any large scale vibration in the vehicle. The sensed data is given to the controller GPS SYSTEM inside the vehicle. The GPS SYSTEM finds out the current position of the vehicle (latitude and the longitude) which is the location of the accident spot and gives that data to the GSM MODULE. The GSM MODULE sends this data to the control unit whose GSM number is already there in the module as an emergency number. We can also use this vehicle unit for health monitoring of the patient using different sensors.

### GPS

GPS (Global Positioning System) It stands for "Global positioning system". It is having 24 satellites it will transmit the coded information. These 24 satellites will rotate one time over the earth in every 12 hours. In order to provide the information about velocity, time etc... GPS will help us identify the distance between the two different places on the earth and it will show the route to reach the required destination. Figure 2 shows the GPS module. There are three different segments in GPS they are: 1) Space segment 2) Control segment 3) User segment When satellites transmit information and each satellite will have a different code and it also transmit information at different frequencies so that the GPS can discriminate with the different signal received by the different satellites. This condition will help to calculate the time taken to travel the distance between the satellite and the GPS receivers and then the travel time is multiplied by the light speed gives the distance between the satellite and the GPS receiver The control segment will identify the satellite and it will guide with the proper orbit and proper time taken by the satellite to reach the GPS.

It is having four unmanned station with single master control station. These unmanned stations will receive the information from different satellites and this information is send to the master station and this is send to the GPS satellite. The user segments consist of users and the GPS receivers. Working of GPS: When a GPS receiver is started to work, firstly it will start to download the orbit information about each and every satellite to download this information it will take around 12.5 min once this information is completely downloaded it will be stored in the receivers in order to use further. The GPS knows the exact location of the satellite but still it needs to know the exact distance between the satellite and the receiver. This distance can be calculated by the receiver, by multiplying the time taken by the signal to reach the receiver and the velocity of the transmitted signal. But the receiver already knows the velocity which is 18600 miles/ sec.



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Vol 4, Issue 11, November 2017



Fig 4: Block Diagram of Ambulance/Control System.

In control section GSM modem receives message about accident and send it to PC. Fig 5 explains the block diagram of control system. PC identifies the nearest ambulance and ambulance is instructed to pick up the patient. Control section transmits the control signal to all the signals in between ambulance and vehicle by RF transmission.



Fig. 5: Block Diagram of traffic unit

Fig 5 explains the block diagram of traffic unit. Whenever the ambulance reaches near to the traffic signal(approximately 100m), the traffic signal will be made to green through RF communication. Thereby the ambulance is recommended to reach the hospital in time.

# **V. CONCLUSION**

There is exigent need of efficient traffic management system in our country, as India meets with 384 road accidents every day. To reduce this congestion and unwanted time delay in traffic and advance system designed here is this project. The next step forward is to implement this scheme in real life scenario for first hand results, before implementing it is on the largest scale. We believe that this may bring a revolutionary change in traffic management system on its application in actual field environment and also in this paper a novel idea is proposed for controlling the traffic signal in favour of ambulance during the accidents. Thus proposed system implemented in country with large population like INDIA can produce better results. The proposed system is more accurate with no loss of time but there may be a delay caused because of GSM messages, since its queue based technique which can be reduced by giving more priority to the messages communicated through the controller, the solution and the application scenario are developed accounting for a high level of nodes mobility.

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