A Synopsis on

IOT based Accident Alert System

Submitted in partial fulfilment of the requirements for the award of the degree of

Bachelor of Engineering

in

Information Technology

by

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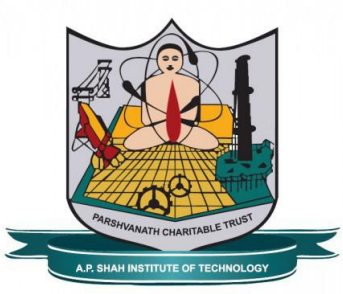

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CERTIFICATE

This is to certify that the project Synopsis entitled "***IOT based Accident Alert System***" Submitted by ***"Kunal Kale (16104027),Viranchee Patil (16104044),Chinmay Kubal (16104023)"*** for the partial fulfillment of the requirement for award of a degree ***Bachelor of Engineering*** in ***Information Technology***.to the University of Mumbai,is a bonafide work carried out during academic year 2019-2020

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Abstract

Ever since India attained independence in 1947, the country has been getting diversified year after year. As a result, urbanisation has taken place in most part of the country. This has lead to an exponential increase in the number of vehicles on road as mapped against the limited number of roads present. As a matter of fact the number of accidents has also increased exponentially. The Indian Ministry of Road Transport and Highways reports that around 4,06,730 accidents take place each year and close to 86,000 are killed! In frequently crowded areas like cities or highways, more than 65% lives are lost due to delay in the arrival of emergency services. If we consider accidents taking place in secluded areas, then the percentage of lives lost is even more. Sadly, with the ever increasing population and lack of pothole – free roads these numbers will continue to increase even more. With an aim to reduce the number of car crash fatalities, we have implemented the concept of IoT, so that we can leverage the nearby sensors to help the vehicles which have collided or are in need of any help. In case of accident, there will be some collision in the vehicle which will be sensed by the sensors. The crash sensors will measure and report the intensity of collision based on certain parameters and operations related to the automotive design of the vehicle. This strength of collision mapped on a scale will then inform the respective nearby sensors in IoT which can come out to help the victims. In case of lighter collision, only the local car repairs and other nearby sensors forming an IoT network will be informed. In case of high intensity collision, the data relating to location of car and other things will be sent to cloud which will then inform the nearby car repairing showroom, hospital services and the repairing services.

Introduction

The advent of technologies like Cloud computing, Internet of Things, Ubiquitous computing, Autonomous computing etc. have turned a number of unimaginable concepts and theories into reality. Earlier a major setback in the realization of any concept or a theory was the lack of availability of computing resources but now, with the introduction of these new technologies we are able to introduce our concepts to the future world in no time. Presently there are vehicles coming with a built in accident tracking system which can detect accidents and can also trigger the emergency help actions. Major disadvantages of such systems comprises of factors like non-portability, high cost, limited options, false delivery etc. In order to tackle these disadvantages, we present the modelling, implementation and testing of an Intelligent Accident Management system based on IoT and Cloud Computing. At the time of accident, IoT sensors will be used to determine the impact of damage caused by the collision. Based on the impact index, a text message will be sent to nearby authorities and/or emergency service providers.

Literature Review

The papers referred are mentioned below:

[1] “Intelligent Accident Management system using IoT and Cloud Computing”
Authors: Akriti Singhal , Sarishma , Ravi Tomar

The model presented here involves a collective integration of different types of sensors as well as a microcontroller unit which acknowledge emergency calling system. This technology includes the benefits of GSM modem used as automatic emergency calling system and GPS sensor for location calling. GSM modem requires a SIM card and works with a GSM wireless network. Accelerometer sensors and vibration sensors are collaborated. The accelerometer is used to measure the acceleration and the vibration sensor is used to measure various physical parameters like change in acceleration, temperature, etc. During an accident abnormal changes in the physical parameters mentioned above are detected and thus, the accident is confirmed. The severity of the accident is mapped on an intensity scale. Further, the display is provided in LCD interfaced with the microcontroller and LED indicates the occurrence of an accident. The GSM module is activated at once by the microcontroller, which has a saved number of a nearby emergency calling location. This emergency location is decided depending upon the impact of collision.

The main advantage of this system is that it is cheap and uploads data onto the cloud.

The disadvantage is that the processing speed and internet speed is compromised due to microcontroller and GSM module respectively.

[2] “S-Car Crash: Real-time crash detection analysis and emergency alert using smartphone”

Authors: Harit Sharma , Ravi Kanth Reddy , Archana Karthik

In this paper, they developed a system which integrates the functonalities of sensors present inside a mobile phone such as GPS receiver, accelerometer, gyroscope, etc. In this model, using smartphone sensors as the source for input stream, makes it a cheaper alternative to expensive in-vehicle accident detection systems. Using smartphone for developing such solution gives an easy access to the already established wireless network infrastructure, which can be used to notify emergency responders in case an accident is detected. Since the primary source of accident detection in this system is the actual smartphone itself, many false positives in the acceleration can be detected which may trigger the emergency mechanism. The proposed model in this paper eliminates cases of false positives by calculating the collision index and then depending upon it's value, emergency authorities are informed.

The main advantage of this system is that all the sensors required are present inside the mobile itself that's why no additional components/modules are required.

The biggest disadvantage of this system is that the mobile device that will detect the car crash can itself get destroyed at the time of an accident. In such a scenario, the system fails immediately.

[3] “A Smart Accident Detection and Control System in Vehicular Network”
Authors: Md. Saeef Abdul Hadi, Abhijit Saha, Faysal Ahmad, Mohammad Shahriyar Hasan, Mehebub Hasan Milon

In this paper, they developed a smart accident detection system which is used to detect accidents that happen at a junction. The smart accident detection system integrates the working of an Access Point infrastructure , a Control Box infrastructure and a Control Room. In case of an accident, a message regarding the accident is broadcasted to all the vehicles that are present in the same lane wherein the accdient has occured. For this the API uses a microcontroller which uses 'push method' for broadcasting messages and the receiver present inside vehicles uses 'pull method' to receive the incoming message.
On receiving the message, drivers are alerted about the accident's lane number. Due to this they can divert their path and avoid further damages.
The system is also capable of alerting emergency authorities in case of an accident.
A major disadvantage of this system is that in case of heavy taffic routes, a slight delay in broadcasting the message reagrding the accident can lead to more vehicles getting involved in accidents as well.

[4] “A Comprehensive Solution to Road Traffic Detection and Ambulance Management”
Authors: Hari Sankar S, Jayadev K, Suraj B, Aparna P

In this paper, they developed a system to address the problem of delay minimization right from when an accident occurs till the time when the patient is handed to the casualty. A dedicated in-vehicle accident module which consists of a microcontroller, GPS receiver, accelerometer and Raspberry Pi B+ is used. A model view controller based Django framework is used to collect data about the accident and nearby ambulances using POST method. When an accident occurs, the server utilizes the Distance matrix service from Google Maps API web services to find the real map distances and transit times of nearby ambulances to the accident location. Only ambulances belonging to the same jurisdiction as that of the accident are considered for sorting. The ”nearest” ambulance is found by using a simple insertion sort on the transit times. The term ”nearest” is defined in terms of time required to reach the accident spot. It is to be noted that the transit time for each ambulance suggested by Google Maps API web servicesdependson theprevalent trafficconditions. Accident coordinates are then relayed to this ”nearest” ambulance. Utilizing other functionalities of Google Maps API web services like transit time, it is possible to track and keep a check on the performance of the ambulance driver from a single terminal preferably at a control room.

Existing System Architecture

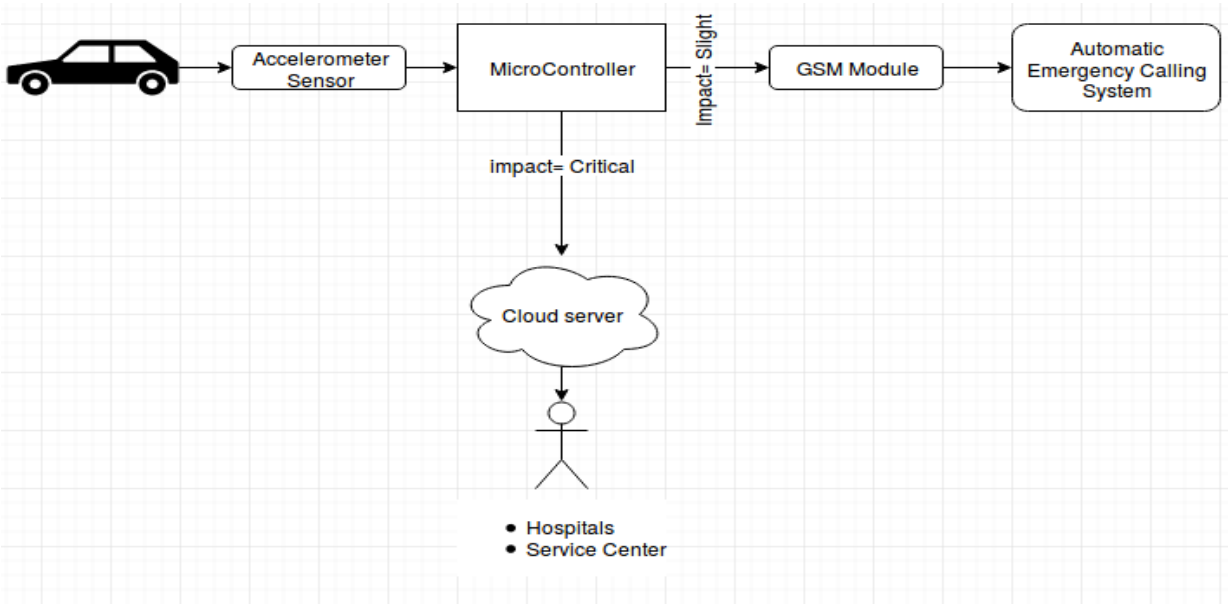

Figure 1 : Existing System

Problem Definition

- To create an assistive system for car crash victims which will automatically alert nearby authorities that can arrive on the scene in quick succession of time, thereby possibly saving the victim's life.
- Based on the impact of collision, the system will automatically send a notification to the service stations, local clinics, police stations, hospitals, etc.

Objectives

- To develop a cheap state-of-art accident management system for vehicles.
- To provide smart assistance to the car crash victim
- To contact the concerned emergency authorities automatically on the victim's behalf

Proposed System Architecture and Working

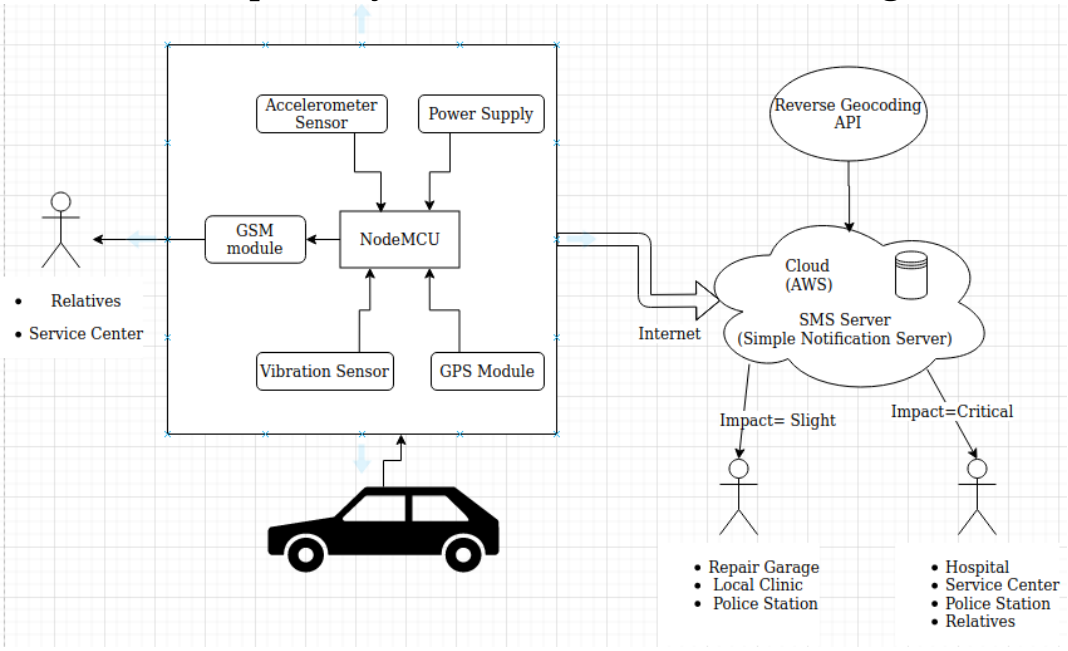

Figure 2 : Proposed System

Accident severity	Value of z	Approximate value of G range
Safe level	1	0-4 g
Slight level	2	4-20 g
Moderate level	3	20-40 g
Critical level	4	40+ g

Figure 3 : Accident detection for varying values of G- forces.

At the time of collision, the accelerometer will detect an abnormal change in the acceleration and the vibration sensor will sense changes in acceleration, temperature,etc and confirm if an accident has taken place or if it's a false alarm. This change in acceleration will be mapped on an intensity scale. Using the Simple Notification Service provided by AWS an alert will be sent to the nearby clinics, garages,etc if the impact detected is low. If impact is high, an emergency alert will be sent to the nearby Hospitals, Service Centers, Police Stations, relatives, etc .

The exact coordinates of the crash will be determined with the help of a GPS module and they will be included in the notification sent to the nearby authorities.

In case of unavailability of internet, GSM module will be used to send SMS to hospitals and relatives.

Proposed Technology Stack

Hardware:

- NodeMCU : Acts as the main microcontroller to integrate functioning of other components
- GSM Module : For automatic emrgency calling
- GPS Module : For providing geographical location
- Accelerometer : For measuring change in acceleration
- Vibration Sensor : For detecting change in various physical parameters such as acceleration, temperatue, etc.

Software:

- ArduinoIDE : For programming and testing the working of the system.
- AWS DynamoDB : For database storage.
- AWS : For providing services related to the system like Simple Notification Server, Storage, etc.
- ReverseGeocoding API : For providing latitudinal and longitudinal coordinates on the map and also for locating services nearby.

References

[1] Akriti Singhal, Sarishma, Ravi Tomar, “Intelligent Accident Management System using IoT and Cloud Computing” , 2nd International Conference on Next Generation Computing Technologies (NGCT-2016) Dehradun, India 14-16 October 2016

[2] Harit Sharma, Ravi Kanth Reddy, Archana Karthik, “S-CarCrash: Real-time crash detection analysis and emergency alert using smartphone” , International Conference on Connected Vehicles and Expo (ICCVE), 2016

[3] Md. Saeef Abdul Hadi, Abhijit Saha, Faysal Ahmad, Mohammad Shahriyar Hasan, Mehebub Hasan Milon, “A Smart Accident Detection and Control System in Vehicular Networks” , 5th International Conference on Networking, Systems and Security (NsysS), 2018

[4] Hari Sankar S, Jayadev K, Suraj B, Aparna P, “A Comprehensive Solution to Road Traffic Detection and Ambulance Management” , International Conference on Advances in Electrical, Electronic and System Engineering, 14-16 Nov 2016