DETECTION OF TRAFFIC COLLISION AND TO ACTIVATE EMERGENCE RESPONSE

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*Abstract---***The aim of this system is to successfully identify a traffic collision using an onboard device which receives data from the sensors placed in the vehicle. The device combined with the sensors read the data and processes them to identify an accident and informs the nearest and the fastest accessible ambulance services and hospital. The partner mobile application in the ambulance receives a notification and the relevant details about the event. The ambulance is provided with the fastest route map to the scene and to the informed hospital. The partner application of the hospital lets the hospital track the ambulance and it also provides the hospital with data such as the condition of the patient, the number of patients etc. as updated by the ambulance via the partner application. This system thus significantly helps in reducing the reaction time and can thus help in increasing the chances of saving a human life.**

Keywords---Car Accident, Bike Accident, Traffic Collision, Accident, Emergency Response Time, Ambulance service, Hospital.

I. INTRODUCTION

In this busy world, time is in great value for everyone. Everyone has work to do and a place to reach. Everyone depends on a mode of transportation that can save time and energy. Vehicles satisfy this need of every human to take them to their destination fast and conveniently. With this comes a new problem, traffic collision which is a major issue that is faced by people in this busy world. Lakhs of people are reported to have died in road accidents in 2017 alone in India [1]. This have figures have gone up at any alarming rate as more and more vehicles come into the roads of India. This is not just the case of India alone. Thus, as a measure to bring down these numbers, an intelligent system that has the capability to identify and report an accident is implemented. Traffic collisions and its management is a major issue faced by many developing and developed countries in the world. These traffic collisions contribute a major share in the total death rate in a country. Traffic accidents are happening at every moment, even as we speak. One of the main reasons for the loss of life in a traffic collision is due to the delay in the emergency medical response. This delay in medical assistance can be due to factors such as delay in informing the services about the traffic collision that has happened, it can be due to the distance between the service provider and the scene of the accident or it can be due to the traffic conditions on the way to the spot of the accident.

Our main aim is to identify an accident successfully and inform the authority about the accident. By successfully identifying an accident and reporting it to the authority in time can help in reduction of reaction time. Reducing the delay in providing the support has proved to be a very important factor in saving human life in many cases and thus reducing the delay in the response time can bring a considerable change in the number of deaths caused by traffic collisions. This reduced reaction time increase the chance of saving human life. We can achieve our objective of reducing the response time by implementing a smart system that can detect a traffic collision in any vehicle. This system must be capable of successfully identify the occurrence of a traffic collision and should be also able to successfully identify the optimal emergency services and notify them about the incident. In this project we are trying to identify the accidents that happen in both four wheelers and two wheelers. Once an accident is identified from the significant variation in parameters, the intelligent system placed in the car informs the nearest and fastest accessible ambulance service and the hospital. The system using the inbuilt GPS module and the communication module sends the location and other relevant data to the nearest ambulance service and the hospital. Both the ambulance service and the hospital have a dedicated application that helps for the communication between the ambulance and the hospital so that the hospital has a clear-cut idea about the incoming patient's health condition.

The application provides the ambulance driver with the fastest and the most optimal route to the accident scene and to the hospital. This can help in reducing the response time since the partner application installed in the device of the ambulance gives the fastest possible route to the spot of the accident and to the hospital that was already informed about the collision. The hospital using their partner app, can monitor the status of the ambulance. These features can play a considerable role in the reduction of the response time.

II. LITERATURE REVIEW

This above topic is something that is under development for some time now. There are many proposed systems that is successfully able to detect an accident and notify the emergency contacts about the incident that happened with the relevant data. However, most of these are not able to tackle problems such as the ability to address the case of both two and four wheelers or clubbing together all the entities into a single system. Few of the studies based on these issues are briefed in this section.

In [2], a two-wheeler accident is identified with the help of a vibration sensor in which if the reading is more than a reference point, it is considered as a fatal accident. Once an accident is detected, with the help of the GPS module, the location is identified and using a GSM sim module the location data is communicated with the emergency contacts. The data is also stored in cloud for future reference with the help of Node MCU Module. This stored data can be used to analyse the accident patterns to improve the system in future.

The next study gives a different way of dealing with the issue by giving a solution that focuses on preventing road accident in the case of two wheelers. In [3] , the proposed system is an intelligent helmet that lets the rider turn on the two wheeler only when the rider is wearing the helmet and when he is not under the influence of alcohol. The helmet has two sensors. One senses if the helmet is being worn by the user and the next is an alcohol sensor which checks if the user is under the influence of alcohol. If the user is wearing the helmet and he has not consumed alcohol, then the ignition on the two-wheeler is activated.

[4] Another proposed system that can detect an accident in two wheelers basically uses a phone application that receives data from a heartbeat sensor and from an accelerometer. Once user logins to the application and establish the connection with the sensors via Bluetooth. When a tilt is detected it starts to count heartbeat using the heartbeat sensor. when an abnormality is found, it is taken as an accident which triggers the message. If no abnormality in heartbeat, then both the sensors are reset.

In [5],the system uses an accelerometer, gyroscope and a force sensor to collect data. The data is processed with the help of an onboard processor and sends it to a smartphone via the Bluetooth module. The algorithm runs this processed data to detect an accident and at the event of an accident the application sends automated text which has the details such as GPS location data and time and date of accident to the specified emergency contacts.

In [6], An accident is said to have happened when vibration and gyroscope sensor detects a change in the threshold values. The vibration sensor cheeks for change in vibration pattern and the gyroscope senses if the car has toppled or not. The values are processed by a processor and if it denotes an accident then a message is sent to the emergency contact numbers using the GSM module along with the location identified by the GPS module. The data is also sent to the nearest hospital and police station identified by the system along with the vehicle details.

The next proposed system is something that is more user friendly and gives a heads up regarding the speed limits to the driver which helps the driver to be careful while driving. In [7] ,The mobile application keeps track of speed, location, sounds, vibration, etc. All these data are analysed by the phone to identify an accident. Once an accident is sensed it asks the user for confirmation. If it's an accident, then the data is sent to the server. A web-based application is implemented with two users i.e.; traffic and medical centres. The received data is processed by the traffic centre and required actions are initiated. The medical centre can revert to the traffic centre regarding the actions taken by them. The phone also gives voice instructions regarding the speed limit. Once an accident is detected the phone informs the authorities about the place and time of the accident along with some personal details of the driver.

The next system proposed in [8] is a low-cost airbag deployment and accident detection system that can be implemented in any low budget cars and helps in notifying any accident responders in time to reduce the loss of human life at the event of an accident. This system can be adapted to any segment of vehicles in the market. In this system we have a shock sensor and a temperature sensor that provides the ARM processors with the required data. This data is processed using the processor and at the event of an accident the second ARM sends signal to release the airbags and also uses the GPS module to get the location data and sends it via a GSM Module to the emergency contacts.

III. RESEARCH WORK

Road accidents are increasing at an alarming rate day by day. This may be due to the carelessness of the driver or through external factors. As from the knowledge from the previous works of people, accident detection in two wheelers and four wheelers can be done in many ways. There are many parameters that can be taken into consideration in the decision-making process. These parameters may be same and there are also some parameters that are unique to the category of the vehicle. All the above systems that are under consideration basically uses an accelerometer, a gyroscope, and a heart rate sensor to collect data from the vehicle. This data is then processed either by an onboard processor or the data is sent to a smart phone that processes this data. The algorithm runs this data and takes the decision if it is an accident or not. If it is decided as an accident the device takes the data from the GPS module and sends it to the emergency services either as text message or as an app notification using the GSM module.

A. *Identifying number of people involved*

The above considered system are only able to answer for few of conditions. So here in the new proposed system came up with answers to many problems that wasn't addressed before. In the system we pressure sensors under the seat in both two and four wheelers so that we can get a rough idea of how many people where in the vehicle at the time of the accident. In Four wheelers this data can be backed up by the counting the active seatbelts i.e. seatbelts that are in use. In two wheelers the pressure sensor alone can give the proper idea and also in two wheelers data from these pressure sensors can be used as a parameter for accident detection i.e. when an accident happens, the rider and the co-rider tends to fall off from the two-wheeler thus the pressure is off the seats.

B.   Parameter based on proximity of the driver

In Four wheelers at the time of a critical accident, the driver tends to lean against the steering wheel. This can be due to the change in cabin dimensions due to the impact or this can be due to a health condition. Thus, we can use a proximity sensor to take the distance between the steering wheel and the driver as a parameter for accident detection. In two wheelers we can use an omnidirectional proximity sensor to find if the rider has gone past the threshold value. This can help in identifying the intensity of the accident.

C.   Fire detection

In both four wheelers and two wheelers, events such as a fire can occur. Such accidents may not involve a collision. In such cases where there is a fire without a collision, we need to identify it as an emergency. Here we implement the temperature sensors to read the temperature of the vehicle. If the value is higher than the threshold then a notification is sent to the owner's mobile. If it's a false alarm the user can stop the initiation of emergency services. If the owner/ driver doesn't respond to the notification within a set time, then the emergency services are activated.

D.   Dedicated onboard device and network

Now instead of using the GSM module to send text messages we come up with a system that interconnects all the consumers with the hospital and ambulance services. In this system the onboard device mounted in the car looks for the nearest active ambulance service and the nearest hospital. The device looks for the nearest and the fastest accessible services based on the distance and travel time based on road conditions and traffic congestions. The onboard device sends a notification to the ambulance service informing about the accident with relevant data such as the exact location, directions to reach the location, optimal route to take, number of people expected to be involved in the accident and the directions to the hospital that has been informed about the accident. It is also responsible in informing hospital about the accident and the number of people expected to be involved in the accident and the time of the arrival of patients.

E.   Collecting data about the user

The end user is provided with an application on his mobile phone and can login by providing some basic information about the him/her. This data is then communicated with the onboard device of the car on start-up using Bluetooth. The onboard device has a Bluetooth module that serves this purpose. The Bluetooth device communicate with the mobile phone to retrieve the relevant data.

F.   Partner Application for Hospital and Ambulance services.

The system uses two partner apps to achieve the above. One is for the ambulance services and the other for the hospital services. These mobile application helps the ambulance driver with all the necessary data. The ambulance driver can install it on his phone and sign up for providing his services. Once he login to the app, when an accident happens, and he is the nearest service provider then he gets a notification about it. Now he is displayed with all the relevant details such as the distance, time and route to the location of accident. He can also see the same to the hospital from the location of accident. The ambulance partner application has an option to update the details about the patient and also the details about the number of people involved in the scene of accident.
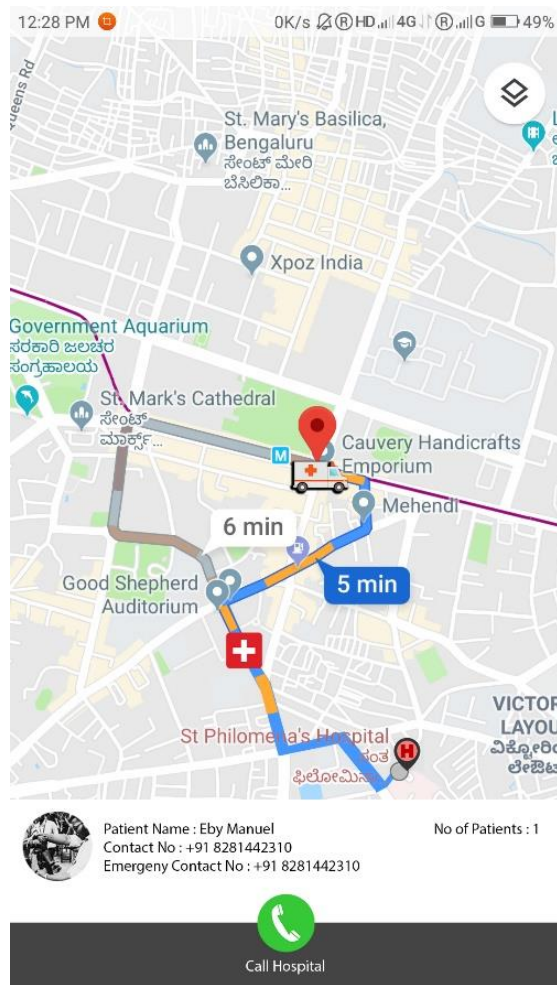
Fig. 1: Representation of the ambulance partner mobile application at the event of an active emergency scenario

Now when we look at the Hospital partner app, the hospital can provide their services by signing up in the application. On successful login, the hospital is ready to take in patients. Once an accident takes place at a nearby location the application gives a notification. The screen shows all the relevant data such as the progress of the ambulance and the details about the ambulance. The application provides a feature for live tracking the ambulance to make sure that the ambulance is on schedule. The application also provides details about the patient that was updated by the ambulance. All these data can help in successful implementation of service.
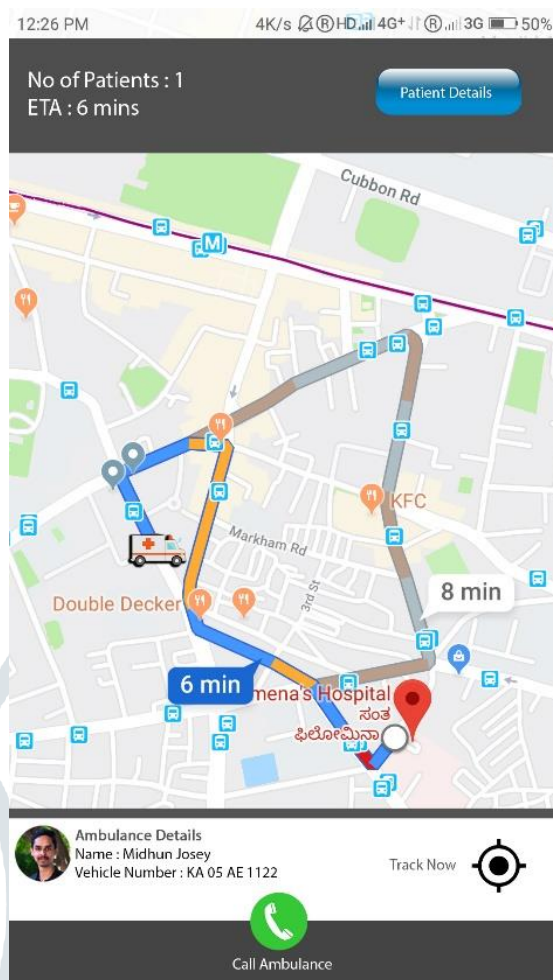
Fig. 2: Representation of the hospital partner mobile application at the event of an active emergency scenario

This mobile application when working together with the onboard system that is fixed in the car can help in successful identification and activation of emergency procedure at the event of an accident. This this helps in reduction of the response time and thus helps in saving the life of people who are involved in the accident. By providing basic personal details about the victim this helps the hospital to easily identify the patient.

IV.   CONCLUSION

This paper basically looks at the different perspectives at which different people looked at the event of an accident and how they came up with a solution that was able to address the issue under consideration. The parameters that was under consideration in all the above cases are not able to address some of the issues and as a result we have added more sensors and parameters to successfully identify the event of an accident. Also, in the proposed system, a dedicated mobile application with separate partner versions are created for both the ambulance services and for the hospital services. This helps a lot providing the service on time at the event of an accident and in the communication between the hospital and the ambulance. The new added sensors and parameters ass well as the partner application helps in making the entire process of vehicle collision detection and providing on time emergency support faster, thus increasing the chances of saving a life.

References

[1]   P.   Kapoor,   "Times   of   India,"   Times   of   India,   4   October   2018   .   [Online].   Available: https://timesofindia.indiatimes.com/india/india-way-off-road-safety-targets-for-2020-road-accidents-still-kill-over-a-lakh-a-year/articleshow/65765549.cms. [Accessed 20 May 2019].

[2]   R. L. Satya, "Intelligent Crash Detection and Emergency communication system for Two wheelers," in *IEEE*, 2018.

[3]   A. Daimary, M. Goswami and R. K. Baruah, "A Low Power Intelligent Helmet System," in *IEEE*, 2018.

[4]   N. Kattukkaran, A. George and M. Haridas T.P, "Intelligent Accident Detection and Alert System for Emergency Medical Assistance," in *2017 International Conference on Computer Communication and Informatics (ICCCI -2017)*, Coimbatore, INDIA , 2017.

[5]   A. Ali and M. Eid, "An Automated System for Accident Detection," in *IEEE Instrumentation and Measurement Society* , 2015.

[6]   N. R Vatti, P. Vatti, R. Vatti and C. Garde, "Smart Road Accident Detection and communication System," in *2018 IEEE International Conference on Current Trends toward Converging Technologies*, Coimbatore, India, 2018.

[7]   S. Jamal, H. Zeid, M. Malli and E. Yaacoub, "Safe Driving: A Mobile Application for Detecting Traffic Accidents," in *2018 IEEE Middle East and North Africa Communications Conference (MENACOMM)*, 2018.

[8]   J. Mohamad Shaphi Mulla, D. Gavade, S. Sandeep Bidwai and S. S. Bidwai, "Research Paper on Airbag Deployment and Accident Detection System for Economic Cars," in *2017 2nd International Conference for Convergence in Technology (I2CT)*, 2017.