

Accident Detection System

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Abstract--- With Reference to The Lancet Public Health journal, road accidents were the leading to death. Approximately 1.35 million people die each year & averages to 3,287 lives, lost every day as a result of road traffic crashes. Crash injuries are estimated to be the eighth leading cause of death globally for all age groups. However, most of the time it has been observed that the deaths/severity of injuries that occurred in the road accident is due to the delays in detecting and providing first aid provision. Systems with the use of GPS, GSM module and a microprocessor can help reduce loss due to vehicle accidents by decreasing the response time of emergency services.

I. INTRODUCTION

With Reference to The Lancet Public Health journal, road accidents were the leading to death. Approximately 1.35 million people die each year & averages to 3,287 lives, lost every day as a result of road traffic crashes. Crash injuries are estimated to be the eighth leading cause of death globally for all age groups. The basic agenda of our project is to detect the accident as soon as possible and let the hospitals and the victim's family know.

1.1. Existing System

The present system only calculates and supervises the current speed of the vehicle. However, this system has a drawback because the speed control as it doesn't help in reducing the fatality rate caused due to accidents.

1.2. Proposed System

This proposed system helps to automatically detecting the accident location details by using a raspberry pi, GPS and accelerometer data values and send the nearest available responders to help. We are using a notification system which helps in improving the emergency system of the accident system. This system detects the accident occurrence using GPS module and then send victims location to the server. It also sends alert notification to the nearest emergency responder along with accident location.

II. LITERATURE SURVEY

2.1 Related Work

A lot of work has been done for automatic accident detection. Different methods used by the researcher to detect an accident automatically such as accident detection using smartphones, GSM and GPS technologies, VANET, and mobile applications.

- **Using GSM and GPS**

GPS (Global Positioning System) is a satellite navigation system used to identify the exact location of an incident, speed, time, and direction. The system determines the

longitude and latitude of a position where an accident occurs through the GPS module. Then it sends a message which contains the position of the vehicle to the emergency department. Like the author of implemented a fully automated system that detects the accident using vehicle sensors vehicle, controls the traffic lights, helping to reach the hospital in time. A GPS and GSM module will send the location of the accident to the main server which will rush an ambulance from a nearest hospital to the accident spot. The control of traffic light signals in the path of the ambulance is provided using RF communication that gives to minimize the time of the ambulance to reach the hospital.

- **Using Vehicular Ad-hoc Network (VANET)**

VANET is a technique to detect accident which uses two sensors, crash sensor and a sensor in an airbag system. The information of the sensors is sent to the microcontroller after the detect a change in the input value of the sensors. Later, the GPS module detects the location of the vehicle and sends it to the registered mobile number with the help of the GSM module.

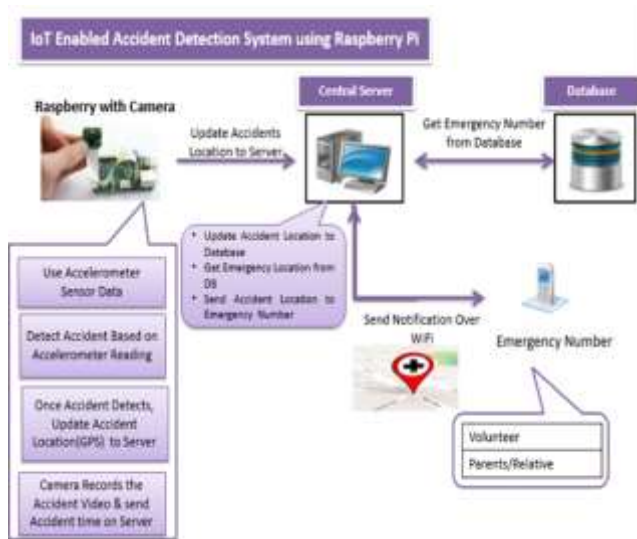
- **Using Smartphones**

Car companies like GM and BMW have developed a built-in automatic collision notification system. They use sensors like accelerometers and airbag deployment monitors in their vehicles to determine an accident event and send this information using built-in cellular radios to the response center.

III. SYSTEM DESIGN

3.1 System Architecture

The proposed system helps in detecting vehicle accidents and report it to the nearest available to help in an emergency. Figure 3.1 shows the architecture of the proposed system.


Fig. 3.1

• Capturing Sensor Data

An accelerometer sensor is used to check whether a vehicle is meeting with an accident or not. The change in Accelerometer values indicates the accidents have happened.

• Analyze GPS data to get speed information.

If any change is detected in Accelerometer values, it is considered as an accident and that accident location is sent to the server. GPS receiver provides location information and that can be calibrated to calculate speed information in a given time.

• Accident detection by applying an accident detection algorithm

1. GPS receiver provides accident location and speed information every second.
2. The latest two speeds information will be stored in memory.
3. Central server will compare the latest speed with the previous speed by utilizing the equations.

$$a = (v_2 - v_1) / (t_2 - t_1)$$

v1=previous speed

v2=latest speed

t2=previous time

t1=latest time

4. Central server will indicate that an accident took place.

• Provide accident location updates

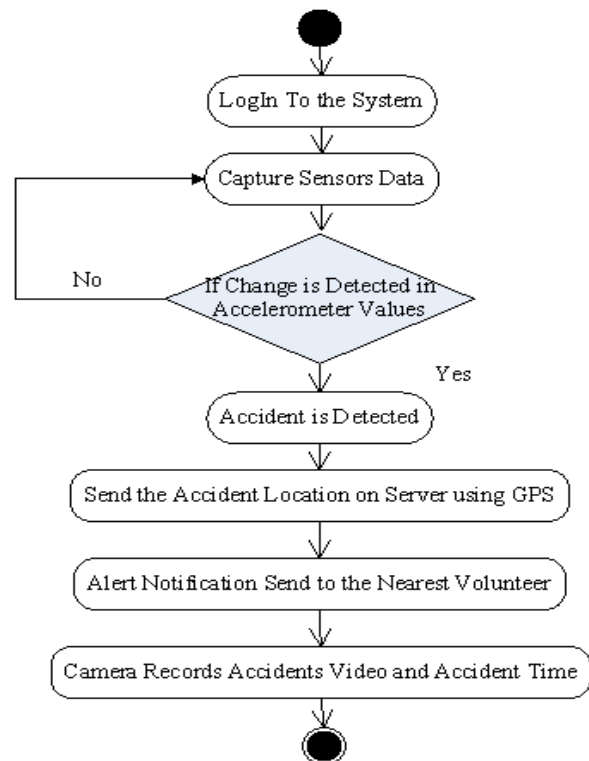
When an accident is occurred, the accident location updates on the server and sends to the nearest volunteer or on emergency number automatically.

• Video recording by Camera

The camera is placed on the vehicle facing towards the roadside. If the accident is detected Camera records the accident video & sends accident time on Server. Accident notification is sent over Wi-Fi to the nearest volunteer/relative.

3.2 System Flow Diagram

The overall flow of the proposed system is shown in figure below.


Fig. 3.2

3.3 Hardware

- Raspberry Pi with Camera
- GPS
- Accelerometer
- LCD Display
- Arduino Uno

3.3.1 Raspberry pi with Camera

- Raspberry Pi is like a mini computer integrated with camera.
- The raspberry pi board will extract GPS data from the GPS module and the information is sent quickly to the registered emergency contacts of the driver.



Fig. 3.3

3.3.2 GPS

- The Global Positioning System (GPS) is developed in order to allow accurate determination of geographical locations by military and civil users.
- It is based on the use of satellites in Earth orbit that transmit information which allow to measure the distance between user and satellite.



Fig. 3.2.2

3.3.3 Accelerometer

- Acceleration forces can be calculated by electromechanical device.
- Speed divided by time or acceleration is difference of the velocity .



Fig. 3.3.3

3.3.4 LCD Display

- It is used for interfacing between user and the control system.



Fig. 3.3.4

IV. EXPERIMENT AND RESULT

The proposed system can help to detect accidents automatically and reach the rescue service in time and save valuable human life. With the help of Pi camera system can record the accident video and exact time at which accident has occurred. The experimental set up of the proposed system is shown in figure below.

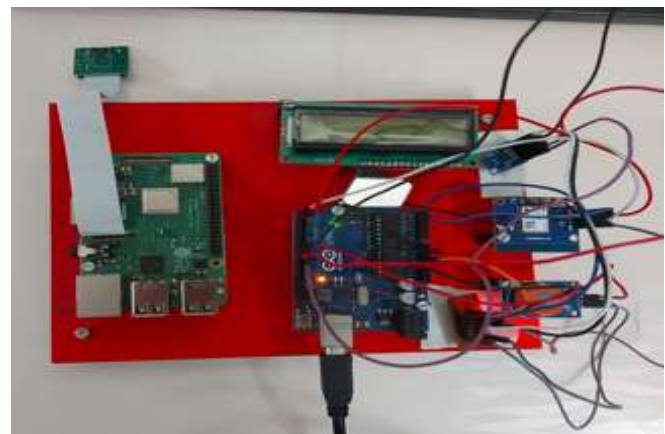


Fig. 4

V. CONCLUSION

This system provides the most favorable way out to poor emergency facilities provided to victims in road accidents in the most feasible way. With the help of proposed system, we can detect the position of the vehicle where the accident has occurred so that we can provide the first aid as early as possible. The system uses on board accelerometer sensor to detect accident and generate emergency alert and send it to the nearest emergency responder containing location coordinates of the accident. With real time location tracking for both victim and responder the system will increase the survival rate of an accident victim by providing emergency service in time. Such system helps to reach the accident spot in time and save the valuable human lives. The system also records the accident video through camera and take out the exact time of the accident.

VI. FUTURE WORK

In future, the system could be implemented to control the speed of the vehicle and to prevent the driver from over speeding by alerting or by sending the information to the driver's family. This can avoid accidents before it happens due to over speeding. The early detection and reporting will account to the responsibility of saving many lives.

REFERENCES

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