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Implementation of Accident Occurrence And Detection Using Raspberry Pi

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Abstract: Over past years the threat for accidents has been increased and many systems for preventing and detecting accidents have been implemented through audio and video analysis however in some situations, the gathered information will not be sufficient due to lack of resource and delay in arrival of emergency vehicles in order to overcome this problem we use Internet of Things (IOT).The IOT is the interconnection of uniquely identifiable embedded computing devices within the existing Internet infrastructure. It promotes things to be sensed or controlled automatically across the network infrastructure. IOT also offers advanced connectivity of devices, systems and services that goes beyond machine-to-machine communications and covers a variety of protocols, domains and applications. In this paper we propose the way to identify the speed of vehicle which will be done by magnetic sensor and to identify the accident we use piezoelectric sensor. This sensor finds the occurrence of accident through vibrations caused during hit. Based on the force of hit the vibrations will be generated which will be sensed by piezoelectric sensor. The information will be passed on to the control room for further recovery along with the location. This system also sends information about accident to their family members along with location.

Key words: Accident detection · Accident alert · Speed alert

INTRODUCTION

In recent years, the need for safety and security among pubic environment has been increased due to number of population among people and vehicles have been increased which results in increased number of road accidents. The increase in population of vehicles results in traffic which delays the arrival of emergency vehicles, which also results in reduction of the time between the moment in which the accident occur and the moment in which the emergency vehicle or team reaches the spot. that may reduce the portability of the victims life. In order to identify the accidents there are cameras only near traffic signals which is a main dropdown. In order to overcome that this system is used. Nearly 1.3 million people die in road crash every year, on average 3,287 deaths a day. An additional 20-50 million are injured or disabled. More than half of the road traffic deaths occur among young adults ages 15-44. In India road accidents kill 382 every day. Major accidents occur due to over speed which makes the biker to lose control over the vehicle resulting in accidents. This system tries in finding solution for this major threat in pubic environment. It is done through low cost since many people are using smart phones. we can easily identify location of the person through GPS which is there in every Smartphone's. The piezoelectric sensor is used to detect accident through vibration. Speed of the vehicle is calculated through magnetic sensor. [1] The concept of detecting and analyzing the audio streams to identify the sound occurred when a vehicle met with an accident like tire skidding and car crashes. There are two methods involved one is low level, the system gather the set of features to capture the events of interest and at a high level, the approach is used to detect both short and validate events. Camera has been used widely to direct the action of vehicles by tracking their trajectories. Four layer proposed in audio analysis are Extraction of low-level features, Learning of a dictionary of basic audio words, Construction of a high-level vector and Classification. This system has complex structure and the analysis is done through audio (sound), since the roads have many disturbances in background this system needs to eliminate all those in order to produce a feasible output eliminating all that. In our system this problem is overcomed, since the accident is identified through vibrations that are occurred during hit. This system handles three cases of speed; they are 1. Low speed, 2. Excessive (over the speed limit), 3. Inappropriate (in wet roads).

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This system has some useful feature, they are

- The probability of making errors due to delay of information will be reduced.
- Simple design makes it more flexible.
- Since its automated the labor cost while handling it will be reduced and it does not require any monitoring.
- The twenty-four hour monitoring is done along with location tracking. This ensures safety of public.
- Messages are sent through online and offline mode for better convenience.

This paper also describes the previous works in section II and section III contains proposed methodology, system design. section IV describes work implementation of the system. Section V describes the conclusion of the work.

Previous Work: The need for more protection and assurance in public environment has been risen due to increasing number of people and vehicles. In most cases we are facing many problems related to vehicle accidents. Paper [2-5], has the studies on some technologies to overcome the vehicle accidents. audio surveillance method is used to analyze and detect the audio streams when accident occurred. This method will send the message to near-by police station and health care center whenever the accident occurred like tire skidding and car crashes [2]. GPRS has been used for long data set transmission.

Taewung Kim *et al*, [15] proposes the main objective of the system is to widen the coverage of vehicle using novel crash detection system. The algorithm is applied to detect the collision of road scenes. There are three methods produced in the system. First method is montecarlo simulations that will monitor the activities and behaviour of driver and also the vehicle dynamics. The second method is tracking algorithm to filter and threat assessment the estimation of crashing systems. Third method is to avoid false alarms we implemented normal and dangerous stage to difference it. These three methods are integrated into single scenario for crash warming, avoidance and mitigation purposes while interrupting tracking message from various sources. The system is based on steering direction if its direction exceeds the offset value (offset value = 0.5) then the alarm will be enabled. It is expected that not all the driver acceptability is based on the results of near-miss cases instead they can drive in a wrong manner or cross the average limit to rush up this may leads to accident.

To overcome the delay of emergency responder we have studied [3]. In this project we have introduced accident detection and notification system. The detection is carried out using samrtphones. Where the samrtphone is used to identify the location of the vehicle through our application. Accident location can be sent to the police station and emergency responder immediately when the accident occurs. In our project the information is also sent to family members with their location. Study [4] has used gps, accelerometer sensors and android phone to prevent the accident. The android phone contains application is used to investigate the threshold value and gps location. Where if the application contains value more than 0.5 then the alarm will be enabled to the person who is riding. This cannot be possible in rural solution i.e., without signal and mobile network the application will not work. To overome those issues we have used piezoelectric and magnetic sensor to sense the accelerometer value and alert the rider when the given limit exceeds.

Proposed Methodology: This system consist of three units. They are

- Speed monitoring
- Accident detection
- Remote monitoring

If over speed is detected while travelling an alert message is sent through contacts in app and a buzzer will be enabled. buzzer continues until speed vehicle comes within the speed or speed gets reduced.Speed is measured using magnetic sensor.

Accident detection is done through piezoelectric sensor.Accident is found using vibration that occur during the vehicular hit.Vibrations generated are converted to electrons and they are sensed by current sensor and thus the accident gets identified.

If the accident has occurred there are two scenarios

- Conscious
- Un conscious

If there is a accident and the person is stable, they will press a switch or else if the victim has not pressed the switch. It is understood that they need medical help and the information is passed on to the control room.

In this implementation the accident occurrence is detected using magnetic sensor. The magnetic sensor investigate the speed of the vehicle if it cross the given threshold value in our application then the buzzer will be vibrated to alert the rider to slow down the gear.

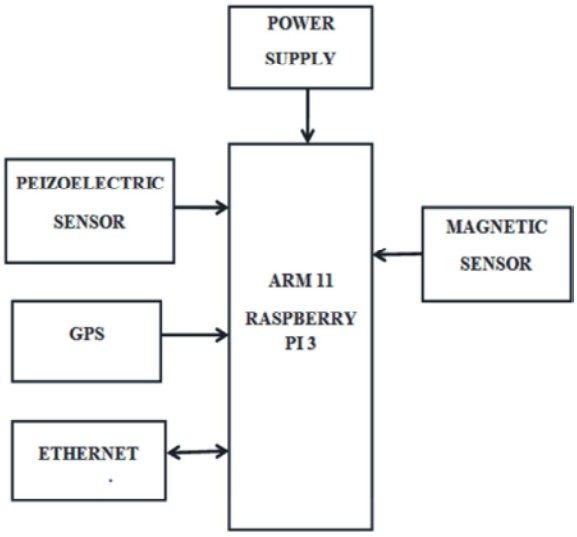

Fig. 1: SYSTEM DESIGN

The Components Used Are as Follows: An Embedded system is a special-purpose system in which the monitor is completely binded by the device it controls. Unlike a general-purpose computer, an embedded system performs one or afew pre-defined tasks, with very specific requirements.It is a fast growing technology in various fields like industrial automation, home appliances, automobiles, aeronautics etc. It is implemented to perform a specified task.An embedded system is some combination of computer hardware and software, either fixed in capability or programmable, that is designed for a specific function.

Raspberry pi3: It is possible to do everything with a Raspberry Pi. The real advantage of a Raspberry Pi as far as programming is concerned is the network port. This port will make it easier to connect to the Internet, which you'll need to do to install some software. Any USB keyboard and mouse should work fine. Here we have implemented by pudding python os in sd card to run the project in monitor. An 900MHz quad-core ARM Cortex-A7 CPU with memory contains 1GB RAM.

Raspberry pi is a small card sized computer that plugs into monitor, keyboard, mouse, Tv and projector. It is a third generation of raspberry pi. It replaced the original Raspberry Pi 1 Model B+ in February 2015. This little board is easily accessible, it's very simple to use. When you power it up you get a nice little desktop environment, it includes all of the things that you need to do to get started to learn programming. There's lots of information out there on the internet that you can take away and start programming code in to make things happen. It is possible to do everything with a Raspberry Pi. The real advantage of a Raspberry Pi as far as programming is concerned is the network port. This port will make it easier to connect to the Internet, which you'll need to do to install some software. Any USB keyboard and mouse should work fine.

Piezoelectric: The Piezoelectric sensor is an effect in which energy is converted between mechanical to electrical energy to produce results. Microphones turn an acoustical pressure into a voltage. Alternatively, when an electrical charge is applied to a polarized crystal, the crystal undergoes a mechanical deformation which in turn create an acoustical pressure.These are the cause of those annoying system beeps that are all too common in today's world.

Magnetic Sensor: Here the magnetic sensor is based on carriers are electrons. When an electron moves through a magnetic field, upon it acts a sideways Hall Effect. The effect is based on interaction between moving electrical carriers and an external magnetic field.

- The sensors, transducers which uses the changes in magnetic field for their operations.
- Used to measure the currents, speed, positions and displacement

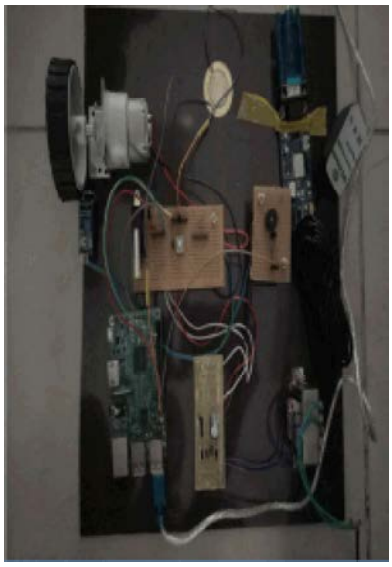

Fig. 2: Snapshot of Accident Occurrence and Detection System

- As the conventional sensors, magnetic sensor does not give output parameters directly
- Signal processing is required for desired output.

Types of magnetic sensors:

- Vector magnetometers.
- Total field magnetometers.

Insensitivity to rotational vibrations and Splitting between some electron or nuclear spin energy level is proportional to the magnitude of the magnetic field over a field range sufficient for magnetometery.

Global Positioning System: The Global Positioning System (GPS) is a space-based radio navigation system owned by the United States Government (USG) and operated by the United States Air Force (USAF)." It is a globalgeo location and time information to a GPS receiver in all weather conditions, anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites The GPS system operates independently of any telephonic or internet reception, though these technologies can enhance the usefulness of the GPS positioning information.

The GPS system provides critical positioning capabilities around the world. The United State government created the system and they maintains and makes it freely accessible to anyone with the GPS receiver. However, the US government can selectively deny access to the system

Power Supply: LPC2148 works on 3.3V Power Supply, So LM117 a 1A low dropout regulator designed to provide 3.3V from a 5V supply. It has ben ideally suited for systems which contain both 5V and 3.3V logic, with prime power provided from 5V bus. Because the LM3940 is a low dropout regulator, it can hold its 3.3V output in regulation with an input voltage as low as 4.5V.

Implementation of Screenshot: The implementation implies the result of collected data will be passed as a mail to the registered mail id with the regular time interval. The family members can check the rider location anywhere, this is reduce stress and worries of the family members. The mail contains latitude and longitude range of the particular location by using GPS. The normal message will be sent as accident occurred to alert the family members.

The piezoelectric sensor is used to detect the vehicle accident by force of the vehicle. If the person is in conciouse stage then the person will press the button if they fail to press the button the information will be passed to nearby control room and to their family members through registered E-mail id, phone number respectively with the location and time using GPS. The raspberry pi 3 is used to hold all the things together in a single controller.

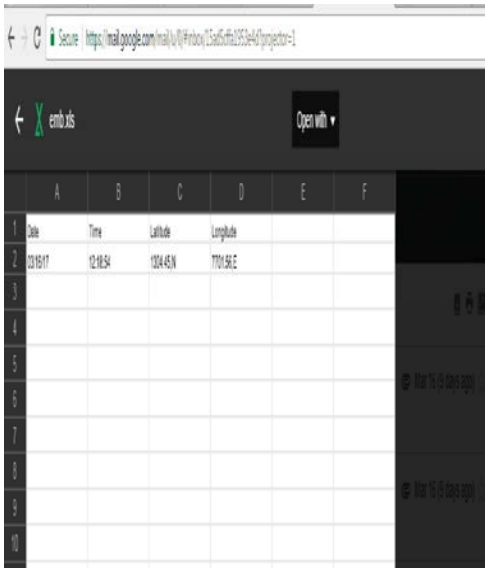

Fig. 3: Snapshot of Message in E- Mail When Accidentoccured

Sometimes there is a chance of delay in sending the message or if the vehicle is in rural areas there may be network problem of delivering message. To overcome those problem, we have registered the same number in way2sms to pass the message with location and also to the control room so that the emergency responder will come to a spot on time.

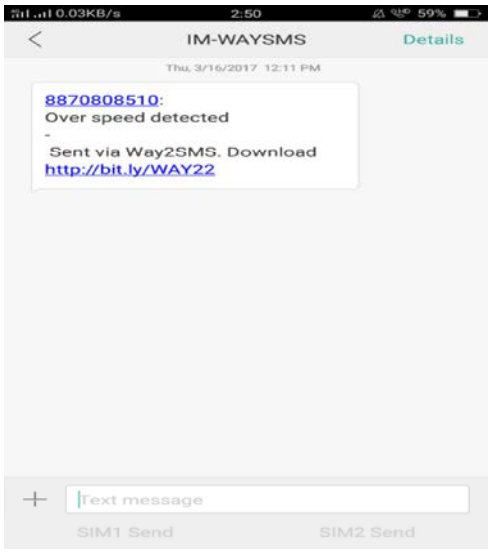

Fig. 4: Screenshot of Message by Way2sms

CONCLUSION

Advanced IOT based accident occurrence and detection systems help in reducing fatalities emanating from vehicular accidents by decreasing the emergency response time. Real-time accident occurrence and detection can save lives. In this work we have presented a android phone application based on accident occurrence and detection systems which aguments data from sensors such as piezoelectric sensor, magnetic sensor, GPS, power supply. Proposed models based on occurrence of vehile accident by monitoring the speed the of accelerometer and sends message to the registered number in our application when the vehicle crossed threshold value. As a part of future work we are investigating whether the information will be delivered when the vehicle is located in rural areas and hill station. The project will be accurate and efficient by introducing hall effect sensor. The overall processing load is still cheaper with low cost systems, so encouraging its porting on embedded systems with limited hardware resources. So that the solution will have important significant impact on reaching message. Therefore, the level of accuracy in passing information is as big as saving lives of people.

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