A IOT Frame work for Accident Detection, Vehicle Monitoring and Accident Alert

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ABSTRACT

Road accidents rates are very high nowadays, especially two wheelers. Timely medical aid can help in saving lives. This system aims to alert the nearby medical centre about the accident to provide immediate medical aid. The attached accelerometer in the vehicle senses the tilt of the vehicle and the heartbeat sensor on the user's body senses the abnormality of the heartbeat to understand the seriousness of the accident. Thus, the systems will make the decision and sends the information to the cloud, connected via Wi-Fi module (ESP-01) and accelerometer and heartbeat sensor. The system will send text message to the nearest medical centre and friend by sharing the exact location of the accident that can save the time to assist the victim. Initially, the GPS continuously takes input data from the satellite and stores the latitude and longitude values in AT89s52 microcontroller's buffer. If we need to track the vehicle, we have to send a message to GSM device, by which it gets activated. It also gets activated by detecting accident on the shock sensor connected to vehicle. Parallelly, deactivates GPS with the help of relay. Once GSM gets activated it takes the last received latitude and longitude positions values from the buffer and sends a message to the particular number and information is stored in cloud which is predefined in the program. Once message has been sent to the predefined device the GSM gets deactivated and GPS gets activated.

Keywords: Accelerometer, GPS, GSM, Arduino UNO

INTRODUCTION:

The motor vehicle population is growing at a faster rate with the development economic and community. Accidents and the death rate due to road accidents are also increasing at an alarming rate. Most of the accident deaths that happen are due to the lack of immediate medical assistance, on the roads like express highways. A facility for providing direct medical aid to the accident area can reduce the fatality to a higher extends. Thus, comes the idea of an alert system that senses the accident and its seriousness to alert the nearby medical center for providing ambulance or medical aid to the accident area. The proposed system will check whether an accident has occurred and identify the seriousness of the injury to the accident victim/driver. Once the decision of serious accident has taken, the system will check for the nearest medical center and notify them about the incident. The rescue team can rush to the spot immediately without any delay as the correct location will be communicated by the GSM and GPS also to cloud about the information regarding accident victim. The system will also send a message to the friends and relatives to inform them about the incident. Accident detection and the alert system has been extensively studied over the past several years. Research work in this field has proposed a Telemetric model which has three main modules.

The system is intended to capture the location of the vehicle through GPS receiver, send the location information to vehicle owner's mobile number through SMS and also to the telemetric operator server through GPRS. The monitoring system main aim is to give Security to all vehicles. When the car is stolen, the location data from the

monitoring system can be used to find the location and can be informed to the police for further action. Some vehicle monitoring system can even detect unauthorized movements of the vehicle and then alert the owner. Another prototype proposes a method to identify and provide faster assistance to traffic accident victims. Prototype architecture to improve the chances of survival for passengers involved in car accidents has also been proposed. The proposed system offers automated detection, reports, and assistance to passengers involved in road accidents by exploiting the capabilities offered by vehicle to vehicle communication technologies. Here a low - cost alert system is proposed to provide immediate medical aid to the accident victims by alerting the nearby medical assistance center with the exact place of an accident by monitoring and sends the details of the patient through SMS. This system also takes the medical condition of the accident victim by checking the heartbeat to understand the seriousness of the accident and inform the medical aid center. Here are the objectives and scopes of the proposed paper: To provide immediate medical assistance to the accident victim in the affected area this can reduce the fatality to a greater extent. To check for the nearest medical center and notify them about the incident and patient information for faster rescue. To capture the location of the vehicle through GPS receiver, send the location information to the authorities through SMS and also to the Cloud for storing details. To give Security to all vehicles. When the vehicle is stolen, the location data from monitoring system can be used to find the location and can be informed to police for further action. To provide medical condition of the accident victim by checking the heartbeat to understand the seriousness of the accident and inform the medical aid center. These are also can be used for fire detector in large vehicles like train, bus etc. because the vehicle like train contains large number of people and the sending alert of fire accident can save many lives. The scopes for this project are in military, navigation, automobiles, aircrafts, fleet management, remote monitoring, remote control, security systems, tele services, etc. Also, it can be fruitful for: Fleet monitoring, Vehicle scheduling, Route monitoring , Driver monitoring , Accident analysis.

LITERATURE SURVEY:

Benjamin Coifman [1], explained a real-time computer vision system for vehicle tracking and traffic surveillance. R.Ramani, S. Valarmathy, Dr. N. Suthanthira Vanitha, S. Selvaraju, M. Thiruppathi, R. Thangam [2] explained Locking Vehicle Tracking System. Their paper proposed a novel method of vehicle tracking and locking systems used to track the stolen vehicle by using GPS and GSM technology. Kunal Maurya, Mandeep Singh, Neelu Jain [3] explained the vehicle tracking system installed in a vehicle to enable the owner or a third party to track the vehicle's place. This design will continuously watch a moving Vehicle and report the status of the Vehicle on demand. Chen Peijiang, Jiang Xuehua [4] explained the remote tracking system based on SMS and GSM. System includes two parts that are the tracking center and the remote tracking station. The tracking centers consist of a computer and communication module of GSM. The demonstration shows that the system can watch and control the remote communication between the tracking center and the remote tracking station. V.Ramya, B. Palaniappan, K. Karthick [5] explained the system which provides vehicle cabin safety. This system monitors the level of the toxic gases such as CO, LPG and alcohol within the vehicle and provides alert information as alarm during the dangerous situations. The system sends SMS to the authorized person through the GSM. Detection of gases prevents further accidents. Albert Alexe, R. Ezhilarasie [6] Explained system based on cloud computing infrastructure. In this system sensors are used to monitor the fuel level, driver conditions, and speed of the vehicle. All the data transferred to cloud server –using GSM enabled device. All the vehicles equipped with GPS antenna to locate the place. To avoid the drunk and drive, the alcohol sensor installed to monitor the driver status.

This system takes input from IR sensor and accelerometer and activates microcontroller enabling GPS Module to track the accident spot location and sends latitude and longitude value to registered authorities through the GSM module using mobile communication. Vehicle Monitoring System is one of the biggest technological advancements to track the activities of the vehicle. The security system uses Global Positioning System (GPS), to find the location of the monitored or tracked vehicle and then uses satellite or radio systems to send the coordinates and the location data to the Server. At monitoring center various software's are used to plot the vehicle on a map. In this way, the vehicle owners are able to track their vehicle on a real-time basis. Due to increasing accidents and vehicle risk, the real-time monitoring facility and alert system are becoming increasingly popular among owners of emerging vehicles and automobile industries.

METHODOLOGY:

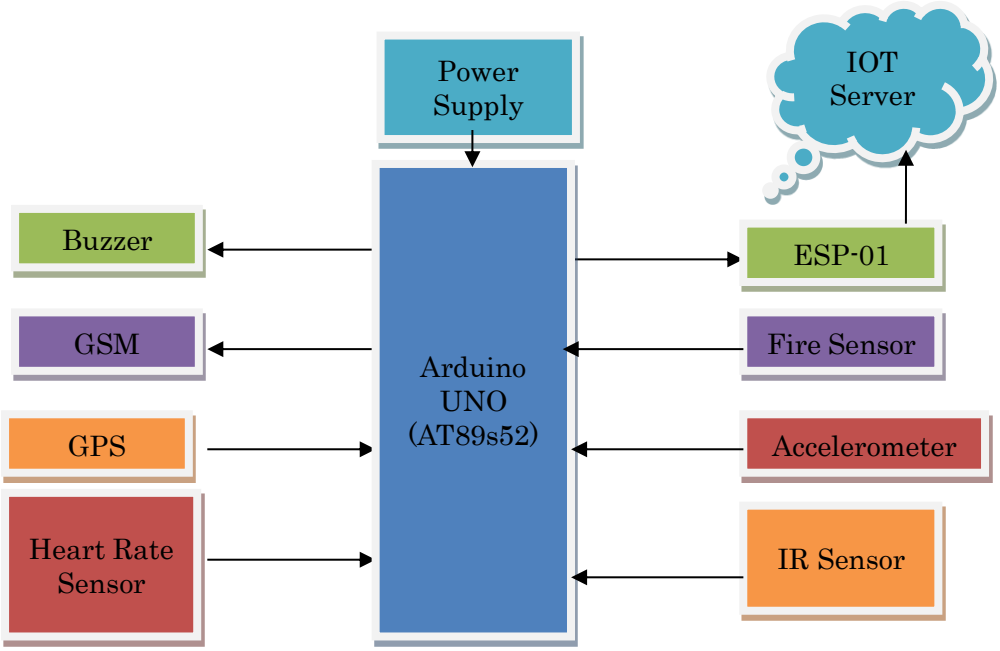

Fig. 1: Vehicle Monitoring and Accident Alert System

RESOURCE AND REQUIREMENTS:

Hardware Requirements:

- Arduino UNO
- Buzzer
- GSM
- GPS
- Heart Rate Sensor
- Power Supply
- Fire Detection Sensor
- IR Sensor
- ESP-01
- Accelerometer

Software Requirements:

- Arduino IDE
- Serial monitor
- Web Server

Resources and IoT Devices:

Microcontroller:

Arduino is an open-source prototyping platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

Advantages of Arduino:

- Arduino also simplifies the process of working with microcontrollers, but it offers some advantage for teachers, students, and interested amateurs over other systems
- Inexpensive
- Cross-platform

- Simple, clear programming environment
- Open source and extensible software

ESP-01:
The ESP-01 is a Wi-Fi module that allows microcontroller's access to a Wi-Fi network. This module is a self-contained SOC (System on a Chip) that doesn't necessarily need a microcontroller to manipulate inputs and outputs.

Accelerometer:
It is an integrated circuit which is used to measure the acceleration with respect to the object where this accelerometer is attached. Here we use this accelerometer for accident detection by placing it to helmet and can be detected by tilting of helmet with respect to ground.

Power Supply:
NI-MH batteries are used to power up the transmitter and receiver part of robotic arm. Batteries used are 9v, 2A. The required voltage to operate transceiver and other devices is just 5V.

GSM modem:
It consists of a sim card port where the sim has to be inserted and can be operated using a mobile operator where to communicate through mobile network. It is used by internet connectivity to send and receive the messages.

LCD:
LCD (liquid crystal display) is the technology used for displays in notebook and other smaller computers. Like light-emitting diode (LED) and gas-plasma technologies, LCDs allow displays to be much thinner than cathode ray tube (CRT) technology. LCDs consume much less power than LED and gas-display displays because they work on the principle of blocking light rather than emitting it.

Buzzer:
Piezo buzzer is an electronic device commonly used to produce sound. Light weight, simple construction and low price make it usable in various applications like car/truck reversing indicator, computers, call bells etc. Piezo buzzer is based on the inverse principle of piezo electricity.

GPS:
GPS is a device that is capable of receiving information from GPS satellites and then to calculate the device's geographical position. Using suitable software, the device may display the position on a map, and it may offer directions. The Global Positioning System (GPS) is a global navigation satellite system (GNSS) made up of a network of a minimum of 24, but currently 30, satellites placed into orbit.

Heart Rate Sensor:
An optical heart rate sensor measures pulse waves, which are changes in the volume of a blood vessel that occur when the heart pumps blood. Pulse waves are detected by measuring the change in volume using an optical sensor and green LED.

Fire Detection Sensor:
A flame detector can often respond faster and more accurately than a smoke or heat detector due to the mechanisms it uses to detect the flame.

IR Sensor:
An infrared sensor is an electronic instrument that is used to sense certain characteristics of its surroundings. It does this by either emitting or detecting infrared radiation. Infrared sensors are also capable of measuring the heat being emitted by an object and detecting motion.

CONCLUSION AND FUTURE WORK:

The system can detect the accident and confirms the seriousness of the accident and then alert the nearest medical assist center to provide emergency medical aid to accident victim. Accelerometer and heartbeat sensor are used

to determine whether an accident had occurred. The communications between the modules are done by using microcontroller. The GSM module will send message to the nearest medical center. The system will also inform the friends and family of the victim through message. A buzzer is also provided to alert the fellow passengers on the road to notify that an accident has occurred to invite their help. Accident detection and alert systems are highly relevant in these days and this paper aims at developing a low-cost solution for the same for the benefit of the society.

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BIOGRAPHY:

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