EMERGENCY ASSISTANCE SYSTEM FOR VEHICLES

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***Abstract* — The main idea of the project is to develop a system which helps in providing quick emergency assistance to the driver at the time of accident using Raspberry pi, GSM network, accelerometer, GPS tracking system, Ultrasonic sensors. In the event of accident, this device will send short message indicating the position of vehicle to family member and a call to emergency medical service (EMS) with the accident location so as to provide quick assistance to the driver. The system also provides distance of vehicles around it with help of a voice message .This device can also be used as a media center which can be used to as listening music, watching videos etc. The biggest advantage of this device is that it is cheap and affordable to all the people who drive a vehicle.**

I. INTRODUCTION

The system can detect accident from accelerometer signal, after accident is detected, short message will be sent to the family member of the person via GSM network, GPS coordinates of current location of the vehicle will also be sent along with the message. The safety and rescue are the primary concern in every part of fast moving world. There are many accidental event occur due to an unavoidable reasons. Though the occurrence of accident is quite unavoidable, this innovative project is challengingly undertaken to make the change in worst scenario by providing importance to alerting, monitoring and tracking the location of an event. Which would in turn provides efficient quick response for rescue process to be carried out without any latency.

EASV can also be used to avoid accidents. The ultrasonic distance measuring sensor will let driver to know about the nearby vehicles, so that driver will get alert and so can avoid the accident. Same thing can also be applied for parking assistance.

EASV uses Raspberry PI which can be further used with Raspbian OS to run large number of applications including Gmail, Facebook, online radio, You-tube, etc.

II. NEEDS AND FEATURES

A. Need for the system

The number of accidents occurring in India and the resulting deaths or injuries have always been high. Despite awareness campaign, this problem is still increasing due to rider's poor behaviors such as speed driving, drunk driving, riding with no helmet protection, riding without sufficient sleep etc. The numbers of death and disability are very high because of late assistance provided to people who met with an accident. These cause huge social and economic burdens to people involved.

Several research group and major vehicle manufacturers including Honda have developed safety devices to protect drivers from accidental injuries. However, good safety device for vehicles is difficult to implement and very expensive. Alternatively, intelligence schemes such as incident detection with tracking system have also recently been devised to notify the accident to related people so that quickest assistance can reach people who got the accident. Presently, tracking system is only installed in some high end vehicles because these systems are still too expensive for most drivers. Thus, accident detection has recently gained attention because these systems are expected to save life by helping the drivers to get medical treatment on time.

B. Features

- Vehicle rotation is been detected via 3 axis accelerometer.
- Distance of nearby vehicles/objects is detected via ultrasonic sensor.
- Music can be played on the system.
- System also provides assistant while parking a vehicle.

II. IMPLEMENTATION

A. Raspberry PI

The Raspberry Pi is a low cost, credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. It is a little device that enables people of all ages to explore computing, and to learn how to program in languages like Scratch and Python. It's capable of doing everything you'd expect a desktop computer to do, from browsing the internet and playing high-definition video, to making spreadsheets, word-processing, and playing games. What's more, the Raspberry Pi has the ability to interact with the outside world, and has been used in a wide array of digital maker projects, from music machines and parent detectors to weather stations and tweeting birdhouses with infra-red cameras.

The Raspberry Pi measures 85.60mm x 56mm x 21mm (or roughly 3.37″ x 2.21″ x 0.83″), with a little overlap for the SD card and connectors which project over the edges. The Raspberry Pi primarily uses Linux-kernel-based operating systems. Every package that is needed in project need to be install via command "sudo apt-get install package_name".

B. ADXL 345 –Triple-axis Accelerometer

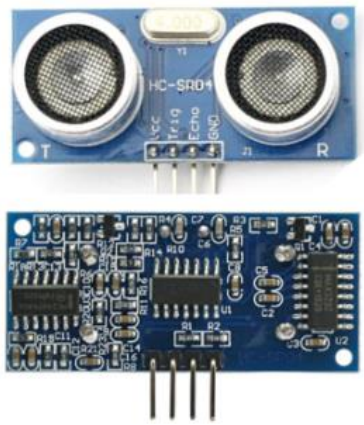
The sensor consists of a micro-machined structure on a silicon wafer. The structure is suspended by polysilicon springs which allow it to deflect smoothly in any direction when subject to acceleration in the X, Y and/or Z axis. Deflection causes a change in capacitance between fixed plates and plates attached to the suspended structure. This change in capacitance on each axis is converted to an output voltage proportional to the acceleration on that axis.
The following are the steps of the working system:

Step 1: Make ADXL345 to give reading after some periodic time interval.
Step 2: When x or y axis tilted more than ±90 deg.

Step 3: The system will run the GSM module code and send the message with GPS coordinates taken by GPS module to his/her family member or Emergency Medical Service.

C. Ultrasonic sensor HC-SR04

The HC-SR04 ultrasonic sensor uses sonar to determine distance to an object like bats do. It offers excellent non-contact range detection with high accuracy and stable readings in an easy-to-use package. From 2cm to 400 cm or 1" to 13 feet. Its operation is not affected by sunlight or black material like Sharp rangefinders are (although acoustically soft materials like cloth can be difficult to detect). It comes complete with ultrasonic transmitter and receiver module.



Pins :

- VCC: +5VDC
- Trig : Trigger (INPUT)
- Echo: Echo (OUTPUT)
- GND:GND

Ultrasonic HC-SR04 is capable of giving its output at the rate of 200ms.

Following things to be done for using HC-SR04 sensor:

1. Put a while loop to take readings continuously.
2. First install pyttsx package to convert text to speech.
3. We will have to put some limit ,under which the system will start speaking the distance (we need system to speak only for nearby vehicles).

D. Adafruit Ultimate GPS

The Ultimate GPS Breakout V3 is a hard to find good, reliable GPS module for microcontroller use, which is why haven't carried one. Most are complicated to use, power hungry and require a completely clear view of the sky to get a decent fix. But when we tested the Adafruit Ultimate GPS, we knew it was worthy enough to be in the Maker Shed. Not only is this module easy to use, it comes fully loaded. The Ultimate GPS breakout is based on the MTK3339 chipset which can

track up to 22 satellites on 66 channels, has a high-sensitivity receiver and a built in -165 dB antenna. It's capable of 10 Hz updates, has a position accuracy of 1.8 meters, a velocity accuracy of .1 meters per second, and it only draws 20ma of current. It's also been successfully tested at over 88,000 feet. There's even options to use a battery to power the RTC for starts, a jack for an external antenna, a pulse per second output, and an output for adding an external LED to indicate a fix.

By far the most interesting feature of the Ultimate GPS Breakout though is it's built in data logger. The module includes an on-board microcontroller and enough FLASH memory to log the time, date, longitude, latitude and height every 15 seconds for up to 16 hours.

III. CONCLUSION

System works properly with all the modules mentioned here. However, there are some challenges or limitations of this system. There are many challenges associated with the accuracy, integration and usefulness of the system. For this system there are limitations on the equipment used because the aim was to make cheaper product. Making system work in a remote area becomes difficult due to unavailability of cellular phone network. The major challenge regarding this project is accuracy of sensor and working procedure because even in the case of fatal accidents there is always a chance of false alarm.

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