Design and Implementation of Anti -Theft Tracking and Accident Detection System using IoT

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Abstract— The implementation of security features in automobiles, especially cars, has been found to be not as effective as it was originally expected. The features which has already been implemented focus mainly on providing authorization to the vehicle. Meanwhile, this paper focuses mainly on equipping the owner of the vehicle with the authority to track his vehicle in real time, by using the coordinates sent to the owner, each time that a vehicle's ignition is switched on. The coordinates of the vehicle's location are sent to the owner via a message, which in turn can be viewed through an android application, installed in the owner's phone. Also, in case the vehicle is involved in an accident, an emergency contact is immediately informed about the accident, along with the vehicle's coordinates, enabling the emergency contact to track the vehicle.

Key words: Anti -Theft Tracking, Accident Detection System, IoT

I. INTRODUCTION

According to a survey done in 2017, it has been found that of 94,588 vehicles registered with the transport department 58,210 vehicles were found to not furnish the coordinates of the vehicles location, thus rendering the process of locating a vehicle by using its geo-coordinates futile.

The huge demand in the usage of vehicles has led to an increasing number of vehicle thefts. This is mainly due to the inability to track the vehicle, once such a theft has occurred.

The design of the system which is implemented is such that an owner of a particular vehicle is notified each time the vehicle is started, that is, a vehicle's ignition is switched on, with the coordinates of the vehicle's location being sent to the owner constantly. If the access to the vehicle is authorized by the owner, then the owner can choose to ignore the notification as well as tracking of the vehicle.

But in case the access to the vehicle is unauthorized by the owner, that is, when the vehicle is stolen, the owner has the capability to use the coordinates which are being transmitted to the owner's phone and to track the vehicle using its geo-coordinates, along with the capability to cut of the vehicle's engine fuel remotely, using an android application which is installed in the owner's phone. This results in preventing the robber from getting away with the stolen vehicle.

II. RELATED WORK

A. *Existing System*

This section illustrates about the limitations of the existing system, describing its advantages and disadvantages.

There are several features which have already been implemented, to impart security to the vehicle. In many systems, Bluetooth technology and RFID sensors are used to detect the distance of any approaching vehicle to the automobile. But the range of operation of this technology is quite narrow. In certain systems, when a vehicle has been stolen, the owner notifies a central controller system about the theft. The central controller system then sends signals to the security system installed in the vehicle, which can stop the vehicle's movement or even lock the engine. The disadvantage found in this system is that, this entire operation relies majorly on the central controller system. If the central controller system is unable to transmit the signals to the stolen vehicle, then the entire system's operation can be deemed ineffective.

Some of the mobile applications which have been built be used in case of vehicular accidents are-

Auto Accident App, designed by Murphy Battista, is an android application which can be used by the owner of the vehicle, to collect information when an accident has occurred. The main disadvantage of this application is that the information collection process has not yet been automated.

Accident Report, developed by Dr. Apps, allows an accident report to be created in a simple manner, which can be used by the insurance companies and law enforcement authorities. Its major disadvantage is that in cases where a vehicle is involved in an accident, the main focus is on reporting about the accident, rather than providing rescue to the people involved in the accident.

To summarize, some of the problems faces by the existing system are-

1) Loud blaring siren is emitted from the vehicle, when an unauthorized person attempts to unlock the vehicle.
2) It's hard to distinguish which vehicle is being stolen, since all the vehicles emanate similar siren in case of attempt of vehicle theft.
3) In cases where a vehicle is involved in an accident, it is found to be immensely difficult to track the exact location of the vehicle.

B. *Proposed System*

The proposed system consists of two main modules-an anti-theft tracking system module and an accident detection system module.

In the anti-theft tracking system module, if the vehicle is found to be stolen, then the owner can immediately cut off the engine fuel, even if the vehicle is in a remote location, thus preventing the perpetuator from stealing the vehicle.

In accident detection system module, the vehicle's location is being constantly sent to the owner to allow tracking of the vehicle. In case the vehicle is involved in an accident, then the owner and an emergency contact are notified about the occurrence of the accident, with an alert message being sent to them, containing the coordinates of the vehicle.

Two additional modules have also been proposed- namely Rash Driving (RD) System and drunken Driving System modules, to aide in preventing the occurrence of an accident, by detecting certain signs, which may lead to cause an accident of the vehicle. In Rash Driving module, the number of times that an accelerometer and brake is pressed, is considered to determine if the vehicle is being driven at a speed much higher than the normal, prescribed speed. Finally, in the Drunken Driving module, the alcohol sensor is placed near the steering wheel of the vehicle, on the driver's side. If the sensor detects the content of alcohol in the air, an emergency contact is alerted with a message containing coordinates of the vehicle, to prevent any sort of accident from occurring.

The entire system uses GSM module to alert the owner of the vehicle, in case the vehicle is stolen. And with the help of GPRS module, the exact coordinates of the vehicle are sent to the owner and also the emergency contact when the vehicle is involved in theft or accident.

The features mentioned above are incorporated together, so that it can the components which are implemented these features can be installed in a vehicle as a single device.

A Renesas microcontroller is used to control the exchange of information between the components of the system,

The general architecture describing the proposed system is shown in Fig 1.

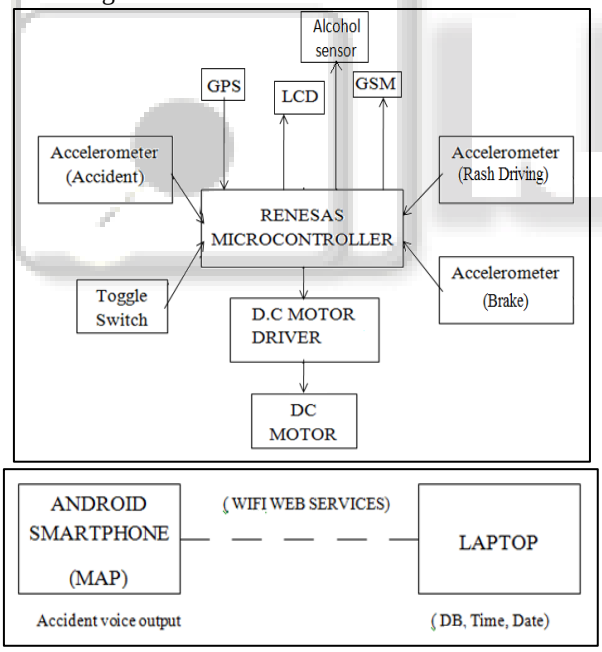

Fig 1: General architecture of the proposed system using Renesas microcontroller

III. IMPLEMENTATION

A. Anti-theft Tracking Module

The anti-theft tracking module is used when an unauthorized access is made to the vehicle. The owner is notified that the vehicle has been started, along with the coordinates of the vehicle's location being constantly sent to the owner's phone. The owner has an added capability to stop the movement of the vehicle by sending a signal from his mobile phone, to cut of the engine fuel of the vehicle remotely.

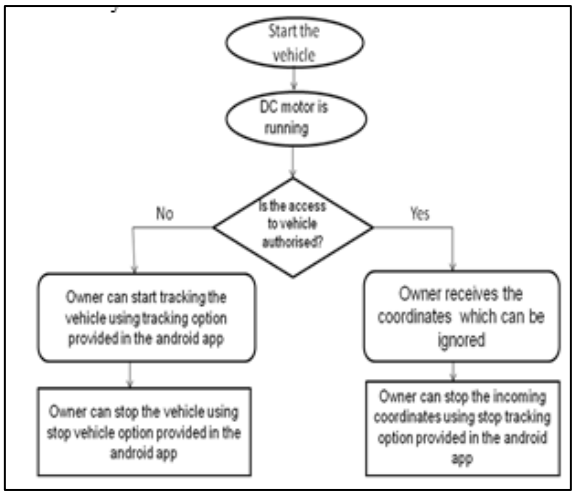

Fig 2: Flow diagram of Anti-theft Tracking Module

B. Accident Detection Module

In the accident detection module, the owner, who is constantly receiving updates about the coordinates of the vehicle and a registered emergency contact are notified that the vehicle is involved in an accident, along with the actual geo-coordinates of the vehicle. This information can be used to locate the vehicle and people involved in the vehicular accident.

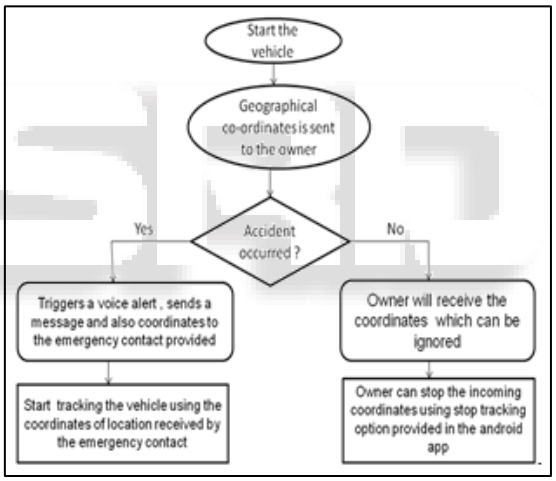

Fig 3: Flow diagram of Accident Detection Module

C. Drunken Driving Module

This module incorporates an alcohol sensor with the entire system, to detect any level of alcohol present inside the vehicle. The sensor is stationed on the driver's side

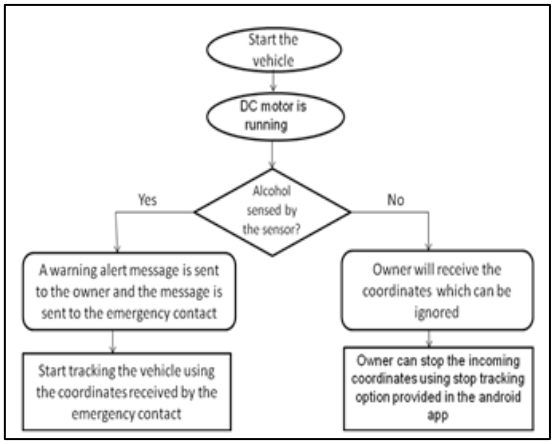

Fig 4: Flow diagram of Drunken Driving Module

D. Rash Driving Module

In this module, the number of times the brake being applied is taken into account, along with the increase in acceleration over a constant period of time. If rash driving is detected, the owner and emergency contact are warned by an alert message sent to their phones.

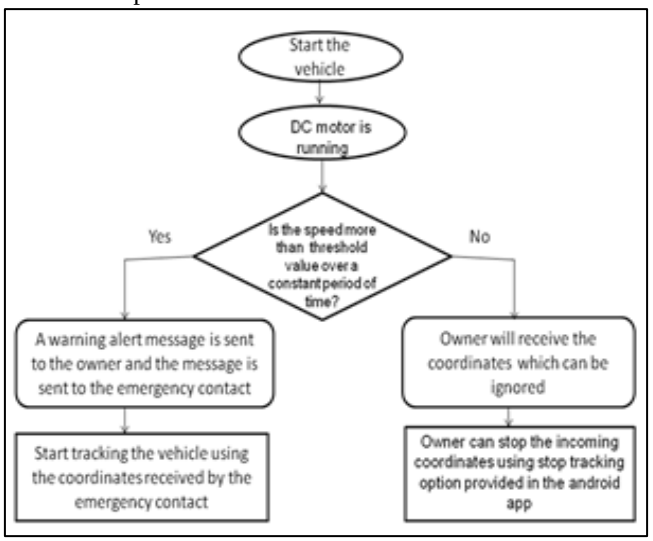

Fig 5: Flow diagram of Rash Driving Module

IV. RESULTS

Case Study 1: The security feature to implement anti-theft tracking system has been implemented by making use of a GSM module and a GPRS module to transmit the location of the vehicle in real time to the owner's phone. Furthermore, the owner is equipped with the capability to cut-off the engine fuel of the vehicle remotely, in case of theft.

Case 2: The accident detection system is implemented by using an accelerometer and considering deflection of the accelerometer in either x-axis or y-axis.

Case 3: The level of alcohol in the air inside the vehicle, was sensed using LM35 sensor, which is placed near the steering wheel, on the driver's side of the vehicle.

Case 4: The RD module considered the duration for which accelerometer and brakes were applied. If the count increased more than a specified threshold value for a predefined duration, only then would an alert message regarding detection of RD is sent to the owner and a registered emergency contact.

V. CONCLUSION

The features which are illustrated above can effortlessly be implemented using components which are easily available. The system can be installed with ease has been implemented keeping in mind the limited or rather, low power availability in vehicles.

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