

An Automated Approach to Driving Assistance and Accident Detection

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Abstract:- Aim of this work is to enhance the security of drivers. Road accidents cause social and economic impacts. Automated Driving Assistance and Accident Detection system is an approach that analyses the driving behavior of a person, notifies them about their driving behavior and the geographical area through which they move. Whenever an instant change in rotation, acceleration and an impact force in an end of the vehicle are detected, immediately notifies an emergency contact through a text message about time and location of the accident.

Keywords:- Driving Behavior, Geographical Area, Instant Change in Acceleration.

I. INTRODUCTION

Automobiles have a great importance in our daily life. One of the main and basic risk factors in driving is over speed. The severity of injury during accident depends on the speed of the vehicle. A vehicle on road with high speed will cause more injuries and have greater impact during the crash. Due to the lack of immediate first aid, deaths also may occur. Automated Driving Assistance and Accident Detection system is an application that provides driving assistance to the driver by notifying the driver about the driving behaviour of the vehicle. Further the system immediately notifies an emergency contact through a text message along with the location if an accident occurs. The accident is detected by the system based on the speed and orientation the vehicle. If there is a change in the speed and orientation of the vehicle above a predefined value then the system will detects it as an accident and immediately notifies it to the respective emergency contact. Besides system also provides assistance to control the speed of the vehicle. The system will notifies the driver whether the driver is in safe speed or over speed.

II. LITERATURE SURVEY

A. The New Lexus 2014 Models

The Lexus Enform feature is included in the new Lexus 2014 models . The driver, also a smartphone user, logs into the app and can use a wide range of services such as the GPS, nearby locations, assistance for directions etc. The technology is equipped with a feature called the Safety Connect feature .It can detects an accident through a force sensor on the rear end of the vehicle or the deployment of the airbag system and sends an automatic notification to the response service center

through the smartphone. Pricing is the problem with the Lexus Enform system.

B. The Onstar cooperation Model

The Onstar cooperation Model provides options such as, Stolen Vehicle Tracking, Automatic Crash Response, Turn by-Turn Navigation, and Roadside Assistance. Online reviews about the system include over pricing, poor service and lack of assistance, revealing the inefficiency of the system. The GPS location is received through the driver's network provider and the system sends a text message through the smartphone and as there is only a one-time purchase by the user, there can be no further pricing associated with the system. The OnStar Corporation, a subsidiary of General Motors Company, started the provision of accident notification service in the United States and later opened its services to Ecuador and Venezuela by the name of Chevystar.[1]

C. e-Notify

e-Notify uses the GPS connection of a vehicle to transmit the data, through Internet connection provided by the roadside units, to the service center that can respond immediately[8]. It is a system that allows fast detection of traffic accidents, improving the assistance of injured passengers by reducing the response time of emergency services and the submission of relevant information on the conditions of the accident using a combination of V2V and V2I communications.

III. OBJECTIVES AND METHODOLOGY

A. Objectives

Main objectives are to (i) detect the speed of the vehicle (ii) notify the driver about the speed (iii) detect the accident when it occurs. (iv) send a message to the predefined contact. Message should contain the location of the accident. If the accident is minor the driver can press the response button within 10s. if the driver does not press the response button within 10seconds,the message will be automatically sent to the predefined contact.

B. Methodology

The system is composed of Arduino Uno, MPU6050 accelerometer and gyroscope module, HC-05 bluetooth module, L293D H-Bridge motor and A3144 Hall effect sensor on the hardware side and the user's mobile phone. Generally the working principle of the system is : the MPU6050 accelerometer and the gyroscope module will detect the

orientation of the vehicle and the hall effect sensor will detect the speed of the vehicle. These values are passed as signals to the arduino board and process the signals and convert it into readable forms. The bluetooth will receive the data from the arduino and will send to the application. When an accident occurs the arduino will detect it and sends the information to the application via bluetooth. The application will send the notification to the emergency contact about the accident with the location of the accident.

IV. EXPERIMENTAL SETUP

A. Framework

- Android Studio- Android Studio is designed specifically for Android development. It is the official integrated development environment (IDE) for Google’s Android operating system.
- Arduino Uno R3 -The Arduino Uno is developed by Arduino.cc. It is an open-source microcontroller board based on the Microchip ATmega328P microcontroller .
- A3144 Hall-effect sensor-It is used to measure the odometer reading or speed of the vehicle depending on the rotation of it’s wheels. The A3144 is an integrated Hall effect non latching sensor.
- MPU6050-s -The MPU6050 has an embedded 3-axis MEMS gyroscope, a 3-axis MEMS accelerometer.
- L293D H-Bridge motor- The L293D is a general purpose high voltage / high current driver device, most often used to drive motors, but they can also be used to drive any inductive load such as relay solenoids or used to drive large switching power transistors.
- HC-05 Bluetooth module- It is a Bluetooth module designed for wireless communication. This module can be used in a master or slave configuration. It has range up to ;100m which depends upon transmitter and receiver, atmosphere, geographic urban conditions.

B. Software Application

The software system is a mobile application which reads data from the hardware system as input and displays the driving behaviour as the output. In case of over speed the system warns the driver by a warning message and alarm. In case of accident a text message is sent to the contact registered informing the accident and location of the vehicle. The application is developed for android platform with the help of android studio.

C. Data Flow Diagrams and Hardware Components

The aim of this work is to design a controller that controls all the works in the system. The sensors sense the speed and orientation and send the data to the controller. The controller will be able to send the data to the bluetooth module. The second aim is to receive the data from bluetooth by the application and to send the message to the emergency contact with the location of the accident and also to display the driving conditions of the vehicle.

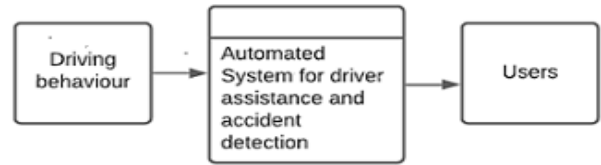


Fig. 1. Level 0 diagram

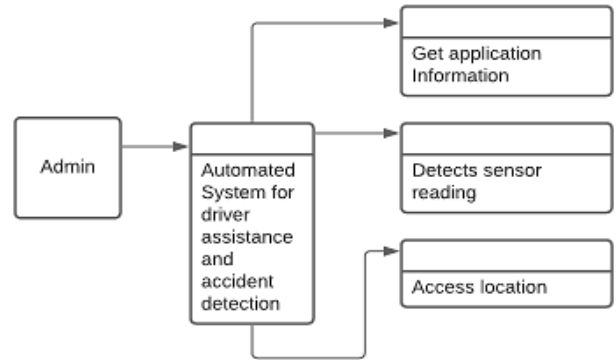


Fig. 2. Level 1 Admin level

The system will help to analyze the driving behavior of a person, assist them by providing geographical information of their path and also notify a dependent of the driver when an accident occurs. In the system a mobile application is designed that can be used by drivers to analyze their driving behavior.



Fig. 3. Hardware system

Communication between hardware system and the user device is as shown in the diagram Fig.4

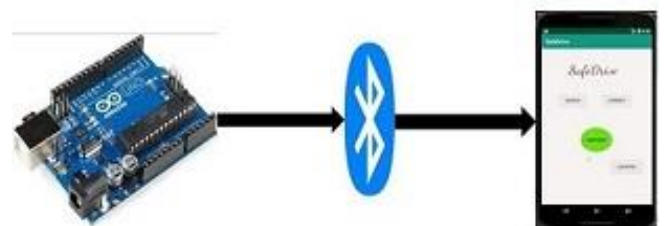


Fig. 4. System overview

D. Working

- Phase 1: The system starts working when the vehicle is started or the power is on. The arduino board and the sensors connected to it gets on. Due to the H-Bridge motor driver the wheel starts rotating. The speed of rotation of the wheels can be managed and varied by the help of a potentiometer connected to the motor driver. When the wheel starts rotating the vehicle moves. The accelerometer and gyroscope connected to the arduino board through MPU6050 module, starts observing the orientation and motion of the vehicle. The Hall effect sensor reads the speed of the vehicle.
- Phase 2: The data obtained by these sensors are continuously passed to the bluetooth module attached to the arduino board. The bluetooth module helps in transferring the data collected by the sensors to the mobile application where the data are processed to analyze and monitor the driving behavior of the vehicle. The Bluetooth module passes data to the application in a serial manner. So data at every point of time regarding the speed and orientation of the vehicle are passed to the software application.
- Phase 3: The mobile application is designed in such a way that a person who logs into it should provide an emergency contact number to the application. The contact number will be saved by the application. The application also has a search button where the user can search for the nearby bluetooth devices and connect to it. Once the application is connected to the bluetooth module of the hardware, the data sent from it is received at the application side. The speed at which the vehicle moves will always be displayed in the application screen.
- Phase 4: A threshold value for speed is already predefined in the application. Whenever the speed of the vehicle increases above the threshold value a warning message will be popped up in the application screen along with a warning alarm notifying the driver that the vehicle is in over speed. Thus the driver can reduce the speed of the vehicle and ride safe. When there occur a sudden change in speed and orientation of the vehicle above the specified threshold value the system considers it as an accident. When an accident occurs a response button will be displayed on the application screen. Along with that a pop up telling that accident had occurred will also be displayed. If it is a minor accident and can be resolved by the driver itself, the driver can press the response button and the application will be reset to normal stage. If the accident is a major one and cannot be resolved by the driver, the application waits for ten seconds to get a response from the driver. Upon not receiving the response the application sends a text message to the registered contact number specified by the user stating that an accident has been occurred and the location of the vehicle. While receiving such a message the person injured can be traced and given care at the earliest as possible.

V. CONCLUSION AND FUTURE WORK

By automatically sending text message to emergency contact immediately after detecting an accident by the system, helps to save the life of people who are in danger. Since the text message delivered to the emergency contact contain the time and location information of the accident , can help to assure timely action. This work can be extended in the following way

- The system can be upgraded in a manner to provide a more customized interface with the user. The application shall provide a user a platform to login and permanently save the emergency contact number and other basic details about the user.
- The number of emergency contacts to be informed on the occurrence of an accident shall be increased. Also the system shall set the numbers of police or ambulance as default emergency contact numbers.
- The hardware of the system can be extended by adding cameras and monitoring devices for analyzing driver drowsiness. Also by the installation of cameras the system will be able to keep records of accidents occurring to the vehicle. This will be helpful in case of major accidents and investigations related to it.

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