

SUSPICIOUS DRIVING DETECTION & CAUSE BASED RECOVERY SYSTEM USING GPS, GPRS AND OBJECT DETECTION SENSORS

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Abstract

Every year, there are huge numbers of accidents being occurred [10] due to constraints like rash driving, drunken driving, drowsy driving, etc. The system considering the need aims to identify suspicious driving under all possible scenarios with the help of object detection sensors. On a positive indication on suspicious driving, few warnings will be provided to the victim, which when neglected, using an alert system, both the public around and the concerned officials are alerted about the scenario. The alert system includes a rhythmic blink on headlights and indicators, or even horn in case of severity, for alerting the public around. The officials of responsibility are alerted by passing the GPS delivered information through GPRS, leaving the further corrective action to the officials. In case of rash driving due to emergency the officials are given option to provide

authority for switching the alert indication to emergency indicating mode which makes the vehicle resemble an ambulance.

Key Words: Object detection sensor, GPS, GPRS.

1 INTRODUCTION

Road traffic accidents in collective are extremely disastrous and are one of the major issues faced by almost all the countries despite their road safety and regulations. Thousands and thousands of serious injuries and deaths take place every year only due to the reckless and lethargic driving by the irresponsible individuals. These are due to the negligence of individuals to follow guidelines of traffic rules and road safety.

According to the statistics [11], it has been noted that an average of one lack individuals ends up with death due to road accidents every year in India. Even more end up with life threatening problems such as mental trauma, loss of memory, permanent physical ability loss, etc. Despite of frequent awareness programs and corrective measures being carried out by social media, social organization and responsible authorities, the continuous occurrences of road accidents makes the measures taken as insufficient effort.

Many researches and projects are being developed concentrating these scenarios. Number of detection, avoidance and prevention based technologies has been developed under the same which are providing improved result in the goal of achieving road safety. These technologies uses variety of devices and components like breathe sensors, retina sensors, collision sensors, vibration sensors, etc. Sensors in accordance with the scenario are chosen and integrated with the micro controller and is programmed to perform further actions. In most systems, micro controller is common and it is equipped with GPRS, for communications with responsible authorities and GPS, for retrieving information on location.

These systems embedded to the vehicle will be capable of sensing any occurrence on relative mishaps and also will be able to automatically notify the driver and to the emergency support officials as a measure of prevention, avoidance and recovery respectively. Advanced systems with speed control technologies implemented takes

a step further to avoid road accidents when programmed for auto pilot and auto speed control programs.

Though such type of technologies has shown a vital improvement in road safety, it is a fact that no technology is complete in terms of efficiency it makes. And there is always a possibility of improvement in any technology. The paper discusses on such an improvement on the existing technology, concentration on the way the output is produced and provided. The improvement made here is expected to ensure the public around to receive awareness about the hazard approaching towards them, before it is late.

2 EXISTING SYSTEMS

Number of researches has been made on the area to ensure reduced road accidents. The technologies derived from such researches are being used in number of safety based systems. Water cluster-Breath Sensors for detecting the drunken driving, Retina Sensors to avoid Drowsy Driving, Auto Speed Control system to avoid rash drives, ABS (Anti-locking Breaking System) which use to pump the break and stop the vehicle, SRS Airbags (supplemental Restraint system air bag) which is designed for inflate during vehicle collision, are some of the successful techniques among such systems. Numbers of system are implemented in real time as a hybrid emerged from these technologies which made a better result in reaching the objective. Few of them are enlisted below:

Technology advancement in vehicle monitoring system for accident prevention, a system proposed by N.P. Chai, W.A.W.Z. Abidin, W. H. W. Ibrahim and K. Hong Ping they use Non-intrusive radar sensor to detect misbehavior in driving and Global positioning (GPS), Geographical information system(GIS), Global system for mobile(GSM) and General packet radio service (GPRS) technologies in delivering alert information. However, the time interval between the alert trigger and action of recovery stands as a hazard for the public around [1]. Water-cluster-detecting breath sensors and applications in cars for detecting drunk or drowsy driving, by Minoru Sakairi, proposes an ideology of implementing water-cluster-detector(WCD) breath sensor, which predicts alcoholics by

measuring electric currents of positive or negative charge water clusters in breath that are separated by using electrical field. However, the breath sensor can detect breath from only about 50cm. It suits for only limited range of scenarios [2].

Accident avoidance and detection on highway, a system proposed by S.P.Bhumkar, V.V Deotare used eye blink sensor, gas or fuel sensor, alcohol detection sensor, impact sensors and a GPS navigation interrelated system to favor variety of scenarios. But the system is inefficient in terms of cost [3].

An automated system for accident detection by Asad Ali and Mohamad Eid Introduces a new system to detect accident called as ASAD (Automatic Smart Accident Detection) It is a auto-detection unit system which notifies the emergency contacts if an accidents occurs. But it is performs recovery process but not preventive actions [4]

Mobile phone based drunk driving detection by Jiangpeng Dai, Jin Teng t, Xiaole Bai, Zhaohui Shen and Dong Xuan. The whole process requires a Mobile phone which is placed in vehicle and with accelerometer and orientation sensor. This system implication encloses only a particular scenario of road accidents [5]. Travolution-An Embedded System in Passenger Car for Road Safety by Amiya Kumar Tripathy, Sejal Chopra, Samantha Bosco, Srinidhi Shetty, Firdos Sayyed, have used variety of sensors to detect accidents and to pass in-time information to registered personals. This also includes speed control and horn honking control in prohibited area. However, steps can be taken in accident prevention process rather than recovery [6].

3 PROPOSED WORK

The ideal scenario of our proposed model is to prevent hazards caused by suspicious drive. An object detection sensor is used to detect faulty driving on road, since it is compatible for detection under most of the scenarios. The object detection makes decision based on the factors like speed, frequency of acceleration, changes in distance metrics between vehicle and other objects on road, and motion of vehicle. Once the system observes a positive result on sus-

picious run check, it makes warning to the operator and a short time level-1 alert indication for public to be alert. The system alerts the public environment before the information is passed to the higher officials about the suspicious drive. Within the time period of level-1 indication, if the system observes another attempt of suspicious drive, the level-3 alert indication gets triggered. Taking number of faulty drives and speed under consideration first, second and third attempts on faulty drives triggers level-1, level-2 and level-3 alert indications respectively. Once level-3 alert system gets triggered, the identity information of vehicle, number of faulty attempts and a continuous stream on location from GPS gets forwarded to the control room, expecting the officials immediate action on the scenario. Indications are made through constant blinks on headlights and other indicators. And the level of indications varies based on the frequency of blink rhythm.

In addition to this scenario, rash drive due to medical emergency is considered as well. The victim will be provided with an additional feature termed Emergency Mode. Once the system is in any level of indication mode, an option of Emergency Mode Switching will be provided to the operator. On request for switching, the vehicle information and location information gets forwarded to the control room server. The server side system now reads the information and generates an OTP for the vehicle. Once the OTP is generated to the vehicle level-3 rhythmic blinking starts on it and they can proceed to the nearby hospital. An official can be assigned to interrogate the victim and provide authentication for the vehicle for switching to Emergency Mode through control room. Confirmation on authentication is made through the OTP which is generated to the vehicle. And honking starts along with the Rhythmic blinking indicating as the vehicle is converted to Ambulance mode which is considered as level-4.

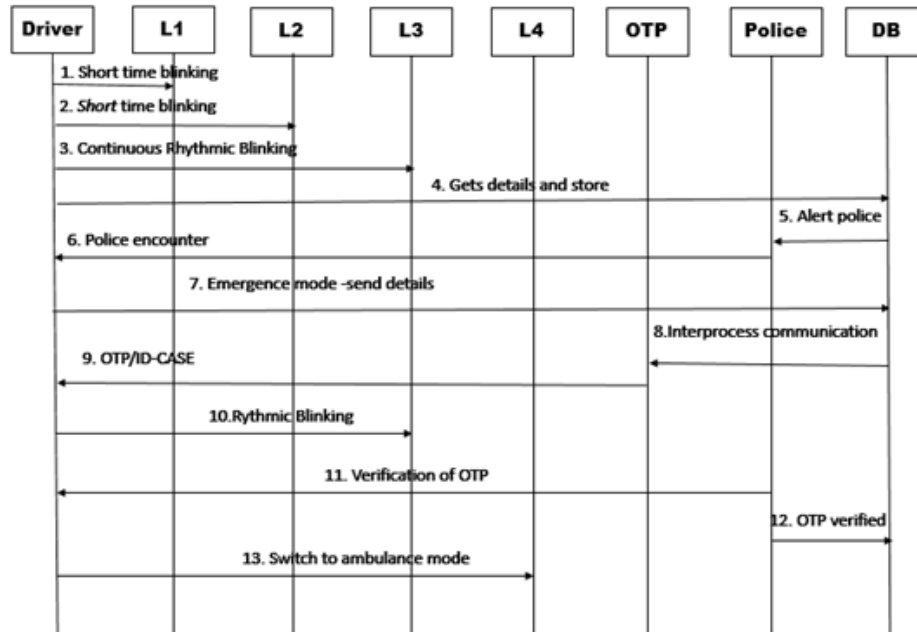


Fig. System flow diagram

4 Materials and methods

I. Hardware devices

A. GPS SKM58: SKM58 Series with embedded GPS antenna is used [7], these antennas enables high performance navigation even in a very bad situation. GPS is a visibility environments. It has 165dBm tracking sensitivity. 6-pin UART connector is embedded in a portable device which is used as a receiver like speed camera detector, vehicle locator etc. its bandwidth-10 MHz min. **B. lpc2148:** The LPC2141/2/4/6/8 microcontrollers are used. It is based on a 32/16 bit ARM7TDMI-S CPU with real-time emulation & embedded trace support [8]. It combines the microcontroller with an embedded high speed flash memory ranging from 32 kB to 512 kB. LPC2141/2/4/6/8 is ideal for applications in which miniaturization is a key requirement. **C. GPRS:** GPRS Modem is built with SIMCOM Make SIM900 Quad-band GPRS engine, it works

on frequencies like 850 MHz, 900 MHz, 1800 MHz and 1900 MHz **D. Ultrasonic Sensor:** Ultrasonic converts ultrasound waves to electrical signal [9], it is used for both transmit and receive. Ultrasonic sensor generate high frequency sound wave. It evaluates the echoes which are received back; this helps to calculate the distance to an object. **E. LED:** Light-emitting Diode is a Semiconductor device. This will emit light visibly, when an electric current is passed to it. The output of each color of LED lights varies Red color (wavelength of 700 nanometer) blue-violet (wavelength of 400 nanometer) LED is called as infrared-emitting diode (IRED).



Fig. Objection detection and alert system

5 Methodology

Scenario 1: Suspicious driving detection

A person is driving in a very suspicious manner. In our model, a collision detection sensor will be attached to the bumper of the vehicle. This sensor is capable of detecting an object at a maximum distance of 10 meters. A speed limit tracker is pre-set with a maximum threshold (V_{max}). These two devices work directly proportional to each other. Hence the threshold on distance to be maintained by the vehicle from the rear object (dt), this varies along with the variation in the speed of the vehicle.

The sensor marks a suspicious driving, when the sensed distance gets below (dt meters). This triggers the alert mode in the vehicle which warns the driver twice giving a chance to avoid false call. Breaking the limit further makes the system to forward the information the vehicle to the concerned official and in order to warn the public through some sort of signal. The signal may include

rhythmic horn and blink of indicators and headlights. These do let the public around to know the hazard to prevent them. The information to the officials includes attributes like the identity details and the location of the vehicle using GPS and GPRS.

Scenario 2: Medical emergency situation

In trauma cases or emergency situations when the ambulance gets delayed, our system is geared to convert normal vehicle into an ambulance to save lives. In this process, the driver can turn ON the emergency mode through a button press which is placed on the dashboard to inform the authorities about the medical emergency. Along with the information on vehicle, and the medical emergency is passed on through GPRS to the respective authority (control room) and the server will generate a key to the vehicle. Location and details of the Car is passed on through GPS and GPRS modem to the police server and the server will generate a key to the vehicle and to the specific area police where the vehicle is located.

And at the same time buzzer alarm and rhythmic blinking of headlights and indicators are activated highlighting the emergency to the drivers environment. This buzzer alarm can also be the Horn which is already available in the car. If the cause seems convincing, the vehicle can be allowed to proceed further in limited speed. This aids the police to locate the car and keep a track of it. If the police wanted to check the vehicle about the emergency drive he can verify them with the help of the key which is been generated. But in case of a false alarm, he can deactivate the emergency call and take action on them.

6 Software and hardware Specifications

A. Windows Bascom Compiler Keil compiler is used for ARM7LPC2148 microcontroller family. Its very comfortable and easy for this concept.

B. Express PCB Express PCB is very easy and fast to use. PCB is all in one freeware in which PCB layout and schematic can be made.

C. Flash Magic Its used to burn the machine language code file, which is generated by compiler. Using the hardware kit it was done,

wherein the IC is placed and connected to PC via Serial Port

D. Hayes AT Commands It is used to control MODEMS. AT commands with GPRS/GPS MODEM can be used to get the following informations: Configuration and information pertaining to MODEM and SIM card.

Data over mobile network: For this concept Hayes AT is used to programming the GPRS /GPS modem for tracking the accident, suspicious driving by sending an SMS to the pre assigned number. The system ensures reduced accidents helps people in medical emergency get benefited. As a road safety measure, under hazardous situation, the public around the location as well gets alert in time due to the open and continuous indication made from the victims vehicle.

7 CONCLUSION

The system favors both the scenarios of controlling cause for road accidents as well as the person in medical emergency. This helps the officials in maintaining the road safety, alerts the drivers in case of lack of concentration and also alerts the public about the danger around on road. As an added advantage it reduces the risk on life of individuals in medical need due to delay in getting treated. Though the implementation provides a promising result, the real time implication requires prior permission from the government authority. The idea on making the system reach the entire road vehicles is a challenging task. However this can be achieved by making few modifications in the traffic regulations. The individuals who get caught in breaking the road rules can be made to install the system in the vehicle. All government vehicles can be made to contain the system. All schools, institutions, companies, cabs, and all private and public sectors can be mandated to install the system to their vehicles.

8 FUTURE WORKS

Since the vehicle includes GPS and GPRS, the system can be extended to tracking down a suspect of crime, to provide live traffic alert and navigate users, to provide vehicle security in terms of accessibility and to provide timely support in case of vehicle breakdowns.

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