

A SURVEY ON AUTOMOTIVE SAFETY DATA INTEGRITY SYSTEM USING A SMART BLACKBOX IN LMV'S

Ahamed Meeran Mydeen.A & Dr.M.Anto Bennet

Faculty, Department of Electronics and Communication Engineering,

Vel Tech, Avadi - Alamathi Road,

Avadi, Tamil Nadu, India.

Email:meeranmydeen90@gmail.com

Mariselvi.T ,Mohanapriya.S ,Monica.S

UG Scholar, Department of Electronics and Communication Engineering,

Vel Tech, Avadi - Alamathi Road,

Avadi, Tamil Nadu, India.

Email:priyasrinivasan1096@gmail.com

Abstract

In today's system, it is very hard to detect if the vehicle gets stolen or get the accident with the vehicle. Because there is not any smart system in it, so police also face many problems in theft detection. Calling a police then observing the situation and after detection also sometimes there is no result. The Black Box system presents an affordable way to collect information from the black box in vehicles. This work proposes an intelligent way of collecting license plate number of neighboring vehicles using RF transceivers. Thereby, when an accident occurs the force sensor get activate and the RF transceivers in both the vehicles transmit their license plate number and receive the license plate of the neighboring vehicle. This work also added GPS to track the location and GMS to send the information about the accident to relatives, police, ambulance etc..This system monitors the state of the driver such as alcohol consumption of driver, the drowsiness of driver. Our system also operates under various scenarios like when a car is met with the accident in the middle of the highway during night time, there is no way of getting help from others. If any heavy injury happened to car driver or passenger, due to delay in medical help there will be the loss of life. In this situation, this system helps to pass the text message to the nearby hospital. It helps to save the life of people. System design uses ARM7 as embedded microcontroller because of low power consumption.

Keywords: ARM7, Global Positioning System (GPS), Global System for Mobile Communications(GSM), Zigbee RF transceiver.

Introduction

According to the fact sheet, there are hardly 0.4 million accidents were recorded in India. When an accident happens, the percentage of finding the real cause of the accident is minimum. Hence, the punishment for the culprits is also arbitrary. Road safety can be improved only by finding the causes and consequences of road accidents. When an accident has happened, investigators needed the information to find cause for the accident. But the investigators did not get correct information by asking the

observers who happen to pass by the place at the time of accidents. Normally, 99 percent of accidents occur outside of the cities are due to drunken driving. Not only drunken driving, improper seat belts condition and also drowsiness also the major factor. This type of accidents can be reduced by adopting black box system in cars. The black box system is used to collect accurate information related to the accident. This work design to develop black box system which stores license plate number of which car makes the accident, position of the vehicle, drowsiness of the driver. This system first exchange the license plate number with which car makes the accident. Secondly, it records the time and location when the accident took place. Several works were reported for extension of black box functionality such as user privacy and a data management for a vehicle-based CCTV records. However, the records are affected by surrounding environment, humidity and bad weather[2-5]. The method [1] of video sequence while driving to extract and record the license plate number and color of the neighboring vehicles. However, the video sequence is not clear and images are blurred during bad weather conditions. In this paper, we propose a black box system which adds several additional functionalities to existing black box system. The proposed system consists of ARM microcontroller which makes the system low cost with low power consumption. When an accident has happened, our system exchanges the license plate number with which car makes the accident. It also passes the vehicle parameters such as sensor values, time and location of the vehicle to the central station in terms of the text message. The central station can review all the data stored in their database. In the proposed system, an encryption algorithm is implemented to avoid falsification of data so that the data will be viewed only by central station persons.

Literature Survey

The existing work [1] presents an intelligent methodology to gather the accident or safety data with the help of widespread black box system. Conventionally, once data or information is required about the accident or crime happened, investigators gather clues non-systematically by asking observers around the accident spot. This existing system proposes a scientific methodology for gathering that

data using the black box that analyzes and gathers data of neighboring vehicles. For this purpose here they add a recognition engine to extract and record the car license plate number and color of neighboring vehicles. The IOT is used practically to receive data request message from the server and transfer the matched data to the server. In paper[2] the task is automatic detection of accidents and informing the emergency services. The system is used in new cars. The installation in older vehicles could also be very hard or uneconomical. This paper presents a system which performing similar tasks employing a mobile device. The mobile phone can be used to send data regarding the collision automatically with voice association. The projected system of the "black box" recording data on a moving vehicle before the collision. In the projected output it can able to associate emergency numbers and relatives and, if necessary, they will give notice to rescuers. The motion sort recognition methodology is employed to cut back the danger of a false collision detection. In the paper[3], the tendency to propose a unique recording equipment fusing knowledge from measuring device and cameras. They have a tendency to estimate the gap and rate of obstacle the with the help of propagation and FMCW measuring device. Especially, this system shows a tendency to compare varied Direction of Arrival(DOA) algorithms for estimation of obstacle angle. The experimental results indicate that the Multiple Signal Classification (MUSIC) is a lot of correct compared to the alternative strategies. Moreover, the system has a tendency to formulate the vehicle following image through the camera image process and measuring the device information. This image is wont to widen viewing angle and it's going to be useful to research an automotive accident. The experimental study results indicate that the new recording equipment overcomes the disadvantages of this black boxes and should be helpful for safe driving and correct accident investigation. In the paper [4], it shows the system style and develop a reasonable user-friendly low price vehicle recording equipment that is it is a real-time knowledge watching with speed control function of the vehicle in the restricted zone. The system will do the major operation for example records varied parameters like, state of the driver (both sleepiness of driver, alcohol consumption of driver), belt state, crash state, engine temperature and speed management of the vehicle. The system uses ARM7 as an embedded microcontroller. It also adds the uses of GPS and GSM modules to spot the position of the car and to transfer the data to the central station. The most advantage of this technique is low power consumption since ARM7 is employed as an associate embedded microcontroller. The price to implement the overall system is low. In the paper[5], the demonstration shows a way to effectively collect and manage data obtained from automotive black boxes in networks. The automotive black boxes recording equipment could be a vehicle-based CCTV that records video pictures, sound, GPS position, speed, and time. These knowledge collect a correct automotive accident investigation and a few public crimes bar. However, there are necessary problems like user privacy and an information management for a vehicle-based CCTV records. The projected proof assortment system will misuse back driver privacy issues

and communication and management overheads. Our contribution is that we have a tendency to propose a possible and helpful situation for public safety[6-10].

PREVIOUS SYSTEM	EXISTING SYSTEM
In previous work, the image of license plate number which is captured during the accident is blur and not clear in appearance.	In this work , when the car meet with an accident it automatically transmit and receive the license plate number .
It is based on the digital image processing.	It is based on embedded system.
License plate number is captured using camera.	License plate number is transmitted using wireless RF transceiver.
It is a time consuming process.	It is a time saving process.
Difficult to find the culprit.	Easiest way to find the culprit.
Cost is high.	Cost is less compared to previous paper.
Power consumption is high.	Power consumption is low.

Proposed System

In the existing system, when an accident or a crime occurs, data about those accidents is needed to find out the reason for the accident or the culprit of the crime. Conventionally that sort of data is gathered non-systematically by the investigator by gathering rumors about the accident or by investigating the observers who pass by the place at the time of the accident. Systematically information gathering system receiving the request from the server when any one person reports to the server. In the previous paper, they used the camera to record the license plate number but due to several reasons, we get the blurred image so we cannot able to track the vehicle which made the accident. But in this proposed system we neglected those disadvantages. In this proposed system, we propose a safety information gathering system with the help of widespread black box system. Here several additional functionalities added to the already existing ordinary black box system. The first functionality is analyzing and extracting the license plate number and engine number recognition of neighboring vehicles using wireless RF Transceiver. Here force sensor is used ,so when the accident occurs force sensor in both the vehicles activated, as a result the RF transceivers in both vehicles start to transmit its license plate number and receive the neighboring vehicles license plate number and also with the help of GPS, the time and driving route information are recorded and send this data about the accident to police, ambulance and the relatives using GSM. From this, the police can easily find the culprit who made the accident.

This system also monitors the state of the driver such as alcohol consumption of driver, the drowsiness of driver with the help of alcohol sensor and eye blink sensor. So when a person consumes alcohol or whether he/she is drowsy the speed of the vehicle decreases automatically and finally, it gets stopped. Here Gas sensor is used to observe whether gas leaks from A.C. The smart black box in the vehicle which consists of ARM processor, Force sensor, Alcohol sensor, Gas sensor, Eye blink sensor, GSM, GPS and wireless RF transceiver. The smart black box in a neighboring vehicle having PIC processor, the Force sensor, and wireless RF transceiver. When an accident occurs the force sensor in our vehicle and the neighboring vehicle gets activated in turn the RF transceiver (Zigbee) starts to transmit license plate number of their individual vehicle and receive the license plate number of the neighboring vehicle, whose license plate number is already stored in their respective vehicles. Here UART is used for serial communication purpose then GPS is used to track the location of the accident happened vehicle. Then the GSM transmits the location where the accident happens to the relatives, police, ambulance etc., whose number are already saved in the controller. Here signal conditioning circuit is used to convert the analog signal produced by the sensor to the digital signal. Here ADC is not used because it is the 4-bit converter for this only single bit converter is needed so signal conditioning circuit is used. The sensors used here like is to observe the condition of the driver and operates according to slow down the vehicles when the sensors get activated. Alcohol sensor activated when the driver consumes alcohol, Eye blink sensor gets activated when the driver is drowsy and Gas sensor activates when the gas leakage occurs. When these sensors are activated, the car automatically gets slow and finally, it gets stopped. So from this paper, the police can easily find the culprit and the cause of the accident.

Analysis of parameters

The requirements specification is a technical specification of requirements for the hardware products. It is the first step in the requirements analysis process which lists the requirements of a particular hardware system including functional, performance and security requirements. The requirements also provide usage scenarios from a user, an operational and an administrative perspective. The purpose of hardware requirements specification is to provide a detailed overview of the hardware project, its parameters and goals. This describes the project target audience and its user interface, hardware and software requirements.

ARM 7

An ARM processor is supported by the RISC (reduced instruction set computer) architecture design. This style developed by advanced reduced instruction set computing Machines. ARM makes 32-bit and 64-bit reduced instruction set computing multi-core processors. The ARM has a load/store and orthogonal instruction set. Advanced reduced instruction set computing could also be a single-cycle execution. It has an enlarged power-saving value. 64 and 32-bit execution states for climbable high performance. ARM

supports hardware virtualization. The ARM7 family is additionally a variety of low-power 32-bit reduced instruction set computing chip cores optimized for price and power-sensitive client applications. The ARM7 family has a feature of the Thumb 16-bit instruction set and 32-bit performance at 8/16-bit system price.

PIC

The PIC microcontroller PIC16f877a is one in all the foremost known microcontrollers within the trade. This controller is extremely convenient to use, the cryptography or programming of this controller is additionally easier. One in all the most blessings is that it may be write-erase as persistently as potential as a result of it uses nonvolatile storage technology. It's a complete variety of forty pins and there are thirty-three pins for input and output. PIC16F877A even have several applications in digital physics circuits. For cost effective here we are using the PIC.

Force Sensor

Force sensors will measure a force between nearly any 2 surfaces and are sturdy enough to fit for most environments. A force-sensor may be a material whose resistance changes once a force, pressure or mechanical stress is applied. They're conjointly referred to as "force-sensitive resistor". The Flexi Force sensing element acts as a force sensing electrical device. Once the force sensing element is dud, its resistance is extremely high. Once a force is applied to the sensing element, this resistance decreases. The resistance may be measured by a multimeter, then applying a force to the sensing space.

Alcohol Sensor

Alcohol sensing element is for sleuthing alcohol concentration on your breath, a bit like your common breath analyzer. It has a high sensitivity and quick reaction time. Sensor results in an analog resistive output with respect to alcohol concentration. The drive circuit is extremely easy, all it desires is one electrical device. A straightforward interface can be a 0-3.3V ADC. It's a less value semiconductor sensing element which might observe the presence of alcohol gases at concentrations from 0.05 mg/L to ten mg/L. The sensitive material used for this sensing element is SnO₂, whose conduction is lower in clean air. Its conduction will increase because the concentration of alcohol gases will increase. It's high sensitivity to alcohol and features a sensible resistance to disturbances as a result of smoke, vapor and fuel. This module provides each digital and analog outputs. MQ3 alcohol sensing element module may be simply used along with Microcontrollers, Arduino Boards, Raspberry Pi etc

Eye Blink Sensor

The Eye Blink sensing element senses the eye blink with the help of infrared. The Variation of the eye can vary as per unconditioned reflex. If the attention is closed the output is high otherwise output is low. This is to understand whether the eye is in closing or opening position. This can be used to avoiding accident as a result of the unconscious. The Eye Blink sensing element may be a device for observing the eye

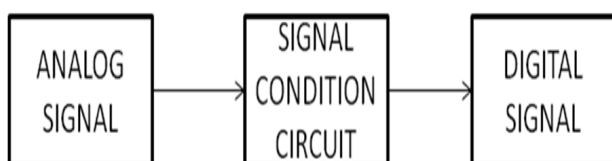
positions and eye movement. Eye trackers are utilized in analysis on the sensory system, in psychological science, in cognitive psychology, marketing, as a data input device for human-computer interaction, and in product style. There are the variety of ways for observing the eye movement. The foremost standard variant uses video pictures from that the eye position is extracted.

Gas Sensor

A gas sensing element may be a device that detects the presence of gases in a part, usually as a part of a security system. This kind of kit is employed to observe a gas leak and then a method may be mechanically turn off. This kind of device is very important as a result of this there are several gases that may be harmful to organic life, like humans or animals. Gas detectors may be used to detect flammable, ignitable and toxicant gases, and gas depletion. This kind of device is employed wide in trade and may be found in locations, like on oil rigs, to watch manufacture processes and rising technologies like electrical phenomenon. They will be utilized in firefighting.

Signal Conditioning Circuit

Signal acquisition Circuit means that manipulation of analog signal in such the simplest way that it meets the necessities of the subsequent stage for more process. It's same as analog-to-digital converters. However, ADC may be a four bit and signal acquisition circuit is the one-bit converter. several applications involve environmental or structural measuring, like temperature and vibration, force sensors. These sensors, in turn, need signal acquisition before a knowledge acquisition device will effectively and accurately observe the signal. The Signal acquisition System could also be needed to perform linear processes like amplification, attenuation, integration, differentiation, addition or subtraction. They're conjointly needed to do non-linear processes like modulation, reception, sampling, filtering, clipping and clamping, squaring and linearising or multiplication by another operator. These functions need the correct choice of parts and the devoted replica of the ultimate output for the presentation stage.



Zigbee Transceiver

The Zigbee Transceiver Module provides bi-directional communication between two-way enabled RTI remote managements and management processors utilizing Zigbee wireless communication. Utilizing the foremost recent in wireless technology, the Zigbee Transceiver Module is capable of over merely receiving signals it'll transmit signals

in addition. Zigbee is associate in nursing IEEE 802.15.4-based specification for a group of high-level communication protocols accustomed manufacture personal area networks with small, low-power digital radios, like for home automation, medical device info assortment, and totally different low-power low-bandwidth needs, designed for little scale comes that need wireless affiliation. Hence, Zigbee could also be a low-power, low rate, and shut proximity (i.e., personal area) wireless unplanned network. The technology printed by the Zigbee specification is supposed to be easier and fewer pricey than totally different wireless personal area networks (WPANs), like Bluetooth or plenty of general wireless networking like Wi-Fi. Applications embrace wireless light-weight switches, home energy monitors, traffic management systems, and totally different shopper and industrial instrumentality that desires short-range low-rate wireless info transfer.

GPS

Global Positioning System. It comes under the specification of wireless network infrastructure. The position of the objects is observed using signal strength and triangulation from base stations. Base stations are capable of delivering the locations of areas like the tunnel and dense areas. The number of phone's international mobile instrument identity, etc. is used to trace the location where the mobile phone is located. It's a world navigation satellite system that sends the geolocation along with the time info to a GPS receiver anyplace on or close to the world and wherever there's a patent line of sight to four or a lot of GPS satellites. The GPS doesn't need the user to transmit any information, and it operates severally of any telecom or net reception, although these technologies will enhance the utility of the GPS positioning info. The GPS provides essential positioning capabilities to military, civil, and business users around the world. The American government created the system and maintains it that makes it freely accessible to anyone with a GPS receiver.

GSM

Global System for Mobile Communications. It comes under the specification of wireless network infrastructure. The position of the objects is observed using signal strength and triangulation from base stations. These base stations are capable of delivering the locations of areas like the tunnel and dense areas. The number of phone's international mobile instrument identity, etc. is used to trace the location where the mobile phone is located. The GSM system was from the second generation (2G) telephone technology. One in all the fundamental aims was to supply a system that will change larger capability to be achieved than the previous 1st generation analog systems. A digital TDMA (time division multiple access approaches) is employed for the achievement of GSM. By adopting this system a lot of users can be accommodated at intervals the obtainable information measure. Additionally to the present, ciphering of the digitally encoded speech was adopted to retain privacy. With the help of sooner analog cellular technologies, it absolutely was potential for anyone with a scanner receiver to pay attention to calls and variety of far-famed personalities had been "eavesdropped" with embarrassing consequences.

Sr. No.	Year	Title of paper	Processor / controller	Force sensor	Eyeblink sensor	Gas sensor	Alcohol sensor	License plate recognition	GSM & GPS
1.	2017	Safety Information Gathering System Using a Smart Blackbox	Raspberry pi	×	×	×	×	Camera is used.	√
2	2016	A Method for Collision Detection Using Mobile Devices	Raspberry pi	×	×	×	×	Mobile phone is used.	√
3.	2016	Vehicle Black Box with 24GHz FMCW Radar	Raspberry pi	×	×	×	×	FMCW radar	×
4.	2015	Real Time Data Monitoring System with Intelligent Vehicle Tracking using ARM7	ARM 7 processor	√	√	√	√	Not recognize any license plate number	√
5.	2010	Evidence Collecting System from Car Black Boxes	Raspberry pi	×	×	×	×	CCTV is used	√

Conclusion

An innovative wireless system using microcontroller and GPS tracking system has been developed for collecting evidence from car black boxes . In the future, all vehicles will have a black box, and then they can provide more useful information about an accident. The contribution of this paper is that it propose a feasible and useful scenario for public safety. This paper shows how to utilize the car black box for car accidents and crime prevention.

Reference

- [1] Changing Kang and See Wean Hoe, "Safety Information Gathering System Using a Smart Blackbox",IEEE International Conference on Consumer Electronics (ICCE) ,2017
- [2] Jakub Smolka¹, Maria Skublewska-Paszkowska,"A Method for Collision Detection Using Mobile Devices",IEEE,2016.
- [3] Jung-Hwan Kim, Sun-Kyu Kim, Sang-Hyuk Lee, Tae-Min Lee and Joonhong Lim,"Vehicle Black Box with 24GHz FMCW Radar",IEEE,2016.
- [4] N.Dheerthi ,G.Kiruthikamani,"Real Time Data Monitoring System with Intelligent Vehicle Tracking using ARM7",2015 Global Conference on Communication Technologies(GCCT 2015).
- [5] Kangsuk Chae, Daihoon Kim, Seohyun Jung, Jaeduck Choi, and Souhwan Jung,"Evidence Collecting System from Car Black Boxes",IEEE Communications Society subject matter experts for publication in the IEEE CCNC, 2010 .

[6] Dr. AntoBennet, M , Sankaranarayanan S, Ashokram S ,Dinesh Kumar T R,"Testing of Error Containment Capability in can Network", International Journal of Applied Engineering Research, Volume 9, Number 19 (2014) pp. 6045-6054.

[7]Dr. AntoBennet, M, Sankar Babu G, Natarajan S, "Reverse Room Techniques for Irreversible Data Hiding ", Journal of Chemical and Pharmaceutical Sciences 08(03): 469-475, September 2015.

[8] Dr. AntoBennet, M , Sankaranarayanan S, Sankar Babu G, " Performance & Analysis of Effective Iris Recognition System Using Independent Component Analysis ", Journal of Chemical and Pharmaceutical Sciences 08(03): 571-576, August 2015

[9] Dr. AntoBennet, M , Sankaranarayanan S, Sankar Babu G, " Performance & Analysis of Effective Iris Recognition System Using Independent Component Analysis", Journal of Chemical and Pharmaceutical Sciences 08(03): 571-576, August 2015.

[10] Dr. AntoBennet, M, Suresh R, Mohamed Sulaiman S, "Performance &analysis of automated removal of head movement artifacts in EEG using brain computer interface", Journal of Chemical and Pharmaceutical Research 07(08): 291-299, August 2015.

