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CAR BLACK BOX SYSTEM FOR ACCIDENTAL EVIDENCE COLLECTION

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Abstract -: *The proposed system is designed for a vehicle that monitors the status of the vehicle after the accident or crash. It can be placed in any type of vehicle. It is developed with less number of components. This system provides assistance to accident victims, and also helps insurance firms by providing accidental information to complete accident inquiry and improving transport value, and it helps to decrease the rate of death. The Car black box system has an accidental video loop recorder that records the video of a vehicle before and after the accident. The car black box system gives information about the accident and it collects real-time information related to the vehicle. Raspberry-Pi microcomputer is used to collect accidental information by interfacing sensors to Raspberry-pi and it sends this information to the authorized department. The information about an accident is also made available to the police department for investigation purpose i.e. how the accident happened exactly. The Car black box provides the scenario of an accident in image format to the control room server. The car black box has the additional feature of an accidental alert system by sending an alert message to the control room after an accident has occurred. The black box data can be used to observe the behavior of the accident easily. The car black box is advantageous over collecting evidence of the crash manually.*

Key Words: **Car black box, Evidence collection system, Video loop recorder, openCv3.4.0, etc.**

1. INTRODUCTION

Most black boxes associated with airplanes for accident investigation. The event data recorder in the black box plays a main role in the car accident investigation. Like in the airplane black box, the Black Box is used to store the data related to accidents. The Car black box stores driving information, video information, accident data, and location before and after the accidents. The car black box can be used to observe the accident easily and it helps in crash investigation, insurance claims settlements also help to improve, road design, vehicle design, and medical service, ambulance, and hospital service. The main function of a car black box is to send accident location data to the emergency and ambulance server in real-time with the use of GPRS/Wi-Fi GSM/ system. Therefore, this system provides a first-aid solution in accidental cases. This system is like vehicle CCTV technology which records video, image, location, date and time. The main purpose is to provide a practical and useful solution for driver safety. In this system, sensors and a camera are used for capturing the various conditions of the vehicle like accidents or crimes, etc. This work presents how effectively collection and management of information obtained from car black box in vehicular networks is carried out.

2. SYSTEM ARCHITECTURE

The car black box has a framework of two sides, first is a client-side system and the second is a server-side system. In the client-side system, we have integrated hardware which captures data from sensors and uploads to the webserver. To show this data we built a web application to fetch this data from a webserver. In this work, we have developed a website with all important information related accidents.

2.1 Proposed system

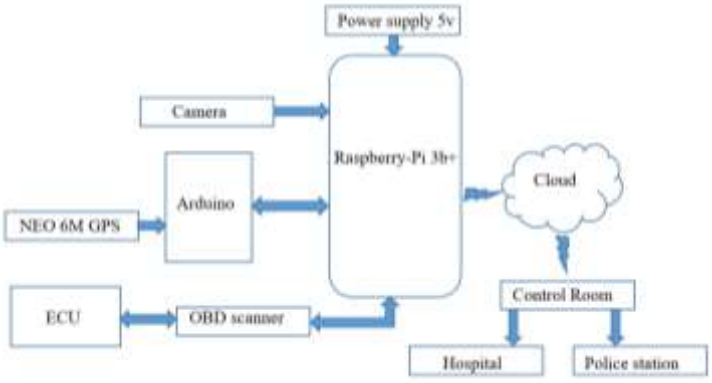


Fig -1: Proposed system block diagram.

This system is mainly designed to perform several tasks like to access, process, and store and also control the data in various electronics-based systems. We have used Raspberry-Pi as a microcomputer and interfacing with sensors with Raspberry-Pi. Raspberry-pi collects sensor output and stores it into the memory and sends it to the database via the internet. This information is further forwarded to the control room and the control room sends this information to emergency aid providing departments, police stations, and the insurance department.

On the client-side system, Camera gets turn on only when the engine starts and starts recording images and video to a raspberry pi. Then it goes on checking the collision, if a collision happens then it automatically stores images, accidental video, and vehicle information and generates an alert message for the control room through the Wi-Fi modem. When a collision does not happen this process is stopped. On the server-side system, Raspberry-Pi transmits vehicle information to the database. A webpage is designed to show vehicle status. There are two categories of

databases: one is for login- registration and another one is for vehicle status. Web page fetches data from the database and shows vehicle status on a webpage. The access of sensitive information is available only authorized departments who are already registered with the system.

2.2 Collision Detection

Collision detection is an important part of this system. An algorithm is written to detect collision. During the collision detection, the status of GPIO pin No 18 (physical pin no 12) on the raspberry pi board is recorded. A limit switch is interfaced to raspberry pi's one terminal connected to 3.3V, a GPIO pin; it will read HIGH when the circuit is closed. Then input status is marked as True and it executes code. When the limit switch is pressed a "pull-down" resistor connects the circuit to the ground so that it reads LOW (False) indicating the circuit is open. This is used as a collision signal. Similarly, four limit switches can be used to obtain the status of GPIO pin No 14, 15, 18, 23 which can be multiplied (ANDing) in python script. If anyone of four sensors is found to be pressed it generates a signal indicating a collision has occurred.

2.3 Loop Detector Algorithm

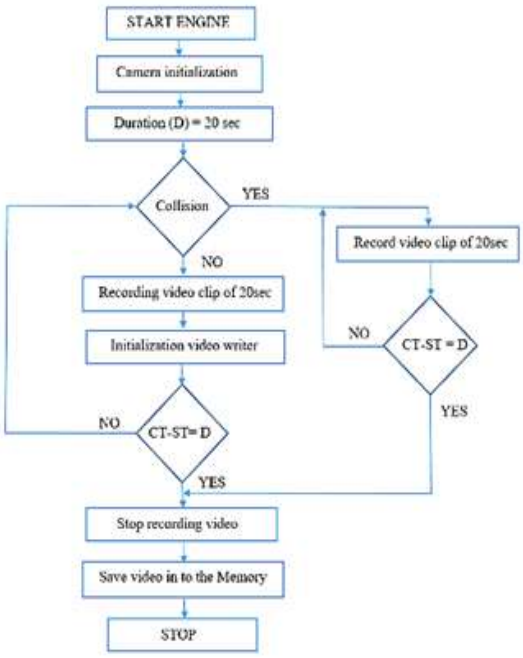


Fig -2: Loop Detector algorithm

To get an exact accidental video loop detector is developed. The loop detector algorithm is written using the python OpenCV 3.4.0 platform. When the engine is started, Raspberry-Pi becomes on and kernel runs the program. The camera turns on and starts recording video continuously. A video clip is stored for the specified duration in the script and this video clip is overwriting again and again till collision happened, this process is stopped after Collison.

3. HARDWARE TOOLS AND SETUP

In this system, the Raspberry-Pi microcontroller is used as the main controller and the sensor interfaced with raspberry-Pi. To minimize the processing load of Raspberry Pi, the Arduino UNO REV 3 Atmega328 controller is used and connected to a raspberry pi. The entire hardware housed in fiber enclosure for making this system more robust as shown in fig. 2.

Fig -3: Raspberry-Pi board connected to Arduino Rev 3 Board and enclosed in fiber material

Fig. 4 shows the OBD port in the car and OBD scanner. OBD scanner is used as a sensor that can communicate with Car ECU and collects real-time data from the car and send it to Raspberry-Pi.

Fig -4: OBD scanner connected to OBD port in the car

4. SOFTWARE TOOL

In software integration, the client-side system is developed in Python openCv3.4.0 platform and on the server-side script is written in PHP, HTML, CSS, and JavaScript. A webserver is developed for data integration by using apache webserver and MySQL query language is used for data storage.

5. USER INTERFACE

This proposed system is basically designed for emergency departments like hospitals, police department. A website is

developed such that it gives a better visual. The car black box consists of an authentication system, user login system and user registration system as shown in (fig. [5]).

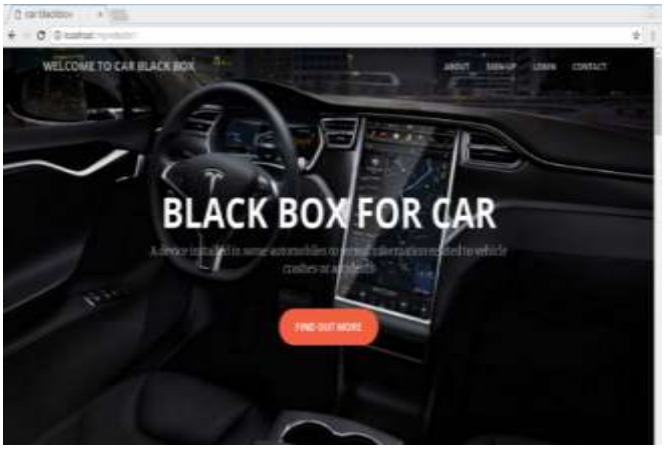


Fig -5: Home page of the project.

6. AUTHENTICATION SYSTEM

6.1 User Registration

fig. [6] is the webpage of the registration system having five fields as reference id, customer name, license number, password, and email id and a sign up (submit) button. When all credential is filled in and by clicking the signup button, all the information sent to the database for verification.

Fig -6: Registration System Webpage.

6.2. User Login System

The first if statement checks if the user is already logged in or not. If they are not logged in, they will be redirected to the login page (fig. [7]). Hence this page is accessible only to the registered users.

Fig -7: Login system webpage.

7. RESULTS AND DISCUSSION

This system provides accidental information like license id, vehicle no, driver mobile no, owner name, time, date, accidental video, accidental footage, location as shown in (fig. [8]). A registered and authorized user can see this information after an accident happens. This system also stores real-time parameters of car-like engine load, speed of car and RPM in the log file which is shown in (fig. [10]). After an accident, this system sends accidental data to the website with the live location. As the user clicks on location link, a new window opens which is google map GUI showed in (fig. [9]).

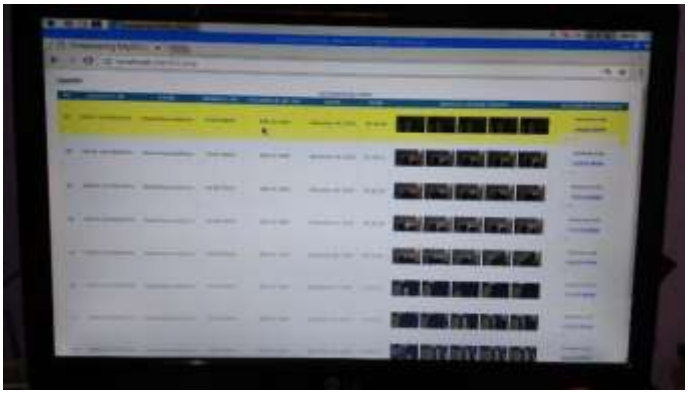


Fig -8: Accidental information on the webpage.

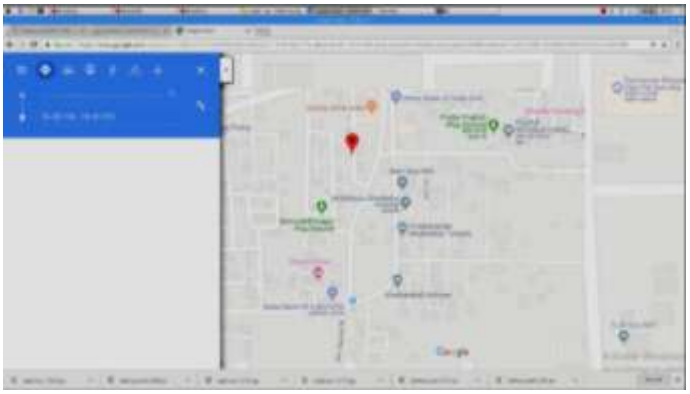
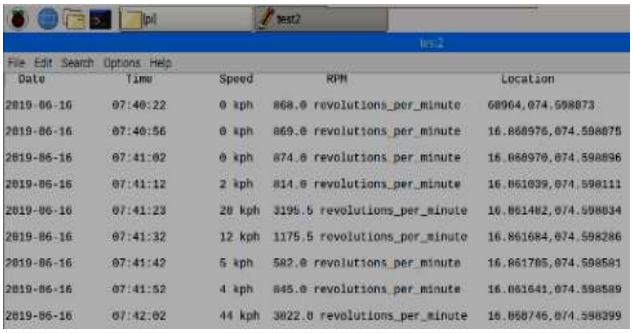


Fig -9: Accidental vehicle location track on google map.



File Edit Search Options Help

Date	Time	Speed	RPM	Location
2019-06-16	07:40:22	0 kph	868.0 revolutions_per_minute	68964,074.598873
2019-06-16	07:40:56	0 kph	869.0 revolutions_per_minute	16.868976,074.598875
2019-06-16	07:41:02	0 kph	874.0 revolutions_per_minute	16.868970,074.598896
2019-06-16	07:41:12	2 kph	814.0 revolutions_per_minute	16.861039,074.598111
2019-06-16	07:41:23	28 kph	3195.5 revolutions_per_minute	16.861482,074.598834
2019-06-16	07:41:32	12 kph	1175.5 revolutions_per_minute	16.861684,074.598286
2019-06-16	07:41:42	5 kph	582.0 revolutions_per_minute	16.861785,074.598581
2019-06-16	07:41:52	4 kph	845.0 revolutions_per_minute	16.861641,074.598589
2019-06-16	07:42:02	44 kph	3822.0 revolutions_per_minute	16.858746,074.598399

Fig -10: Store the real-time status of the vehicle in a log file.

8. CONCLUSION

In the proposed system, Car Black Box is designed, implemented and tested live in a car. The embedded system is successfully implemented which provided satisfactory results. The proposed Car Black Box is feasible and useful for public safety. It acts as an Evidence Collection System from Car Black Box with Raspberry-Pi microcomputer as the main controller and sensor and helps to find the location of the accidental vehicle. With this, necessary help and first aid can be made available to accident place and lives of victims can be saved. When the driver starts the car, all the sensors are activated, and the data is stored in memory card periodically and transmitted to the webserver. The data saved in the memory card can be retrieved after an accident with perfect support of the embedded system and IoT technology. The Accidental Evidence Collection System as Car Black Box will certainly be helpful to know the exact reason of the accident and to provide necessary help-aid to the place of accident.

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BIOGRAPHIES

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