Evidence Collection from Car Black Boxes using Vehicular Digital Video Recorder System

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Abstract— A vehicular digital video recorder system acts as the flight recorder of a vehicle which is used to record the behaviour of a running vehicle. This proposed system provides information related to scenario of accident occurred and collecting information on real time basis, from obstacle detection and video camera. This information is collected by Raspberry Pi processors using module and camera which are connected to the processor which is based on Linux operating system gives all the collected data information to the monitoring system. The monitoring system display the data in real time which help the police investigation to find out the scenario of accident occurred exactly after accident which displays the scenario of accident in image format on police station server window. This information is used to analyze the behaviour of accident easily and conflicts related to car accident such as investigation process and falsification of data collected from car black box is avoided and it gives high performance advantages of evidence collection from car black box.

Keywords— Camera, Embedded system, Black Box, Raspberry Pi processor, Linux, Video streaming, Server.

INTRODUCTION

The analysis of a car accident requires physical evidence, including clear evidence from the accident site such as a witness and a trace of the vehicles. In many cases, however, there is insufficient evidence in the place of accident, and it is difficult to accurately identify the accident cause and the victims or offenders. To solve these problems, objective and trusted accident data are required. Governments, institutions, and car manufacturers have been studying the vehicle black box and many such products have been released. As a result of these efforts, recently, black boxes or Digital Video Recorders (DVRs) for vehicle are being widely used to store accident circumstances or the overall circumstances of a driving process. Current black boxes, however, simply store and provide video and sound during a specific period before and after the accident using imaging devices. Therefore, it is impossible to check whether the stored data is authentic. When the possibility for the falsification of the stored data is proposed, it is difficult to prove that the data is trust or objective evidence. The possible security threats of black box are data forgery and data modification can be done easily.

The vehicle black box is a device similar to the black box device used in flight to record driving history details which is used for police investigation process to find out the scenario of accident occurred. The vehicle black box stores the video clips information which is very helpful for investigating process carried out by police. This paper shows the proposed scheme of video streaming through Vehicular Digital Video Recorder System(VDVR) in real time which helps to collect facts of scenario of accident occurred on real time basis.

PROPOSED SCHEME OF VIDEO STREAMING

To develop and enhance the security of vehicle black box data an efficient scheme is proposed which is online video streaming of data to prevent the falsification of black box data obtained and to obtain the scenario of accident without any modification. The proposed approach is useful using a commercial black box. The proposed scheme is suitable for vehicle black box system to enhance the security of saved data. Hence a research agenda is proposed which enhances current models explaining outcomes by a conceptualization and emergent states. The principle of operation of online video streaming simulation mode is described in Fig.1

The cameras are integrated in traditional Black Boxes which continuously record video in front side and back side of the vehicle. Therefore the camera in this case helps to collect data as a evidence when accident is occurred. The system which is embedded in Black Box is Raspberry Pie which is implemented using the Linux Operating System. This operating system supports the USB connection interface with camera and other required devices which make interfacing easy.
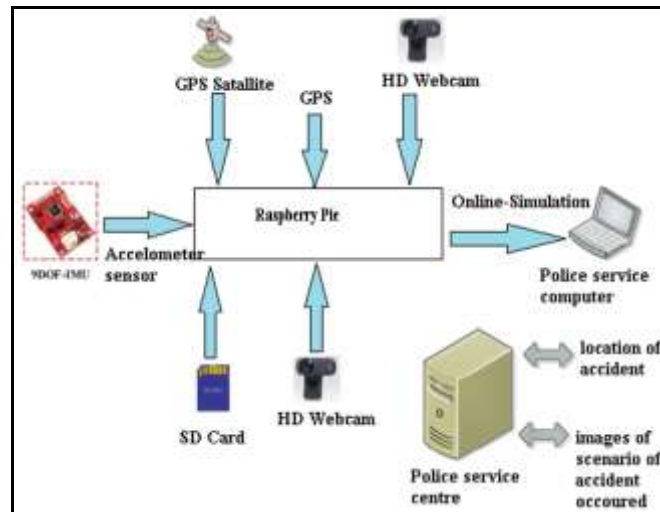

Fig.1. Online simulation of data carried out in black box

This is one of the major advantage of these operating system because of which the USB ports can be plug with many cameras. These camera helps to record the video in real-time and to capture the images of car such as of front side, back side almost around all side of car the images can be captured . In online simulation mode i.e. in real-time, webcams are used for video recording process. The principle of application of this operating mode shows the whole scenario happening in inside and outside the car with the help of webcams which are being used in real-time. The collected data is in real-time i.e. in online simulation mode is used to identify the scenario of accident exactly what happened around the car environment which helps the police department to get the information related to car accident which has occurred. We get all the information of the vehicle environment in real-time, therefore these mode is very important to analysis the behaviour of vehicle and modification in data is not possible in these process. Hence the proposed method of real-time online simulation mode avoid the modification of data process and helps out as a proper method for evidence collection.

EXPERIMENTAL RESULTS OF VIDEO SREAMING

The proposed video streaming process scheme described above was implemented using commercial black box system. The implementation of the proposed scheme on Raspberry Pi is shown in Fig. 2.

Fig.2. Implementation of device with Raspberry Pie

For the functional test, the accelometer is moved to get a specific impact to the device which gives the information to the operating device that the accident has occurred. Immediately after the accident is detected the latitude and longitude i.e. the location of car is send on the respected police server monitoring device with the help of GPS(Global Processing System) which gives the exact location of car where it is located. Secondly, after the location is send on server window images of the scenario of accident occurred which are taken with the help of camera which are placed inside vehicle are send on respected server window as shown is Fig.3.
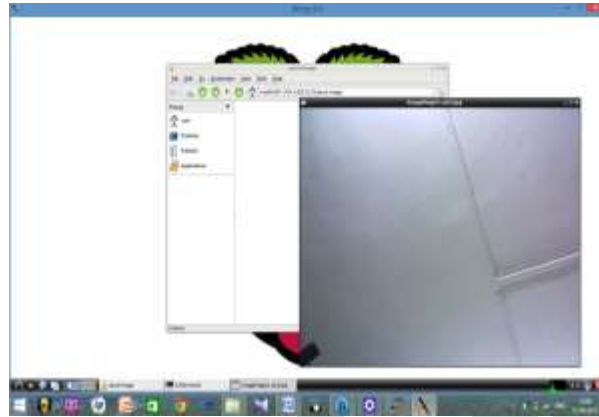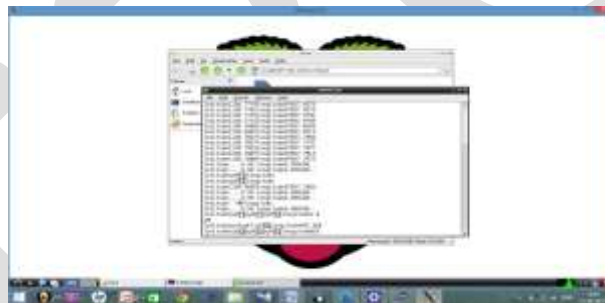

Fig.3.Image displayed on server window

Fig.4. Latitude and Longitute postion displayed on server window
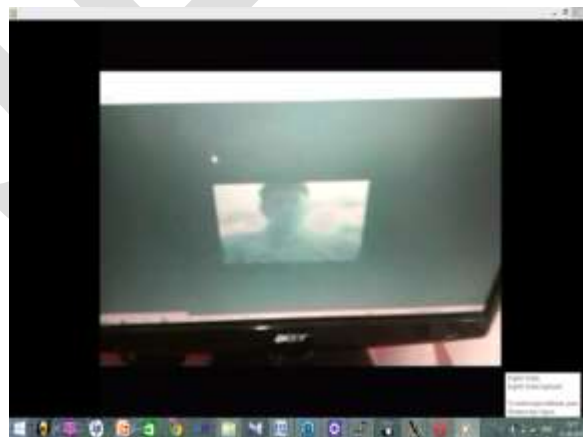

Fig.5. Video streaming displayed on server window

The images received on server window are very important fact which are obtained because it gives the information of exact scenario of accident occurred. These fact of information is very important for further investigation process. Moreover it also gives the online

simulation data i.e. it also provide the video in online mode i.e. in real time. These process of video streaming of data which we get on server window is important evidence factor for investigation process , as it gives the information of accident which has occurred in real time. In real time operation mode the fact of accident data that we get are true facts. The possibility of modification of data is avoided in these case. Whereas the evidence which are obtained helps to carry out the further investigation process very rapidly. The monitoring system successfully check and   work on these process. At some part the availability of network is not available in such cases the data is stored in black box itself i.e. the data is stored in black box which could be seen at any time. Therefore, in the aspect of collection of data in real time and processing it in real time in order to get true fact of evidence, the proposed scheme can be used as an alternative method for the integrity in the black box system .

CONCLUSION

An efficient scheme of evidence collection of data from car black box and the scenario of accident occurred is being proposed in these paper. Which prevents data modification and data forgery of black box system and low-cost effective device is developed. The secure structure of memory for the black box and a proposed secure data streaming process is designed in order to avoid data modification in system and to collect data as evidence. In addition, an efficient verification scheme for secure black box system is described. In summary, the video streaming functionality strongly indicate that the proposed scheme is suitable for black box system, which urge for data integrity and data modification and falsification of data from system is avoided.

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