

A Design of the Intelligent Black Box using Mining Algorithm

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Abstract

The black box has the function that stores driving video, location, time and rear-end collision before/after the accident with mounted on the vehicle. And, in case of car accident, it has GPS function to find the location of accidents. In this paper, the system was designed that traces the moving path of the vehicle and transmits current location of vehicle and the videos of accident happened during movement to the remote control system. As the results of study, it was recognized that the mining system for automotive black box is useful for presenting the driver and administrator with the required traffic status, optimum path and accident situation by accumulating the movement information of vehicle transmitted from the vehicle.

Keywords : *Vehicle, Black Box, Camera, Mining System, Embedded System.*

1. Introduction

Today, most people have and are running the cars as nearly every home possess at least more than one car. Small and big car accidents occur a lot along such increase of car. In case of accident, the videos of black box are often used as the field evidence of accident as it records the moment of accident with videos. For such reason, the black box is mounted on the numerous cars currently. Looking into the developing trend of automotive black box, it played the role of the operation recorder (operation recording, accident recording & fuel efficiency recording, etc.) related with simple operation of the car at beginning stage. Today, as the embedded system technology and camera technology develop, the current black box that is capable of recording the video is made by combining the black box that played the role of the operation recorder at its beginning with the technologies of embedded system and digital CMOS camera. Now that black box of today is capable of recording the video, it gets to have the function that stores the location of accident and condition of the car in case of rear-end collision by adding the video information of head-on collision and GPS in case of accident. In this paper, it adds the functions that store the current location information, speed and moving path of car using the mounted GPS and transmits data and videos of collected information to remote control system by mounting WCDMA modem additionally and using WCDMA modem to such original function of black box. And, in case of transmitting data to distant place, it realizes the algorithm that can transmit data efficiently to reduce the traffic jam due to data transmission by judging whether to go straight ahead or make change according to current driving direction and location not transmitting data by periodic cycle and designs the intelligent black box mining system that enables the transmitted data and videos to be stored in mining system server at distant place. The black box mining system is the one that enables the efficient operation of the car by collecting the information of car and providing the driver with the information of driving path of driver, driving habit of car and the information of mainly-driving road using the transmitted data and videos of car through communication module and analyzing which day of the week and what time moving path of driver is jammed up most on the moving path of driver in case of operating the car [1, 2]. In

this paper, such intelligent automotive black box mining system was designed. For this, the hardware structure and software of black box mining system was designed and its performance was analyzed.

2. System Configuration of Automotive Black Box Mining System

Figure 1 shows the network configuration against entire operation of black box mining system.

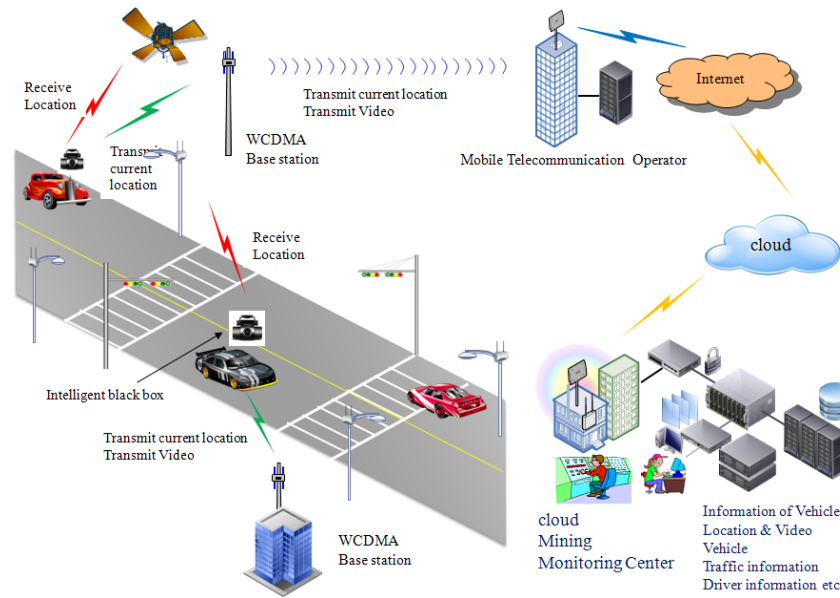


Figure 1. Network Configuration of Black Box Mining System

Black box mining system collects the moving path of car, speed of car and information of current road if the car starts the movement with mounted on the car. It is composed to transmit data to the control system at distant place using the collected data through WCDMA transmission module and is the system that produces and provides with the car information, analysis of moving path, whether it is jammed up on moving path of car or not and the information which is helpful for the driver using such collected information [3, 4]. Looking into hardware system configuration of black box mining system, it is composed of the black box module that collects and stores the video of front direction, GPS-receiving module that enables the current location of car to be known and mobile telecommunication module that transmits current location of car, moving path, traffic jam & information of car. Figure 2 shows hardware system configuration of automotive black box mining system.

Main processor used in black box mining system is ARM926J and supports the video compression and voice compression. The video compression technology used in this paper supports MPEG4 standard format and applies AAC voice compression technology, and the system is designed to enable video compression technology to proceed up to 30 frames per second at maximum 640x480(320x240). And, it supports real-time video recording technology and JPEG video capture technology and the current road status is configured at transmission module using storing and capture technologies based on this technology. The hardware system is configured to control the system efficiently as the transmission module is

not mounted on internal hardware of black box mining system and processed through external interface [5].

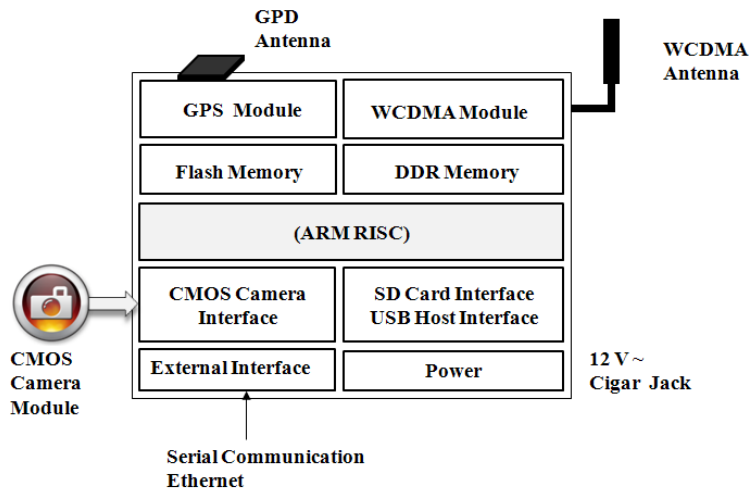


Figure 2. Block Diagram of Black Box Mining System Hardware

3. Algorithm of Black Box Mining System

Figure 3 shows the system configuration of black box mining terminal system.

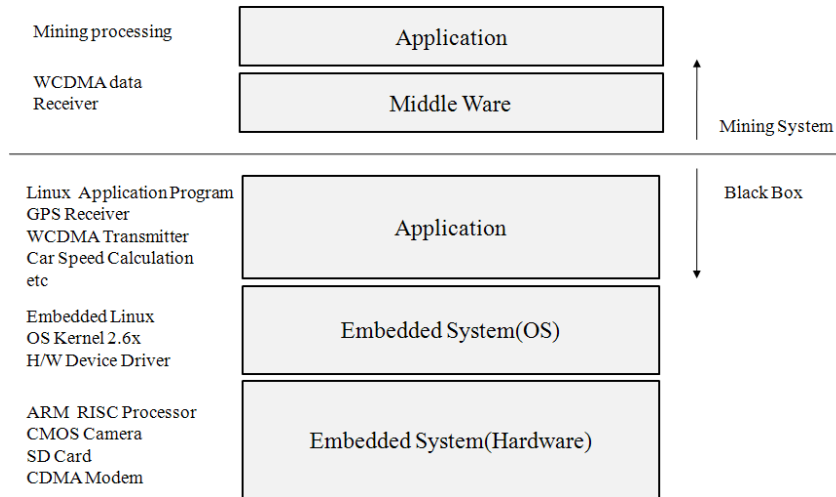


Figure 3. System Configuration of Black Box Mining System

Existing vehicle positing system provides with the service against public service vehicle based on the technology that simply checks current location of car or moving trace. But, the development of new service that can provide the driver with more useful and efficient information by applying existing study results of moving object and space-time data is required. In this paper, the development of black box mining system that provides the driver with useful information by presenting the driver with the smart movement information of vehicle and road information along moving time on daily-moving road was proposed. The

black box mining system proposed in this paper can be divided into two in large. They can be divided into black box mining terminal system and mining control system composed at the control center. The composition of black box terminal mounted on the vehicle composed its hardware based on embedded system and designed its software using embedded Linux. In case of transmitting the videos of road and location information of car using the network periodically, traffic jam occurs a lot. So, the program is composed to trace the current location of car by implementing the algorithm against the location of car along moving pattern using driving pattern of driver, moving pattern of car, current location of car and driving speed in order to reduce the load of the network due to such data transmission and estimate current location and speed of car by calculating moving speed of car and realize the transmission algorithm to have least cycle in case pattern of car changes and the event happens to car [6, 7, 8].

It enables the control system to store all moving trace of the past as well as current location of car and process space-time interrogation based on various locations, and the system is configured to find the meaningful moving pattern from the past moving traces of car and provide the efficient operation information through that and the control system is composed to use the mining control system using WCDMA module mounted on the terminal.

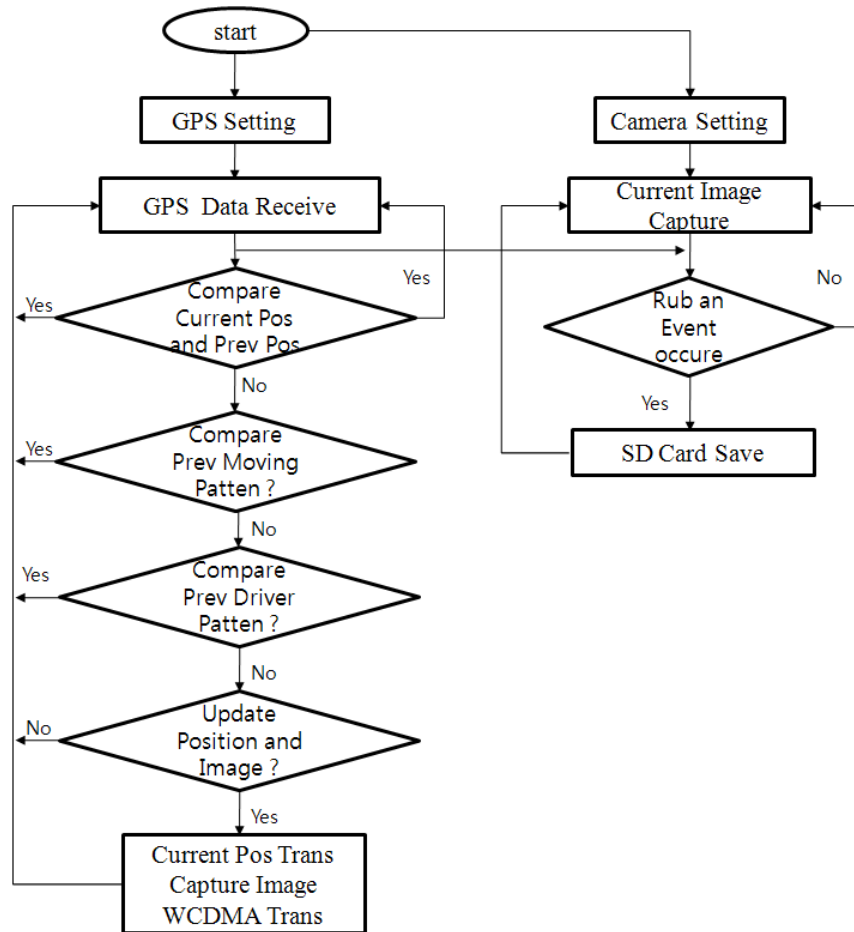


Figure 4. Basic Configuration of Software Algorithm

4. Conclusion

In this paper, black box mining system terminal and mining control system were designed to collect the location information and video information into automotive black box. It enables the traffic of the network to be minimized by minimizing the transmission of data using GPS of black box mining system terminal and moving path of driver & moving pattern transmitted from location information of car and control system. And, in mining control system at distant place, the system that is helpful for the operation of car was designed by recognizing the moving pattern of car using the transmitted information from the car and providing the car driver with the various information through development of algorithm that analyzes data mining method for controlling car.

Table 1 is the summary of functions and features of automotive black box designed by this paper.

Table 1. Function and Feature of Black Box Mining System Designed

<i>Function</i>	<i>Existing system</i>	<i>Proposed system</i>	<i>Function & Feature</i>
Function of detecting collision	Yes	Yes	Function of detecting external shock to car
Audio/video encoding	Yes	Yes	Function of encoding video & audio signal
Function of saving data	Yes	Yes	Encoding & storing information data of car
GPS function	Yes	Yes	Function of receiving current location information of car
Communication function	No	Yes	Function of transmitting car information to distant place using WCDMA modem
Function of transmitting video	No	Yes	Function of transmitting video of current load status to control center at distant place
Function of analyzing location information	No	Yes	Function of minimizing the load of network by analyzing current moving path of car and minimizing the transmission of data to distant place using moving path & pattern of car collected from mining system at distant place

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