WO 2006/052080 A1

Title: ACCIDENT DATA RECORDING SYSTEM IN VEHICLE

Abstract: The invention is about video recording system for vehicle that is linked to speedometer of the car. Video signal from video camera installed in the car is mixed with character video signal corresponding to the speed of the car, and is written/updated into temporary memory (RAM) in real-time manner.

When the car stops, the video file that has been written in the said temporary memory is dumped into main memory that has memory size of several files. In case an accident happens in the middle of driving, the car normally stops. Therefore, the video file recorded by the system of the invention contains the pictures of the pre-accident process that leaded to the accident. If user input preserve request to the system, the file that has been dumped just before the request is input is preserved. That is, the file to be preserved is not erased through successive dumping process. If user input request record to the system, the file that has been written in the said temporary memory is promptly dumped into the said main memory regardless of speed of the car and is preserved. Hereby, the recording system of the invention has the following advantageous points. (1) It records video of pre-accident driving process. Moreover, the picture of the recorded video shows the speed of the car.

Those will make it possible to judge clearly which side is more responsible for the accident. (2) It costs low, because it uses no other sensors but speedometer of the car and records only a few files of pre-determined duration into memory device having small memory size. (3) It can be easily installed in a car, because it uses no other sensors but speedometer of the car.
Description

VIDEO RECORDING SYSTEM IN VEHICLE

Technical Field
In case a car accident happens in the middle of driving, evidence material showing pre-accident process of driving that leaded to the accident would help to judge who is more responsible for the accident. The invention is about the video recording system that can record pictures of the pre-accident process of driving.

Background Art
There already exist several types of recording system in vehicle. Followings are some types of them and disadvantages of each type.

(1) In first type of those, photographing apparatus is linked to a sensor/sensors (e.g., impact sensor) that would detect some unusual driving situation, and when unusualness is detected by the sensor, taking photograph is carried out by the apparatus. The most disadvantageous point of this is that it cannot record the pre-accident process of driving that leaded to the accident and so cannot obtain clear evidence for judging which side is more responsible for the accident.

(2) In second type, video data is continuously recorded on large size recording media such as magnetic tape or HDD, regardless of happening of accident. Disadvantage of this system is that mechanical elements in the recording devices are unstable in driving environment and that the recording system costs high.

(3) In third type known as black box for vehicle, the system monitors various driving data such as speed of the car, braking operation, wheel steering, etc. through various sensors, and records sampled data of those. Disadvantage of this system is that it is extremely hard to install the system in a car and that the system costs high.

Disclosure of Invention

Technical Problem
The purpose of the invention is to overcome the disadvantages of the existing systems mentioned above. That is, goals of the recording system of the invention to be achieved are the following advantageous points.

(1) When an accident happens in the middle of driving, the recording system of the invention should record the video of pre-accident driving process for predetermined duration.

(2) The recording system of the invention should use low cost recording apparatus that has relatively small memory size.

(3) It should be easy to install the system in a car. That is, the system of the invention should have no additional sensor.
Technical Solution

[10] In the invention, the recording system is linked to the speedometer of the car. Video data from video camera installed in vehicle is written and updated into a temporary memory (RAM) in real-time manner so that the latest video of predetermined duration (T) is maintained in the said temporary memory at all times. And the data in the said temporary memory is dumped into a main memory when speed data from the said speedometer drops to zero or when user (driver) requests to record. Hereby, just after the vehicle stops or user requests to record, the latest video of predetermined duration (T) is recorded into the said main memory.

[11] If an accident happens in the middle of driving, the driver normally stops the car. Or the car would be stopped through a big accident. Because the recording system of the invention records automatically the latest video into the said main memory just after every stops of the car, the video data that has been photographed for duration T just before the stop is recorded in the said main memory. So the system of the invention can acquire the evidence material that shows the pre-accident driving process that leaded to the accident. And, if user wants to record what he has seen in the middle of driving, the system of the invention records the video data that has been photographed for duration T just before user requests to record.

Advantageous Effects

[12] Hereby the recording system of the invention has following advantageous effects.

[13] (1) When the car stops after an accident, the recording system of the invention records automatically the video of pre-accident driving process, and so it can acquire the evidence material for judging which side is more responsible for the accident.

[14] (2) The system of the invention does not need large size memory device such as magnetic tape or HDD, because it records video of only predetermined duration (T). The said predetermined duration (T) would be several tens of seconds, and that would be enough for evidence material for the accident. So memory device (with no mechanical parts) such as FLASH memory can be used as the main memory, and hereby the system costs low.

[15] (3) Because the system of the invention is linked only to the speedometer of the car and does not need various sensors, it costs low and can be easily installed in a car.

[16] (4) Because the system of the invention is linked to speedometer of the car, the speed of the car can be easily recorded.

Brief Description of the Drawings

[17] Fig. 1 is a block diagram of a simple mode for invention.

[18] Fig. 2 is a conceptual drawing that represents relationship between the temporary memory and the main memory of Fig. 1.
Fig. 3 is a timing chart for an example of driving process of the car for the sake of explanation of operation of Fig. 1.

Fig. 4 is an example of flow chart for the controller of Fig 1.

Fig. 5 is a block diagram of another mode for invention.

Fig. 6 is a timing chart for an example of driving process of the car for the sake of explanation of operation of Fig. 5.

Fig. 7 is an example of flow chart for the controller of Fig 5.

**Mode for the Invention**

The simple mode for the invention is depicted in Fig. 1. The whole system comprises video camera(1) installed in the car, recording system(2) that records the video data from said video camera(1), and the speedometer(3) of the car.

Said recording system(2) comprises signal processor(24) that transforms the video signal from said video camera(1) into digital data and compresses the data, temporary memory(22), main memory(23), and controller(21) that controls the whole system.

The said temporary memory(22) is a memory device like RAM. In the following description, the said temporary memory(22) is assumed as a memory device that has shift register structure, for the sake of brief description. But, in reality, it is just a RAM of field memory. The memory size of the said temporary memory(22) determines the duration(T) of one video file.

The said main memory(23) is a non-volatile memory device like FLASH memory in that data can be written and erased electrically, and has a memory capacity of several video files.

In Fig. 2, video data (Buffered Video Data, bvd) in temporary memory(22) consisted of n frames makes one video file of duration T, and the main memory(23) is assumed to have memory capacity of 5 files as an example. As the current video data (cvd) is written into the first address of the temporary memory(22), the video data occupying all the addresses of the memory(22) are shifted right and the data of the oldest frame is erased. Hereby, video file written in the said temporary memory(22) is updated to the latest video of duration T at all times. The update operation is carried out by the said controller(21) in real-time manner.

When the speed data (sd) from the said speedometer(3) changes to zero, the controller(21) dumps the video file that had been written in the temporary memory(22) into the main memory(23). For the "dump" operation, the controller(21) makes space for the new video file through erasing the oldest file of those occupying the main memory.

Following is an explanation of the operation of the recording system of Fig. 1, using an example depicted in Fig. 3. In Fig. 3, it is assumed that the car is stopped 7 times at
the moments of t1, t2, ... t7. At every moments (t1, t2, ...t7) when the speed changes to zero, "dump" operation is carried out. And in every dump operation, number of file is increased by one. But after f5 is dumped, the number of file is reset to one, because it is assumed in the description that the main memory(23) has the memory capacity of 5 files. Hereby, the number of files that are dumped at the moments t6 and t7 are f1 and f2, and the files that had been dumped at the moments of t1 and t2 are erased.

One example of flow chart of program for the controller(21) for proper operation mentioned above is shown in Fig. 4. For preparations of the first file dump, file number(fn) is set to one at the beginning of the program (s1). After s1, the controller(21) waits for moving of the car (s2). In s2, speed data(sd) is compared to a reference speed (rs) that is a predetermined value near zero. By using judgement, "sd> rs ?", an error that may happen in case of minute movement of the car is prevented. If the car starts to move, the controller waits for stop of the car (s3). When sd becomes zero, file is dumped (s4). After s4, the controller(21) waits for another moving of the car (s5). When the movement of the car is perceived, file number is increased by one (s6) for preparations of next file dump. After that, routine s3 - s6 are repeated.

Routine for real-time update of video into the temporary memory(22) is not shown in Fig. 4. For the operation can be processed through an interrupt routine. For example, vertical sync. signal of the video signal can be used as an interrupt signal. That is, every time vertical sync. signal is input to the controller(21), interrupt routine for writing video data of one frame into the temporary memory(22) is carried out.

Another mode for the invention is depicted in Fig. 5. In the mode of Fig. 5, input means(4) through which user can request several operations to the recording system and display means(5) that displays currently photographed video or recorded video file are added to the mode of Fig. 1. In the recording system(2) of Fig. 5., register(25) in that numbers of files(pfn) that should be preserved are written, clock(26) that generates current time data(td), character generator(27) that produces character video signal(cvs) for speed and time, mixer(28) that produces mixed video signal(mvs) from cvs and video signal from the said video camera(1), and data processor(29) that produces proper video signal for display(4) from recorded video data(rvd) are added to the said recording system(2) of Fig. 1.

In Fig. 5, elements 26, 27, and 28 are added in order to display current speed and time within the picture of recorded video. That will help more clear judgement in case of an accident.

In the mode of Fig. 5, there are two major requests that user may do to the system through the said input means(4). One is preserve request for preserving some important video files written in the said main memory(23), and the other is record request for recording the video regardless of the speed of the car.
In an example depicted in Fig. 6, it is assumed that speed of the car has changed to zero at 11 moments of t1, t2, ..., t11, preserve request is input at the moments of t12, and record request is input at the moments of t13. Because the number of file that is dumped at the moment t2 is f2 and the moment t12 at which preserve request is input is between t2 and t3, the controller(21) writes the number 2 that is the number of file to be preserved into the said register(25). When the controller(21) sets the address of main memory(23) for the next dump, it refers the number written in the register(25) in order not to erase the file to be preserved. As the result, in the data dump process at the moment t7, file f3 (not f2) is erased and new video file is dumped at the location of f3. In this manner, file to be preserved is remain unerased through successive dumping process. Because record request is input at the moment t13, the file in the temporary memory(22) is promptly dumped at the location of f4, and the number 4 is written in the register(25) so that the file f4 should be preserved. For the video file dumped through record request by user must be important data. As the result, in the successive dump after t13, files f2 and f4 are preserved, in the example of Fig. 6.

One example of flow chart of program of the said controller(21) for second mode for invention is shown in Fig. 7. In the first place, the controller(21) checks if there exists space in the main memory(23) into which new file will be dumped, by checking the register(25) (s7, s8). If all the files are to be preserved, that is, if there is no space in the main memory(23), the controller(21) informs to user that there is no memory space (s9) and the program is terminated for brief description. But in reality, in that case, the controller(21) may request user some proper action such as memory change or release of preserving. If there is memory space, the controller(21) sets file number for next dump (s10), taking into account of the latest file number and the preserved file number. After that, the controller(21) waits for speed change to zero(s11) and input of record request(s13). If speed changes to zero, zero speed dump routine(s12) is carried, and if record request is input, record request dump routine(s14) is carried.

In the zero speed dump routine(s12), two operations are carried out. One is data dump, and the other is writing the current file number into internal register. Writing the current file number is for preparations for input of preserve request and for next file number setting. After those operations, the zero speed dump routine(s12) would be terminated by speed change to some value above reference speed. Although routine for treating preserve request is not shown in Fig. 7, the operation can be processed through another interrupt routine. In preserve request interrupt routine, the current file number is written into the register(25). In the record request dump routine (s14), three operations, data dump, writing current file number into the register(25), and writing current file number into internal register, are carried out.
Claims

[1] Video recording system for vehicle, comprising video camera(1) installed in vehicle, recording system(2) that records the video from the said video camera(1), and speedometer(3) that measures the speed of the vehicle, and the said recording system(2) comprises controller(21) that controls the whole system, temporary memory(22) that has memory size for a video file of pre-determined duration(T), main memory(23) that is non-volatile and has memory size for several video files, and signal processor(24) that processes the video signal from the said video camera, and the said controller(21)
- writes/updates the current video data from the said signal processor(24) into the said temporary memory(22) in real-time manner, and
- dumps video file that had been written in the said temporary memory(22) into the said main memory(23) when speed data from the said speedometer(3) changes from some value above predetermined reference speed to zero.

[2] In the claim 1, the video recording system comprises input means(4) through which user can input preserve request and record request to the system. That is, - when a preserve request is input the said controller(21) memorizes the number of file that has been dumped just before the request is input, and in the successive dumping process, the said controller(21) refers the number of file to be preserved so as not to erase the file that should be preserved, and
- if a record request is input, the said controller(21) promptly dumps the file in the said temporary memory(22) into the main memory(23) regardless of speed of the car and memorizes the file number so as not to erase the file that had been dumped through record request.

[3] In the claim 1, the video recording system produces character video signal corresponding to the speed of the car and adds the character video signal to video signal from the said video camera(1) so that the speed of the car is displayed in the picture of the recorded video file.
**INTERNATIONAL SEARCH REPORT**

A. **CLASSIFICATION OF SUBJECT MATTER**

**H04N 5/76(2006.01)i**

According to International Patent Classification (IPC) or to both national classification and IPC

B. **FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

H04N 5/76

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean Patents and applications for inventions since 1975

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

USPAT

C. **DOCUMENTS CONSIDERED TO BE RELEVANT**

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☐ Further documents are listed in the continuation of Box C.  ☒ See patent family annex.

Date of the actual completion of the international search

10 MARCH 2006 (10.03.2006)

Date of mailing of the international search report

13 MARCH 2006 (13.03.2006)

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