

MOBILE VIDEO AND IMAGING SYSTEM

Description of the Drawing Sheets

Figure 1 is a functional block diagram of a video system according to one embodiment of the present invention.

Figure 2 includes various views of a console of the system of Figure 1.

Description

With reference to the figures, a video system is herein described, shown, and otherwise disclosed in accordance with embodiments of the present invention. More specifically, the present invention provides a portable vehicle-mounted video system that is capable of recording, storing, and replaying video images, wherein the video system includes at least one connector for connecting to an external camera and a display monitor, with both being integrated into a console housing. The video system may also allow for capturing audio signals and other desirable information, including, for example, data captured by external components and communicated to the system.

Referring to FIG. 1, an embodiment of the video system is shown broadly comprising various components mounted in or on the console housing, including a video display or monitor, an internal camera, an electronics module, a memory, an internal microphone, a speaker, a plurality of input buttons, one or more LED indicators, input connectors, and output connectors. The system also preferably includes one or more external cameras in communication with the electronics module via a specialized or general purpose connector. One or more additional external components (not

illustrated) may be connected to the console housing via the input connectors such as, for example, a GPS antenna or a speed detector.

The internal camera may be positioned on the console such that it is either forward facing or rear facing. The internal camera may be mounted at an angle, such as approximately between 10 degrees and 90 degrees to the left or to the right, so that the camera is able to properly view an area directly behind or in front of the console even when the console is angled towards the user during normal use, such as where the console is mounted on a vehicle windshield or motorcycle handlebar and angled toward the user. One appropriate camera for use as the internal camera is a 510x492 black and white CMOS sensor with TV resolution, 0.01 Lux sensitivity, and a 140 degree 4-element coated glass lens.

The external camera is mounted outside of the console housing in a separate enclosure. One appropriate camera for use as the external camera is a color CCD sensor NTSC with 768x484 pixels and 470 lines of resolution, a 10x optical zoom and auto focus capabilities, a wide viewing angle that is from 50.7 to 5.4 degrees, and standard and low light modes. The monitor may be operable to automatically turn off when the vehicle begins to move or when the vehicle's transmission is shifted into reverse or drive, so that the driver is not distracted while the vehicle is in motion. One appropriate monitor for use as the video monitor 40 is a 3.5 inch diagonal, 640x480 TFT LCD monitor. While a single external camera is illustrated in the attached drawing, the invention is not so limited. Multiple external cameras may be used without departing from the scope of the invention.

The electronics module includes a number of electronic components, including components for receiving video signals from the video camera and for transmitting video signals to the monitor. The electronics module also includes components operable to receive and execute instructions stored in internal memory. In one embodiment, for example, these instructions include menu instructions for setting operational modes and resolutions. These instructions may be updated by loading instructions into a memory card and then inserting that card into a port in the system.

The input and output connectors are connected to the module for receiving electronic signals thereto and transmitting electronic signals therefrom. The input connectors may include, for example, connectors for the external camera, power input, an external microphone, and for accessories. The input connectors may also include one or more connectors for receiving signals to trigger operation of the system. These triggers may include, for example, turning on a law enforcement vehicle's siren and/or signal lights. The input connectors may also include a port, such as a USB 2.0 or 3.0 port, to allow for directly accessing the memory using a laptop or other computer. The output connectors may include, for example, an audio/visual connector for transmitting audio/visual signals to an external monitor or recording device. Additionally or alternatively, any one or more of these physical connectors may be replaced with wireless communication technology allowing the system to wirelessly receive or transmit any of the aforementioned input or outputs.

The module may also include components for receiving audio signals from audio sources, such as the internal microphone, and for transmitting audio signals to the speaker. The module may also include components for receiving wireless signals from

one or more remote microphones, such as a wireless microphone worn by a user. In this case, the module may include an integrated 900 MHz (or another suitable frequency allowed by law), spread spectrum, dual receiver capable remote microphone system with a nominal range of up to approximately 1000 feet or greater (a range of several miles may be achieved under the proper conditions). Control signals may be also be communicated from a remote microphone to the electronics module, such as a signal to begin video recording.

The memory is in communication with the module for receiving and storing the video, audio, and other data. One appropriate form of electronic memory for use as the memory is a CF card form factor removable memory module, and one appropriate format for storing the data is MPEG 4 format. Other appropriate forms of electronic memory for use as the memory include micro hard drives, laptop-type hard drives, and flash memory cards. As will be understood by those in the field, the amount of data storable in the memory is dependent, at least in part, on the resolution utilized by the electronics module. It is contemplated, however, that the memory may store approximately one hour of data per gigabyte of memory per simultaneous camera for high resolution, approximately two hours of data per gigabyte of memory per simultaneous camera for medium resolution, and approximately four hours of data per gigabyte of memory per simultaneous camera for low resolution.

The input buttons are mounted on the console housing and allow for controlling various components and functions of the system. In one embodiment, the buttons may include and operate as follows. A record button may trigger recording in one of several recording modes, such as various night and day recording modes. Day and night

recording modes may be set automatically using information from an on-board real-time clock or from a light sensor or from the camera. One or more visual indicators, such as LEDs, on the front and/or the back of the unit may be activated when the system is recording. A flag button may place a bookmark in the video to mark the location of significant events in a video sequence. A series of arrow buttons scroll through settings such as Video Monitor and Control illumination/indicators ON, Video Monitor OFF, Control illumination/indicators ON, and Video Monitor and Control illumination OFF. A menu button toggles the menu display on the monitor and turns the monitor ON if the display is OFF. A play button toggles between play and pause in video playback mode.

An exemplary console is illustrated in Figure 2. The console is relatively small and lightweight. By way of example, the console is preferably between five inches and ten inches wide, between three inches and five inches tall, and between one-half inch and two inches thick. The console is preferably weatherproof, including waterproof, such that it may be used in situations where it is exposed to moisture and other elements. The system may include one or more mounting elements for mounting the console on a vehicle. Such mounting elements may be configured to mount the console on a vehicle windshield, on a motorcycle or ATV handlebar, on a boat or on another vehicle component.

Power is supplied to the components of the video system 10 from the vehicle. The power provided is heavily filtered and regulated to avoid interference. The video system, using the particular components described herein, may require 4 amps from a 10 V to 13.8 V DC power supply. The video system includes a cable that is configured to plug into the power input connector of the console housing and into a standard

vehicle power jack, such as a “cigarette lighter” type power jack. It should be noted that the illustrated embodiment of the invention does not include an internal power source. While some embodiments of the system may include an internal power source, such as a battery, omitting the internal power source and relying exclusively on an external power source allows the console to be constructed according to a smaller and lighter design.

Additionally, the system may be provided with a “stealth” mode in which the camera and the microphone are active and recording, but the lights and indicators, such as the one or more LEDs, are turned off, thereby making the system appear to be dormant. Furthermore, the system may provide “pre-event” recording in which the system 10 records constantly in a loop of a selected duration of time, such as thirty seconds or sixty seconds, so that when an event triggers recording, the events occurring shortly prior to the initiation of recording are also recorded and stored.

Various embodiments of the system include any one or more of the following features: required entry of a password or code prior to accessing and changing operational settings; required use of a key to remove any removable memory components; incorporation of electronic watermarks into the recorded video images to prevent tampering or alteration; wireless downloading of the contents of the memory to a laptop or other computer; streaming the live video from the camera and possibly other inputs and/or outputs, via a high-speed wireless data network; encoding of multiple video streams from four or more cameras simultaneously; a remote control device for allowing a user to remotely control the operation of the system; a temperature sensor and temperature indicator operable to detect and warn the user if the system is at risk of

malfunction or damage due to an ambient temperature that is too high or too low for proper operation, such as may easily occur in a vehicle on a very hot or very cold day. The console housing, and possibly the housings of other components of the system, may be vented to dissipate heat, and may include other passive or active features to moderate temperature, especially in relatively extreme environments.

Although various exemplary data formats and data transfer protocols are identified above, it is contemplated that any suitable format or protocol, whether now existing or hereafter developed, may be used in conjunction with the present invention. The discussion of specific formats or protocols herein is not intended to limit the scope of the present invention. For example, although the MPEG-4 format is mentioned above for encoding and storing audiovisual data obtained by the present system, it is contemplated that other formats such as, for example, H.263 and H.264, may also be used. Likewise, audiovisual data may be stored in high-definition (HD) format. Hardware or software changes or upgrades may be required in order to change formats, however the inventive functionality of the present system, as described herein, is preserved regardless of the specific format used. Because one goal of law enforcement implementations of the present system is to produce an evidentiary record, it is preferred that a lossless format be used in those implementations.

In addition to various suitable formats that may be used in conjunction with the present system, it is contemplated that any suitable data transfer protocol may be used. For example, real-time streaming protocol (RTSP) may be used to transfer data in the present system providing that the system is adapted to recover any lost frames from the camera. User datagram protocol (UDP) provides a better, lossless protocol for use with

the present system. Any suitable existing protocol may be used, and new protocols may be developed for use with the present system. Because implementations of the present system include a data storage function in the camera, as described above, for retrieval of frames lost during data transfer, it is contemplated that typical IP cameras having such a storage feature may be used, with the system ensuring that lost frames are faithfully transmitted to central control unit when requested therefrom.

As noted above, the present system may be used with a variety of software, audiovisual formats, data transfer protocols, and the like. In some instances, changes to formats or protocols, or even making hardware changes such as upgrading the system to a HD-capable camera, may require that the software of the present system be updated. In some implementations of the present system, it is contemplated that the system software will be capable of being upgraded in the field. In such implementations, software upgrades may be provided via a memory card, portable flash memory device, a wireless data link to a portable devices, a wireless internet data link, or any other suitable device or method for upgrading the system software in the field. In some implementations wherein wireless communications are used for system upgrades, it is contemplated that the present system may optionally include a wireless communications component adapted to connect to a remote source for obtaining updates automatically. Such communications could, for example, be carried out over the internet via a cellular communications signal that allows the present system to access the internet.

In addition to what has been described above, various peripheral devices may be utilized in conjunction with the present invention. In law enforcement implementations of

the present system, for example, or in other implementations where security is important, the present system may be provided with a biometric identification component or other secure identification component. In an implementation of the present system requiring biometric identification, for example, a fingerprint may be required before a user of the present system can log into the system and begin to use the system. Other security peripherals include, for example, a dongle carried by a user of the present system that can be presented to the system in order to verify the identity of a user. Any suitable security component or method may be included with the present invention.

In addition to maintaining or verifying user security, the present system may also include additional components to establish the security and evidentiary value of the audiovisual data recorded thereby. For example, it is contemplated that the camera associated with the present system include a unique identifier, such as a serial number or other identifier that is unalterable, and that audiovisual signals obtained by any given camera are stamped with that camera's identifier. Thus, the identity of the camera that acquired any given data is verified and secured along with the actual data recorded by the system.

Peripheral devices used for interfacing with the present system may also be provided. For example, a keyboard may be provided, the keyboard adapted to plug directly into the present system or to communicate wirelessly with the present system via Bluetooth, infrared, or other suitable method of wireless communication. Further, it is contemplated that a PDA, laptop, smartphone, or other mobile device may be adapted (for example by installing software thereon) for communication with and

manipulation of the present system. Such devices may be used to manipulate a display associated with the present system, or to configure or control the present system.

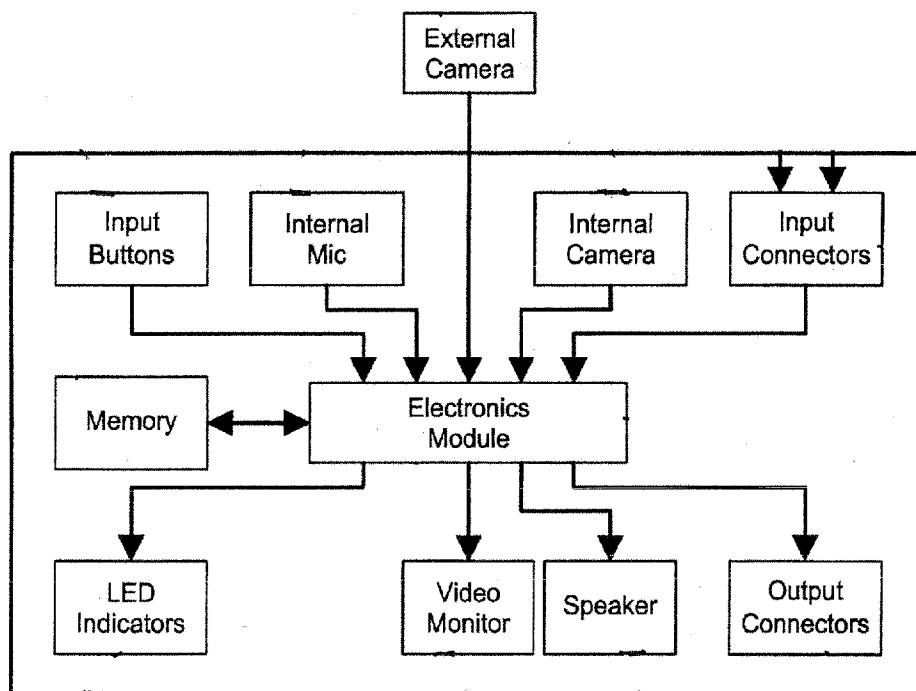


Fig. 1

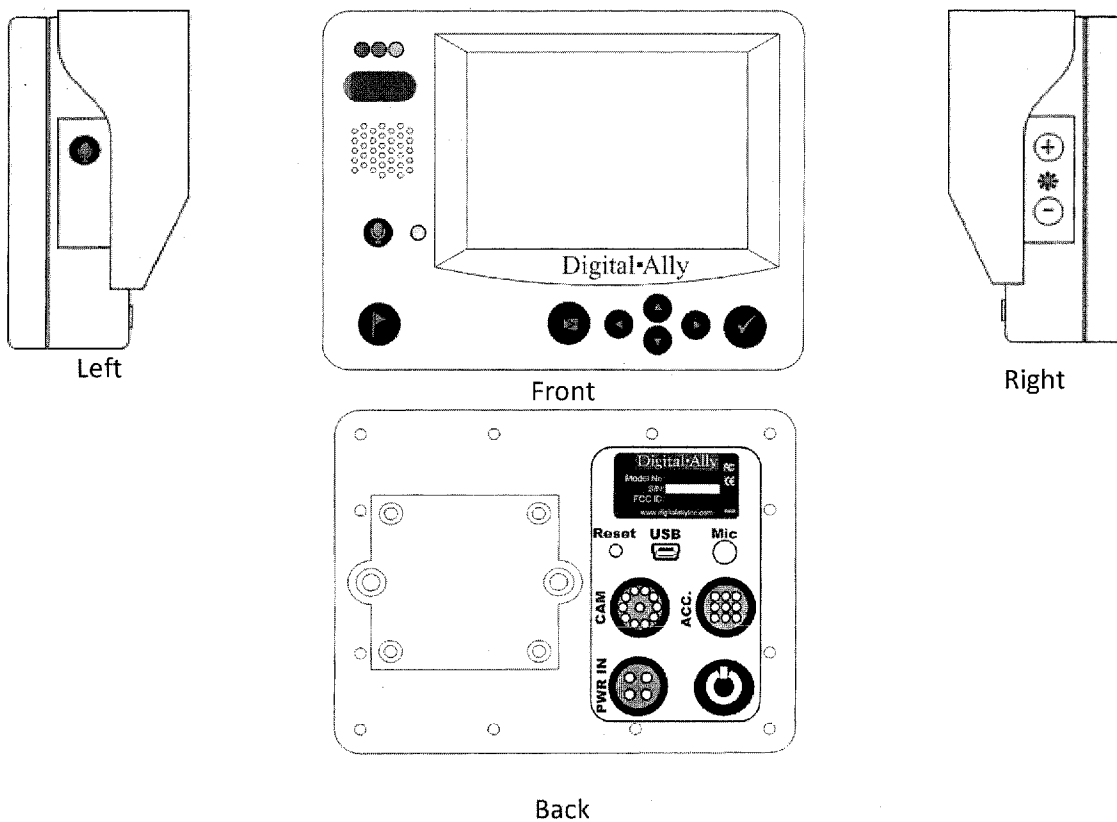


Figure 2