

APPARATUS FOR CAPTURING, CONVERTING AND TRANSMITTING  
A VISUAL IMAGE SIGNAL VIA A DIGITAL TRANSMISSION SYSTEM

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~~[0001] This application is a divisional application of and claims priority from a nonprovisional United States Application entitled Apparatus For Capturing, Converting And Transmitting A Visual Image Signal Via A Digital Transmission System, Serial No. 09/006,073, having a filing date of January 12, 1998; the specification and drawings of which are hereby incorporated by reference.~~

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

~~[0002]~~ The invention is generally related to image capture and transmission systems and is specifically directed to an image capture, compression and transmission system for use in connection

~~connection~~ with land line and wireless telephone systems.

DISCUSSION OF THE PRIOR ART

~~[0003]~~ Industry has developed and continues to develop and enhance techniques for scanning, compressing, transmitting, receiving, decompressing, viewing and printing documents. This technology, encompassing the full body of facsimile transmission and reception, is currently in widespread use. The current standards, CCITT Group III and Group IV, define methods to scan and

~~and~~ transmit high quality, hi-level images with a high degree of success and has become commercially

~~commercially~~ acceptable throughout the world. However, gray scale documents are not easily transmitted because

~~transmitted because~~ the scanners and algorithms are not tailored to the function. Three dimensional objects will not fit into the flat document scanners and cannot be transmitted.

~~[0004]~~ Examples of systems that have addressed some of these issues are shown in U.S. Patent No.

~~No.~~ 5,193,012 which shows a video to facsimile signal converter, and U.S. Patent No. 3,251,937 which

~~which~~ discloses a system for transmitting still television pictures over a telephone line.

~~[0005]~~ Wire photography, and its extension, radio photography, have long been used by the news ~~news~~ media. The most common form involves an input device that converts photographs into encoded

~~encoded~~ signals for communication over telecommunications facilities or radio. At the receiving end,

~~end,~~ reproducing equipment reconverts the encoded image signals by exposing photographic film or other

sensitized paper. The term facsimile is often ~~used~~ use with these products.

~~[0006]~~ Still video equipment has recently become available from vendors such as Kodak, Canon

and Sony, and is again primarily used by the television and print media, although applications are

expanding rapidly in such areas as insurance investigations and real estate transactions. A still video camera captures a full color still video image that can be reproduced using a special video printer that converts the still video image data into hard copy form. For applications requiring communication of the still video image, transmit/receive units are available wherein the image begins and ends as a video image.

~~{0007}~~ The Photophone from Image Data Corporation is an example of a specialty product that ~~product that~~ combines a video camera, display and storage facility in a terminal package. One terminal can send

a real time or stored still video image to another for display or storage, or printing on special video

printers. Again, the signal begins and ends as a video image.

~~{0008}~~ Another example of a specialty product is peripheral equipment available for personal ~~personal~~ computers that enables the input/output, storage and processing of still video images in digitized

formats. For instance, the Canon PV-540 is a floppy disk drive that uses conventional still video disks, digitizing and a still video image using a conventional format, and communicates with the computer through a standard communications ~~110~~I/O port.

~~{0009}~~ U.S. Patent No. 5,193,012 discloses a still-video to facsimile conversion system for ~~system for~~ converting the still-video image frame into a half-tone facsimile reproduction without having to store

an entire intermediated gray scale image frame by repeatedly transmitting the still-video image frame from a still-video source to an input circuit with a virtual facsimile page synchronization module. This system permits image to facsimile conversion by utilizing a ~~half tone~~half tone conversion technique.

~~{0010}~~ While the various prior art systems and techniques provide limited solutions to the problem

of transmitting visual images via a facsimile transmission system, all fall short of providing a reliable and convenient method and apparatus for readily capturing, storing, transmitting and printing visual images in a practical manner.

#### SUMMARY OF THE INVENTION

~~{0011}~~ The subject invention is an image capture, compression and transmission system that is

specifically designed to permit reliable visual image transmission over land line or wireless communications using commercially available facsimile transmission techniques. The invention incorporates a camera and signal converter into an integrated unit wherein the converted signal may

be transmitted on a real time basis or may be stored in memory for later recall and transmission. The

design of the invention permits maximum flexibility, with the camera/converter/telephone or other

transmission device being designed in a modular configuration wherein any or all of the devices ~~may~~

~~devices may~~ exist as integrated or independent units.

~~{0012}~~ The preferred embodiment permits capture of a video image using a digital

camera, an analog camera, or a video camera such as a camcorder. The captured video image is then converted into still frame digitized format for transmission over any of a variety of transmission systems ranging from Group-III facsimile to computer, or to a like device at a remote location, in any protocol desired. The invention recognizes that once the signal is digitized, the transmission protocols are virtually endless.

~~{0013}~~ For example, the present invention, permits a still frame visual image to be captured at a remote location and sent immediately, over wireless communication systems, to a remote location such as, by way of example, a computer system wherein the image could be merged directly into newsprint. The image may also be sent to and printed as a hard copy using any Group-III facsimile machine, anywhere in the world. Where desired, the images may be stored in memory for later-~~recall, and may be~~ recall, and may be archived on a portable medium such as a memory card or the like.

~~{0014}~~ The system of the subject invention is particularly useful for applications where immediate ~~immediate~~ transmission of visual images of scenes, people and objects is desirable and sophisticated equipment ~~sophisticated equipment is not always available for receiving the information. The is not always available for receiving the information. The~~ system also provides a unique and reliable means for transmitting visual data to and from remote locations, such as, by way of example, law enforcement and emergency vehicles and the like.

~~{0015}~~ In the preferred embodiment of the invention, the system includes a video camera and an integral cellular telephone, wherein the telephone using the standard audio mode or future digital modes, can be used to transmit and receive visual image signals. A desk model is also disclosed and permits connection to a standard land line telephonic system. A mobile console model is disclosed for use in law enforcement vehicles, and the like. Other communication systems are also supported by the subject invention, including hardwired networks, radio and satellite transmission and the like.

~~{0016}~~ A local facsimile machine may be incorporated with the unit and can serve as a printer for providing hard copy of the captured image at the point of capture, as well as being adapted for receiving facsimile transmissions in the standard fashion.

~~{0017}~~ The circuitry is disclosed for supporting any of the preferred configurations from a basic real time transmission system via Group-III fax to a comprehensive system supporting both land line and wireless transmission of image, audio and documentary data at both a local and remote 30 station.

~~[0018]~~ The subject invention also permits digitized collection of audio signals through the use of the use of an internal microphone, and external input device, a cellular telephone, land line telephone, wireless radio or other communication system, and digitized audio playback, as well. The playback can be via an internal speaker, out an external ~~outjack~~out jack to a remote device or via a cellular telephone, land line telephone, wireless radio or other communication system.

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~~[0019]~~ The digitized image and audio capture features permit association of audio with an image, with an image, as well as data with the image. Useful data associated with the image includes GPS from either internal or external GPS devices, range information from ranging devices, date and time, and text ~~which may be input from an integrated~~ which may be input from an integrated keyboard or from a remote device.

~~[0020]~~ It is an important feature of the invention that the system supports storage of images in an interim storage format including raw video, compressed video, interim gray scale format and/or ~~halftone~~half tone format. The image can also be stored in the selected output mode, such as by way of example, a Group III facsimile mode. The versatile capability of the system permits transmission of captured data to a standard hi-level facsimile machine such as Group III, to gray scale facsimile systems or ~~full color~~ full color facsimile systems, as well as to other remote receiving devices such as, ~~by way~~byway of ~~example,~~ example, personal computers and network servers. The data may be transferred in any of a variety of formats and protocols including JPEG, FAX, wavelets, emerging imagery formats, FAX and computer data protocols. The invention is adapted to operate in multiple modes, with a unitary capture and send mode or separate capture and store, and send modes.

~~[0021]~~ In the preferred embodiment, the system is adapted for tagging a collected image, video, ~~audio, and other data such as a GPS information, with geospatial~~ audio, and other data such as a GP S information, with geospatial information and real time clock and added text. This permits the complete historical data to be transmitted simultaneously with the image signal.

~~[0022]~~ It is contemplated that the system of the invention would be self-contained with an integral ~~an integral~~ power unit such as a disposable battery, rechargeable battery source or the like. Therefore, the system is adapted to power up when in use and power down or "sleep" when not activated, ~~"sleep" when not activated,~~ preserving power during idle time. The power systems for the video camera, the video input circuits ~~and converters, the modem or other~~

and converters, the modem or other transmission devices and other high drain components may be isolated and only powered when needed. This also permits use of ancillary functions, such as use ~~as a~~ 30 as a cellular telephone, to proceed without draining the power source by powering idle components.

~~components.~~ The processor clock rate may also be slowed down during idle mode to further conserve power.

~~[0023]~~ Where desired, the system also includes camera operation control capability through the use of a digital/analog circuits for converting digital commands to analog signals for controlling the gain, pedestal, setup, white clip, lens focus, white balance, lens iris, lens zoom and other functions of the camera from a local input device, a remote device or as automatic or programmed functions. The central processor may also be used to control camera shutter rate. Other camera features and ~~parameters~~ parameters which may be controlled in this manner are compressor resolution ( such as high, medium, low user settings) corresponding to compression rate parameters, field/frame mode, color or monochrome, image spatial resolution (640x420 pixels, 320x240 pixels, for example), lens and ~~for example~~, ~~lens and~~ camera adjustments, input selection where multiple cameras or video sources are used and the like.

~~[0024]~~ When an integrated communications device is used, such as by way of example, a cellular telephone, the telephone can be isolated from the rest of the system to permit independent use, and ~~to permit independent use, and~~ independent power up and power off and other cellular phone functions.

~~[0025]~~ In operation, the system permits not only the manual capture, dial (select) and send of ~~send of~~ images, but may also be fully automated to capture, dial and send, for example, on a timed sequence or in response to a sensor such as a motion sensor, video motion detection, or from a remote trigger device. The remote trigger also may be activated by an incoming telephone signal, for example.

~~[0026]~~ The remote device may also be ~~used~~ use for remote loading and downloading of firmware, and for setting of the programmable parameters such as to provide remote configuration of sampling modes during capture, compression rates, triggering methods and the like.

~~[0027]~~ The triggering function permits a multitude of sampling schemes for a simple triggered ~~triggered~~ activation for capturing an image upon initiation to a trigger signal to more complicated ~~complicated schemes~~ schemes for capturing and transmitting images prior to and after receipt of the trigger signal. The trigger function can be set to operate, for example, on a time per sample and number of sample basis, or

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