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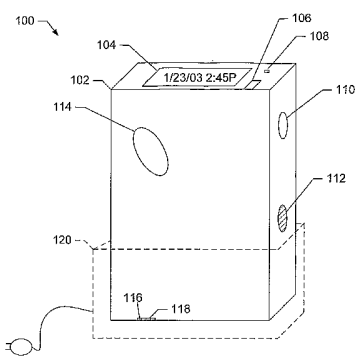
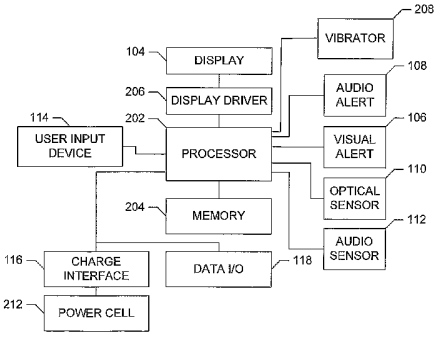
(54) Title: METHODS AND APPARATUS TO MEASURE MEDIA CONSUMPTION





(57) Abstract: Methods and apparatus to measure media consumption are disclosed. A disclosed apparatus (100) includes a sensor (110 and/or (112) to observe program characteristics in a media presentation, a processor (202) coupled to the sensor (110 and/or 112) and configured to detect the program characteristics observed by the sensor (110 and/or 112) and an input device (114) coupled to the processor (202) and configured to provide to the processor (202) a user response to a prompt observed by the user.

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METHODS AND APPARATUS TO MEASURE MEDIA CONSUMPTION

TECHNICAL FIELD

[0001] The present disclosure pertains to audience measurement and, more particularly, to methods and apparatus to measure media consumption.

BACKGROUND

[0002] Audience measurements of broadcast media, such as television and/or radio, are typically carried out by monitoring media consumption (e.g., the viewing or listening) of homes that are statistically selected to represent particular demographic groups. Using various statistical methods, the captured media consumption data is processed to determine audience size and demographic for programs of interest. The audience size and demographic information is extremely valuable to advertisers, broadcasters and any other entity that needs to know an audience size and demographic of a particular program. For example, audience size and demographic information is a determining factor in the placement of advertisements targeted at a particular demographic cross-section, as well as a driving factor in valuing commercial time slots during a particular program.

[0003] Traditionally, in the television industry, measurement of media consumption has been accomplished using invasive techniques in which monitoring hardware is installed in an information presenting device such as a television, a set top box, a radio, a digital recorder, etc. The monitoring hardware includes a tuning monitor to determine the frequency or channel to which the information presenting device is tuned and also includes a real-time clock to note the time at which the detected channels are tuned. The acquired channel and time information is combined with the programming schedule of a particular geographic area in which the information presenting device is located to identify the consumed programming. Traditional systems have several limitations, such as the need to install the monitoring hardware on monitored information presenting devices. As will be readily appreciated, the installation of the monitoring hardware is time consuming and may be invasive to the information presenting device, which may result in damage.

[0004] Recognizing the drawbacks of invasive monitoring, monitoring services have developed non-invasive monitoring techniques. The non-invasive techniques reduce the likelihood of damage to equipment and have a shorter installation time than is required to install invasive monitoring hardware. In general, the non-invasive techniques use information external to a monitored information presenting device (e.g., audio and/or video) to determine the programming tuned by that device. In particular, non-invasive monitoring techniques capture codes and/or signatures of video and/or audio information emitted from an information presenting device.

[0005] Collectively, the information detected or produced by any of the foregoing techniques is referred to as program characteristics, which may be active (e.g., the detection of codes inserted in broadcasts) or passive (e.g., the acquisition of program content). Considerable work is being carried out by organizations responsible for defining standards relating to program characteristics for audio and visual content identification and for defining standards for placeholders in the signal to carry program characteristics.

[0006] Even with the advent of non-invasive code and signature extraction techniques, which alleviate the need to install hardware within a monitored information presenting device, most monitoring equipment is still housebound. For example, monitoring equipment is usually associated with a specific information presenting device within a specific house. As a result, these audience measurement systems are still limited in that they can only capture viewing data about a panelist (e.g., a particular audience member) when that panelist is at home watching television on a monitored information presenting device (e.g., a television, a radio, etc.). Fixed installations are incapable of capturing all of a panelist's consumption data, such as, for example, programs consumed by the panelist outside his or her home. Accordingly, the use of fixed monitoring equipment that is tied to a particular information presenting device provides an incomplete data set of consumption information for a panelist.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] FIG. 1 is a trimetric view of an example device to measure media consumption.

[0008] FIG. 2 is a block diagram of the example device of FIG. 1.

[0009] FIG. 3 is a flow diagram representative of example machine readable instructions that may be executed by the example device of FIGS. 1 and 2.

[0010] FIG. 4 is a timeline illustrating example passive information acquired by the example device of FIGS. 1 and 2.

[0011] FIG. 5 is a timeline illustrating example active information acquired by the example device of FIGS.1 and 2.

[0012] FIG. 6 is a table illustrating example active information corresponding to the timeline of FIG. 5.

[0013] FIG. 7 is a block diagram of an example base station to which the example device of FIGS. 1 and 2 may be interfaced.

[0014] FIG. 8 is a flow diagram representing example machine readable instructions that may be executed by the example base station of FIG. 7

DETAILED DESCRIPTION

[0015] Although the following discloses example systems including, among other components, software or firmware executed on hardware, it should be noted that such systems are merely illustrative and should not be considered as limiting. For example, it is contemplated that any or all of these hardware, software and firmware components could be embodied in hardware, in software, in firmware or in any combination of hardware, firmware and/or software. Accordingly, while the following describes example systems, persons of ordinary skill in the art will readily appreciate that the examples are not the only way to implement such systems.

[0016] Additionally, while the following description is provided with respect to the example of monitoring consumption of television broadcasts (e.g., Internet, satellite, cable or terrestrial broadcast television programming), which includes both audio and video components, the example apparatus, methods and articles of manufacture disclosed herein could be used to monitor consumption of other types of media (e.g., radio, personal computer, and any other media). Indeed, in the radio context, the only

difference from the examples described below is that only audio content is included and a video component is not present.

[0017] FIG. 1 illustrates an example portable device that is easily carried or worn by a panelist to measure media consumption 100 by the panelist, and which includes a housing 102 in which a display 104, a visual alert 106, and an audio alert device 108 are disposed. The example device 100 further includes an optical sensor 110, an audio sensor 112, a user input device 114, a charge interface 116 and a data I/O 118. The example device 100 may be placed in a base station 120 to recharge the example device 100 and to facilitate data extraction from the example device 100.

[0018] FIG. 2 reveals additional detail of the example device 100. In FIG. 2, reference numerals identical to those of FIG. 1 refer to like components. The example device 100 includes a processor 202 having an associated memory 204 to store instructions for execution by the processor 202 and to store information logged by the example device 100. A display driver 206 is interfaced between the processor 202 and the display 104 to provide communication therebetween. The visual and audio alerts 106, 108, and the optical and audio sensors 110, 112, and the user input device 114 are interfaced to the processor 202. The example device 100 also includes a vibrator 208 that, in addition to the visual and audio alerts 106, 108, may be used to gain the attention of the panelist. The alerts 106, 108 and the vibrator 208 may be referred to as output devices. The charge interface 116 is coupled to the processor 202, the data I/O 118 and a power cell 212. Through the charge interface 116, power is provided to charge the power cell 212 and through the data I/O 210, information may be exchanged between the processor 202 and a remote data collection center. Although not shown in FIGS. 1 and 2, the example device 100 may include a sensor for receiving signals, such as radio frequency (RF), audio, or video signals, from sources such as, for example, a television status reader (TSR) located within a television.

[0019] In general, a panelist carries the example device 100 on his or her person. As described in detail below, the example device 100, via the optical sensor 110 and the audio sensor 112, observes the environment in which the panelist is located and watches and listens for programming content. When programming content is

detected, the example device 100 logs a representation of the content and/or identifies the content, along with the time at which the content is detected. As described below, depending on a mode in which the example device 100 is operating, the panelist may be prompted via one or more of the audio alert 108, the visual alert 106 or the vibrator 208 to indicate whether they are consuming the detected program or are merely exposed to it via the user input device 114. Additionally, the panelist may be prompted to express approval or disapproval of a program, or may submit his or her approval or disapproval without prompting.

[0020] At a later point in time, the example device 100 is placed in the base station 120 and information acquired by the example device 100 is communicated back to a remote data collection center, which compiles information from a number of devices 100 and performs statistical analysis on the information to generate viewing information. Along with the acquired information, information identifying the example device 100 is connected back to the remote data collection service. The information that identifies the example device 100 may be, for example, an electronic serial number of the example device. The remote data collection center is informed *a priori* of the identity and demographic information of each panelist and it also aware of the unique serial number provided to each panelist. Accordingly, the remote data collection center may pair acquired information with demographic information. As described below, the base station 120 may also provide power to charge a power cell 212 located within the example device 100.

[0021] Although the example device 100 is shown in FIG. 1 as having a shape or form factor similar to that of a pager, the example device 100 may be implemented in any number of various form factors, such as, for example, a wristwatch, a cellular telephone or communication device, or a personal digital assistant (PDA). However, the form factor of the example device 100 is preferably portable and the housing 102 may include mechanical features such as, for example, a belt clip and the like that enhance the portability of the example device 100.

[0022] While the example device 100 of FIG. 1 includes an audio sensor 112 and a video sensor 110, the example device 100 need not include both sensors 110, 112. For example, the audio sensor 112 is sufficient to identify program content via

program characteristics, such as signatures or, if they are present, audio codes. Additionally, the video sensor 110 is sufficient to identify program content via program characteristics, such as signatures or, if present, video codes. However, because video monitoring generally requires a line of sight between the device 100 and the information presenting device, one particularly advantageous example includes the audio sensor 112 even when a video sensor 110 is present.

[0023] The display 104 may be, for example, a light emitting diode (LED) display, a liquid crystal display (LCD) or any other suitable display. Like a conventional pager, the processor 202 and the display driver 206 may control the display 104 to provide the date and time to a panelist. Additionally, the example device 100 may provide alphanumeric messages to the panelist through the display 104. The messages may be generated by the processor 202 or may be provided to the processor 202 via the data I/O 210 from a monitoring service. Although shown as a separate components in FIG. 2, the display driver 206 could be integrated with the processor 202.

[0024] As noted above, the visual alert 106, the audio alert 108 and the vibrator 208 are provided to draw the attention of the panelist to the example device 100. The visual alert 106 may be a LED that is green, red, blue, or any other suitable color. Alternatively, the visual alert 106 may be any suitable device that produces a visual signal useful to get the attention of a panelist. The audio alert 108 may be a piezoelectric device, a speaker, or any other suitable device that the processor 202 controls to generate an audible signal to obtain the attention of the panelist. The vibrator 208 may be embodied in any well known vibration device such as those used in conventional cellular telephones or pagers. The processor 202 may use any or all of the devices 106, 108 and 208, as well as the display 104, to draw the attention of the user to the example device 100.

[0025] In the example device 100, the optical sensor 110 may be a video sensor, such as that employed by the VEIL I® or VEIL II® produced by VEIL Interactive Technologies. Alternatively, the optical sensor 110 may be a photo sensor, such as a photo detector capable of sensing one or more optical wavelengths or ranges of

wavelengths. As a further alternative, the optical sensor 110 may be implemented using a charge coupled device camera, or the like.

[0026] The audio sensor 112 may be, for example, a condenser microphone, a piezoelectric microphone or any other suitable transducer capable of converting audio information into electrical information.

[0027] In the example of FIGS. 1 and 2, the user input device 114 is shown as being a switch. However, the user input device 114 may be, for example, a keyboard, a voice response device, a proximity detection device, or any other device that enables a panelist to provide information to the example device 100. Information provided to the example device 100 may include responses to queries generated by the example device 100, expressions of like or dislike of a program the panelist is consuming in response to polling queries made by the monitoring service via the processor 202, or information provided by the panelist and used to change the settings of the example device 100. Changing the settings of the device may include, for example, disabling one or more of the display 104, the visual alert device 106, or the audio alert device 108. Such setting changes allow a panelist to customize the interaction with the example device 100 to enhance the panelist's experience.

[0028] The charge interface 116 and the data I/O 118 may be, for example, metal contacts adapted to mate with the base station 120, and to transfer power therefrom and to exchange data therewith. Alternatively, the charge interface 116 and the data I/O 118 may be separate or combined connectors. For example, the data I/O 118 could be a universal serial bus (USB) connection and the charge interface 116 could be a conventional co-axial jack into which a user may insert an alternating current (AC) adapter.

[0029] The processor 202 may be any microprocessor or microcontroller, either of which may include on-board memory. Alternatively, the processor 202 may be a digital signal processor (DSP). As a further alternative, the processor 202 may be an application-specific integrated circuit (ASIC) including custom hardware to perform various functions required of the processor 202. Regardless of the implementation of the processor 202, the processor 202 tracks the time of day and the date for use in logging information collected by the optical or audio sensors 110, 112.

[0030] The memory 204 may be a read only memory (ROM), such as a nonvolatile ROM (NVROM), of which flash memory is one type. The memory 204 could also be a random access memory (RAM) device. In one example arrangement, programming instructions for the processor 202 could be stored in ROM, and acquired information, such as codes and/or signatures, could be stored in RAM.

[0031] The power cell 212 may be a rechargeable cell such as, for example, a lithium-ion cell, a nickel-metal hydride cell, a nickel-cadmium cell or any other cell of suitable technology. Additionally, the power cell 212 could be a non-rechargeable cell, such as a conventional alkaline battery. If a non-rechargeable cell were used, the charge interface 116 may be eliminated.

[0032] Having described the hardware and general operational aspects of the example device 100 in conjunction with FIGS. 1-2, attention is now turned to an example process that may be carried out by the example device 100 (described in connection with FIG. 3). The example process described in conjunction with FIG. 3 may be implemented, for example, as software or firmware instructions stored in the memory 204 and executed by the processor 202 of the example device 100.

[0033] In the example of FIG. 3, the process carried out by the example device 100 begins execution by determining if audio and/or video information is available (block 302). This determination may be carried out by sensing information provided by the optical sensor 110 and/or the audio sensor 112. In one example, the example device 100 may detect audio or video codes within available audio and/or video information.

[0034] Alternatively, if the audio and/or video source includes a TSR, the example device 100 may receive signals from the TSR that indicate that a television (or any other information presenting device) is on, that a channel change has occurred or that the television (or any other information presenting device) is muted. For example, the TSR could emit optical energy (e.g., infrared), RF energy, or audio signals to provide status information regarding the information presenting device. The example device 100 receives these indications through the optical sensor 110, the audio sensor 112, or an RF receiver within the example device 100. The receipt of such signals from the TSR indicates that the audio and/or video are available.

[0035] The example device 100 continues to look for available audio or video (block 302) until either audio or video including codes is observed. In some instances, the example device 100 may be placed in a pocket or on a belt in an orientation that is not conducive to receiving video, the reception of which requires a line-of-sight between the example device 100 and the video source. In such a situation, the example device 100 relies on the detection of audio codes and/or channel changes.

[0036] When audio and/or video are available (block 302), the program characteristics (e.g., codes or signatures) in the audio and/or video are detected and stored (block 304). The detection and storage (block 304) may be carried out in any number of different ways depending on whether all audio and/or video includes codes embedded therein. For example, if all audio and/or video content includes embedded codes, the codes may be detected and stored. Alternatively, if some or all of the audio and/or video does not include codes, signature information may be captured and stored. The signatures may be acquired at a rate of two to three bytes per second and, therefore, each signature may include 15 bytes of data. Signatures may be taken following channel changes and at regular intervals thereafter. The acquired signatures may be later transferred to a remote data collection center for later analysis.

[0037] The audio and/or video codes and the audio and/or video signatures are referred to as program characteristics. If only an audio program characteristic is available, only the audio program characteristic is stored. If only a video program characteristic is available, only the video program characteristic is stored. If both audio and video program characteristics are available, both of the audio and video program characteristics may be stored. The time of storage is also stored in association with the program characteristic(s).

[0038] After program characteristics are stored (block 304), the example device 100 determines if an active monitoring state has been set (block 306). When operating in the active monitoring state, the example device 100 prompts the panelist for information. The information may include a simple acknowledgement that the panelist is consuming a program (as opposed to mainly being exposed to the program) or may include a response to a poll requesting that the panelist indicate a like or

dislike of the program. When not in the active monitoring state, the example device 100 may operate in a passive monitoring state that causes the example device 100 to monitor the audio or video being detected but not prompt the panelist for information. The mode of the example device 100 may be set by the monitoring service before the example device 100 is provided to the panelist, may be set by the panelist via the user input device 114 or may be set by the monitoring service using a communication link provided via the base station 102. An additional mode of operation, which may be part of either of the foregoing states, accepts panelist approval or disapproval without prompting the panelist for such information.

[0039] If the example device 100 is in a passive monitoring state, the process passes to a delay (block 308) for a period of time. After the delay period has passed (block 308), the example device 100 again determines if audio or video signals are available (block 302). Control continues to loop through blocks 302-308 until video and audio signals are no longer available (block 302) either because the source of audio/video signals has been turned off or the example device 100 has been carried out of the range of the audio/video signals. The delay (block 308) drives the periodicity with which the program characteristics and their associated times are stored (block 304).

[0040] Referring to FIG. 4, an example timeline 400 generated based on passive monitoring data includes time demarcations 402-410. The example timeline 400 may be processed at a remote data collection center. The example timeline 400 indicates that a signal (one or both of audio and video) was received at 8:00PM and that the panelist was exposed to a first program, until 8:30PM. At 8:30PM, the panelist was exposed to a second program, until 9:30PM, at which point the signal was no longer detected. At 10:00PM, a signal was received that indicating the panelist was exposed to a third program until 10:30PM.

[0041] Returning to FIG. 3, if active monitoring is desired (block 306), it is determined if it is time for prompting the panelist for input (block 310). Time for prompting may be based on one or more different factors. For example, prompting may be channel change based, time-based, or program content-based. In a channel change based prompting arrangement, the station identifier (ID) may be monitored

and a panelist may be prompted for input in response to channel changes or after a fixed period of time since a prior channel change. In an alternative, the television may include a TSR that produces output signals indicative of channel change, no channel change, or signals indicative of program characteristics. For example, a TSR could be used in an implementation in which not all audio and/or video content presented on the television includes embedded codes. Time-based prompting provides a user with a prompt at time intervals, which may be fixed or variable. Additionally, content-based prompting monitors program identifiers and prompt a panelist for input when program identifiers change. Of course, any combination of channel change, time, and/or content-based prompting may be used to determine when the panelist should be prompted.

[0042] If a channel change is detected (block 310), a delay (block 312) is experienced to allow for multiple channel changes that may occur, for example, during a channel surfing session. After the delay (block 312), the panelist is prompted for an input (block 314). The prompt (block 314) may be manifest by one or more of flashing of the visual alert 106, chirping of the audio alert 108, or actuation of the vibrator 208. Additionally or alternatively, the prompt may be displayed to the panelist on the display 104.

[0043] Depending on the type of active monitoring carried out, the prompt may request that the panelist indicate whether the panelist is consuming the programming, or may ask the panelist to express approval or disapproval of programming being consumed. The panelist may make responses by actuating the user input device 114. For example, in an active monitoring mode, in which polling is not performed, the panelist may respond to the prompt by actuating the user input device 114 to inform the example device 100 that the panelist is actually consuming the audio and video being detected and stored (block 304). If polling is also performed, the panelist may be prompted to actuate the user input device 114 a single time to express approval and multiple times to express disapproval of programming being consumed.

[0044] Alternatively, the panelist may express approval or disapproval by actuating the user input device 114 for different periods of time (e.g. depressing a button for a short period of time e.g., 1 or 2 seconds, may indicate approval and depressing a

button for at least 5 seconds may indicate disapproval). Panelist expression of approval or disapproval of programming content may be made in response to a prompt or may be made independent of any prompting. For example, a panelist may provide his/her opinion on a television program without being prompted to do so. In such a situation, the example unit 100 logs the preference (or lack thereof) of the panelist and provides this data, along with other captured data, to the remote data collection center.

[0045] After being prompted (block 314), a panelist has a period of time by which to respond. If the user does not respond by a predetermined period of time (block 316), the example device 100 returns to scanning for available audio and video (block 302). If, however, an input is received from the panelist (block 316), the input is logged (block 318) before the example device 100 returns to scanning for audio and video (block 302). In practical effect, the logging activities of the example device 100 are performed so rapidly that the example device 100 appears to be constantly scanning for audio and video.

[0046] Returning to block 310, if a channel change is not detected, a timer is started (block 320). The timer is used to determine if a predefined period between panelist prompts has passed. After the timer is started (block 320), the timer is incremented (block 322) until the predetermined period has passed (block 324), at which time the panelist is prompted (block 314). As described above, the panelist response will depend on the type of prompt generated as the example device 100 (i.e., whether the prompt requires an answer to the question).

[0047] An example timeline 500 is shown in FIG. 5, which illustrates a panelist viewing pattern substantially identical to that described in conjunction with FIG. 4, except that at points denoted on the timeline with an X (502, 504, 506), the panelist was prompted for a response. In response to the prompt 502, the panelist responded with approval 508. In response to the prompt 504, the panelist responded with disapproval 510. The panelist did not respond to the prompt 506. In addition to a panelist responding to prompts, it is desirable to allow a panelist to express his or her opinion at any time. For example, as shown in FIG. 5, the panelist provided disapproval 512 that was not in response to a prompt.

[0048] An example table 600 of example responses of a panelist during active monitoring is shown in FIG. 6. The table 600 is formatted on a timeslot 602-610 per panelist basis, with only a single panelist 612 being shown. In the table 600, the responses of the panelist, as well as the source of the codes or signatures are shown. For example, in the 8:00-8:30 timeslot a cell 614 indicates that program 1 was being consumed (C) and was approved (A) of by the panelist. The cell 614 further indicates that both video and audio codes and/or signatures were being acquired for program 1. Cell 616 indicates that program 2 was consumed (C) between 8:30 and 9:30 and was disapproved (D) of by the panelist. Further, video and audio watermarks were acquired during the viewing of program 2. The cell 618 indicates that no program information was acquired during the 9:30-10:00 timeslot. The cell 620 indicates that from 10:00 to 10:30, the panelist was exposed (E) to program 3 and only an audio code or signature was acquired for program 3.

[0049] In an example circumstance that would yield the results of FIG. 6, a panelist placed the example device on a table in line-of-sight of a television and responded to prompts issued by the example device 100 during the time period from 8:00 to 9:30. At 9:30, the panelist may have been reading the newspaper and getting ready for bed while the television was off. At 10:00, the panelist may have been in bed watching a news program during which the panelist fell asleep. During the 10:00 timeslot the example device 100 was not within a line-of-sight of a television, consequently only audio codes or signatures were acquired. The panelist fell asleep and, therefore, did not respond to any prompts. Accordingly, the audio codes and/or signatures acquired by the example device 100 during the 10:00 timeslot correspond to content that was displayed but not, in fact, consumed by the panelist detected.

[0050] An example base station 120 is shown in FIG. 7. The example base station 120, includes a processor 702 to which is coupled a memory 704, a data interface 706 and an I/O block 708. The base station 120 also includes a connector 710 that is coupled to the data interface 706 and is also coupled to a power supply 712, which is further coupled to and controlled by the processor 702.

[0051] In general, the connector 710 is adapted to mate with the charge interface 116 and the data I/O 118 disposed on the example device 100. For example, the

connector 710 may be metal contacts adapted to mate with the example device 100 to provide power thereto and to exchange data therewith. When the example device 100 is placed in the base station 120, the charge interface 116 and the data I/O 118 of the example device 100 come in contact with the connector 710. The connector 710 serves a dual function of providing a data path from the example device 100 to the data interface 706 of the base station 120 and providing a power path from the power supply 712 of the base station 120 to the power cell 212 of the example device 100.

[0052] The base station 120 is not required for the full use of the example device 100. For example, the base station 120 could be eliminated in favor of a personal computer having a connector port (e.g., a USB port) through which information could be ported from the example device 100 to a monitoring station via communication facilities provided by the personal computer and network such as the public switched telephone system and/or the Internet. In such an arrangement, an AC adapter could be provided to charge the power cell 212, if the power cell 212 is rechargeable. Further, it would be possible to recharge the power cell 212 using power provided by a USB connection from the personal computer. In the alternative, the power cell 212 could be an alkaline battery, in which case no recharging is necessary and the data connection to the personal computer is the only needed connection.

[0053] The processor 702 may be any microprocessor or microcontroller and may include on-board RAM and/or ROM. Alternatively, the processor 702 may be a digital signal processor (DSP). As a further alternative, the processor 702 may be an application-specific integrated circuit (ASIC) including custom hardware to perform the various functions required of the processor 702. Accordingly, the instructions carried out by the processor 702 may be stored local to the processor 702 or may be stored in a memory (e.g., the memory 704) remote from the processor 702.

[0054] The memory 704 may be RAM, ROM, NVROM, or any suitable combination thereof, of which flash memory is one type. In fact, while shown in FIG. 7 as one block, the memory 704 may include several different devices. For example, the memory 704 could be a combination of RAM, ROM, a magnetic storage media, such as a hard disk and/or an optical media, such as a compact disk (CD) and associated drive. In addition to instructions executed by the processor 702, the

memory 704 may store information received at the base station 120 from the example device 100. For example, information from the example device 100 may be stored in the memory 704 until a time at which the processor 702 transfers such data to the monitoring service.

[0055] The data interface 706 facilitates the passage of data between the processor 702 and the processor 202. The data interface 706 may be hardware or software. For example, the data interface 706 may be analog or digital circuitry that converts the voltage levels of the data provided by the example device 100 into voltage levels that are recognized by the base station 102, which may include, for example, stepping 3.5 volt logic levels to 5 or 12 volt logic levels that may be used by the base station 120.

[0056] The I/O 708 is connection hardware that enables the processor 702 to export data from the memory 704 to a monitoring service. For example, the I/O 708 may be a network card, such as an Ethernet card that provides Internet connectivity so the processor 702 may transfer information from the base station 120 to the monitoring service via an Internet connection. Alternatively or additionally, the I/O 708 could include a modem to facilitate a dial-up connection between the base station 120 and the monitoring service.

[0057] The connector 710 is a mating connector to the charge interface 116 and the data I/O 118 of the example device 100. For example, if the charge interface 116 and the data I/O 118 of the example device 100 are metal contacts, the connector 710 may be a mechanical arrangement adapted to couple thereto, such as, for example, spring contacts. Alternatively, if the charge interface 116 and the data I/O 118 are one or more connectors, the connector 710 may be one or more mating connectors therefor.

[0058] The power supply 712 receives power from, for example, a wall outlet that supplies line power at 120 volts alternating current (vac) and produces, for example, 12 volts direct current (vdc). The output of the power supply 712 provides power to the devices shown in FIG. 7 and, in the example of FIG. 7, is controlled by the processor 702. The power supply 712 may be a switching power supply or a filtered rectifier power supply built into the base station 120. In the alternative, the power supply 712 may be separate from the base station 120, such as, for example, an AC adapter.

[0059] Turning now to FIG. 8, an example process carried out by the base station 120 is shown. When the example device 100 is inserted into the base station 120 the example device 100 is detected (block 802). To charge the example device 100, the power supply 712 is enabled (block 804). The base station 102 then prepares to extract information from the example device 100 by establishing communications with the example device 100 (block 806). After communications have been established (block 806), data is downloaded from the example device 100 (block 808). Data downloading (block 808) may also include transferring the data from the base station 102 to the monitoring service via, for example, a wired or wireless connection. During data download (block 808), the base station 102 may track the data that has been downloaded and, in the event of a data interruption, may return to downloading data from a prior point at which the downloading was interrupted.

[0060] After the data has been downloaded from the example device 100 (block 808), the base station 120 detects if the example device 100 is removed (block 810). When the example device 100 is removed, the power supply 712 is disabled (block 812), until another example device 100 is inserted into the base station 100.

[0061] Although certain apparatus, methods and articles of manufacture constructed in accordance with the teachings of the invention have been described herein, the scope of coverage of this patent is not limited thereto. On the contrary, this patent covers all apparatuses, methods and articles of manufacture of the teachings of the invention fairly falling within the scope of the appended claims either literally or under the doctrine of equivalents.

What is claimed is:

1. A portable audience meter for measuring whether a user is exposed to programming content or is watching programming content, the portable audience meter comprising:

a sensor to observe programming content;

a processor coupled to the sensor and configured to acquire a signature of the programming content;

an input device coupled to the processor and configured to provide to the processor an indication that the user is watching the programming content when the user actuates the input device; and

a housing in which the sensor, the processor, and the input device are contained, wherein the housing is wearable by the user.

2. A portable audience meter as defined by claim 1, wherein the processor is configured to determine if the user is watching the programming content if the user actuates the input device.

3. A portable audience meter as defined by claim 2, wherein the processor is configured to determine if the user is exposed to the programming content if the user does not actuate the input device.

4. A portable audience meter as defined by claim 1, wherein the processor is further configured to generate an output signal, the portable audience meter further including an output device coupled to the processor and configured to receive the output signal and to generate a prompt.

5. A portable audience meter as defined by claim 4, wherein the prompt includes requesting the user to express one of approval and disapproval of the programming content corresponding to the signature.

6. A portable audience meter as defined by claim 4, wherein the sensor includes at least one of an optical sensor and an audio sensor.

7. A portable audience meter as defined by claim 4, wherein the output device includes at least one of a vibrator, a visual alert, and an audio alert.

8. A portable audience meter as defined by claim 4, further including a memory, wherein the processor is configured to store data representative of the signature in the memory.

9. A portable audience meter as defined by claim 8, wherein the processor is configured to store the user response in the memory.

10. A portable audience meter as defined by claim 4, wherein the programming content includes at least one of visual and audio content.

11. A portable audience meter comprising:

a sensor to observe a media presentation;

a processor coupled to the sensor and configured to acquire a signature of the media presentation;

an input device coupled to the processor and configured to provide to the processor a user response to a prompt observed by the user; and

a housing in which the sensor, the processor, and the input device are contained, wherein the housing is wearable by the user.

12. A portable audience meter as defined by claim 11, wherein the processor is further configured to generate an output signal, the portable audience meter further including an output device coupled to the processor and configured to receive the output signal and to generate the prompt.

13. A portable audience meter as defined by claim 12, wherein the prompt includes allowing the user to express one of approval and disapproval of the media presentation observed by the sensor.

14. A portable audience meter as defined by claim 12, wherein the sensor includes at least one of an optical sensor and an audio sensor.

15. A portable audience meter as defined by claim 12, wherein the output device includes at least one of a vibrator, a visual alert, and an audio alert.

16. A portable audience meter as defined by claim 12, wherein the output device comprises a visual display and wherein the prompt comprises text presented to the user on the visual display.

17. A portable audience meter as defined by claim 11, further including a memory, wherein the processor is configured to store data representative of the signature.

18. A portable audience meter as defined by claim 17, wherein the processor is configured to store the user response in the memory.

19. A portable audience meter as defined by claim 11, wherein the media presentation includes at least one of visual and audio content.

20. A method of measuring media consumption using a portable device, the method comprising:

observing a media presentation with a sensor located in a housing wearable by a user;

acquiring a signature of the media presentation;

prompting a user to input a response; and

receiving from the user the response.

21. A method as defined by claim 20, further including requesting the user to express one of approval and disapproval of the media presentation corresponding to the signature.

22. A method as defined by claim 20, wherein prompting the user comprises presenting textual information on a visual display.

23. A method as defined by claim 20, further including storing data representative of the signature.

24. A method as defined by claim 23, further including transmitting the data representative of the signature of the media presentation to a data collection service.

25. A method as defined by claim 20, wherein the sensor includes at least one of an optical sensor and an audio sensor.

26. A method as defined by claim 20, wherein the media presentation includes at least one of visual and audio content.

27. An article of manufacture comprising a machine-accessible medium having a plurality of machine accessible instructions that, when executed, cause a machine including a sensor and an input device to:

read a sensor that observes a media presentation, wherein the sensor is located in a housing wearable by a user;

acquire a signature of the media presentation observed by the sensor; and

receive from the input device a user response to a prompt observed by the user.

28. An article of manufacture as defined by claim 27, wherein the machine further includes an output device, the article further including machine-accessible instructions that, when executed, cause a machine to generate an output signal that causes the output device to generate a the prompt.

29. An article of manufacture as defined by claim 27, further including machine-accessible instructions that, when executed, cause a machine to request the user to express one of approval and disapproval of the media presentation corresponding to the signature.

30. An article of manufacture as defined by claim 27, further including machine-accessible instructions that, when executed, cause a machine to store data representative of the signature.

31. An article of manufacture as defined by claim 30, further including machine-accessible instructions that, when executed, cause a machine to store the user response in the memory.

32. An article of manufacture as defined by claim 27, wherein the machine further includes a data connection through which data is transferred from the machine, the article further including machine-accessible instructions that, when executed, cause the machine to export data stored within the machine.

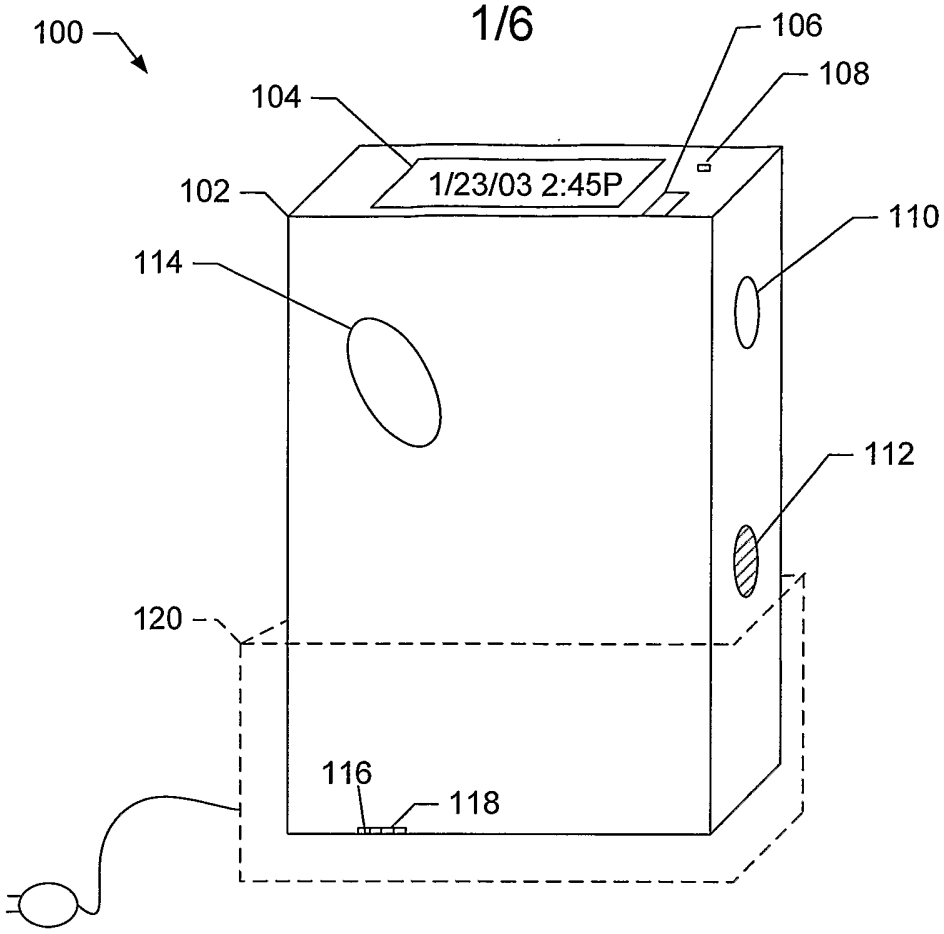
100
104
106
108
102
1/23/03 2:45P
110
114
112
120
116
118

FIG. 1

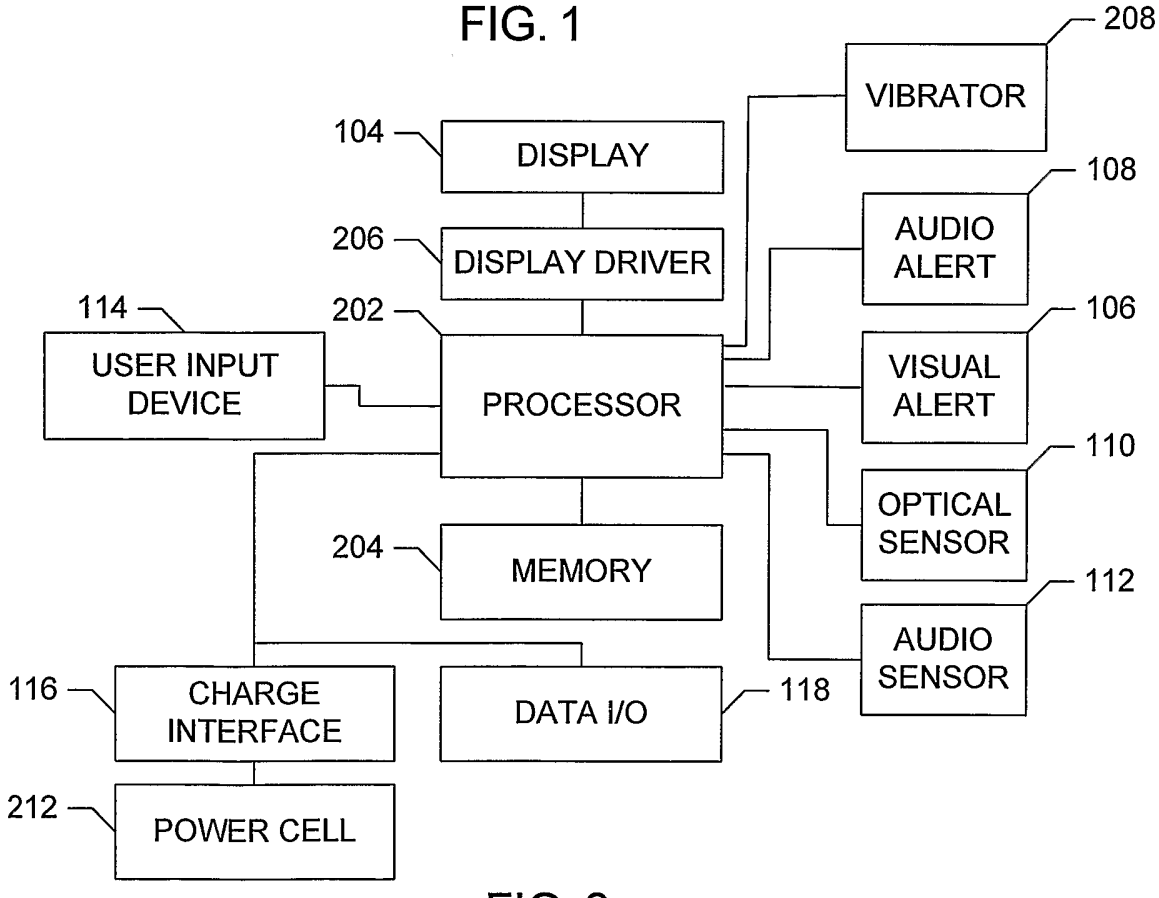
208
VIBRATOR
104
DISPLAY
108
AUDIO ALERT
206
DISPLAY DRIVER
114
USER INPUT DEVICE
202
PROCESSOR
106
VISUAL ALERT
110
OPTICAL SENSOR
204
MEMORY
112
AUDIO SENSOR
116
CHARGE INTERFACE
DATA I/O
118
212
POWER CELL

FIG. 2

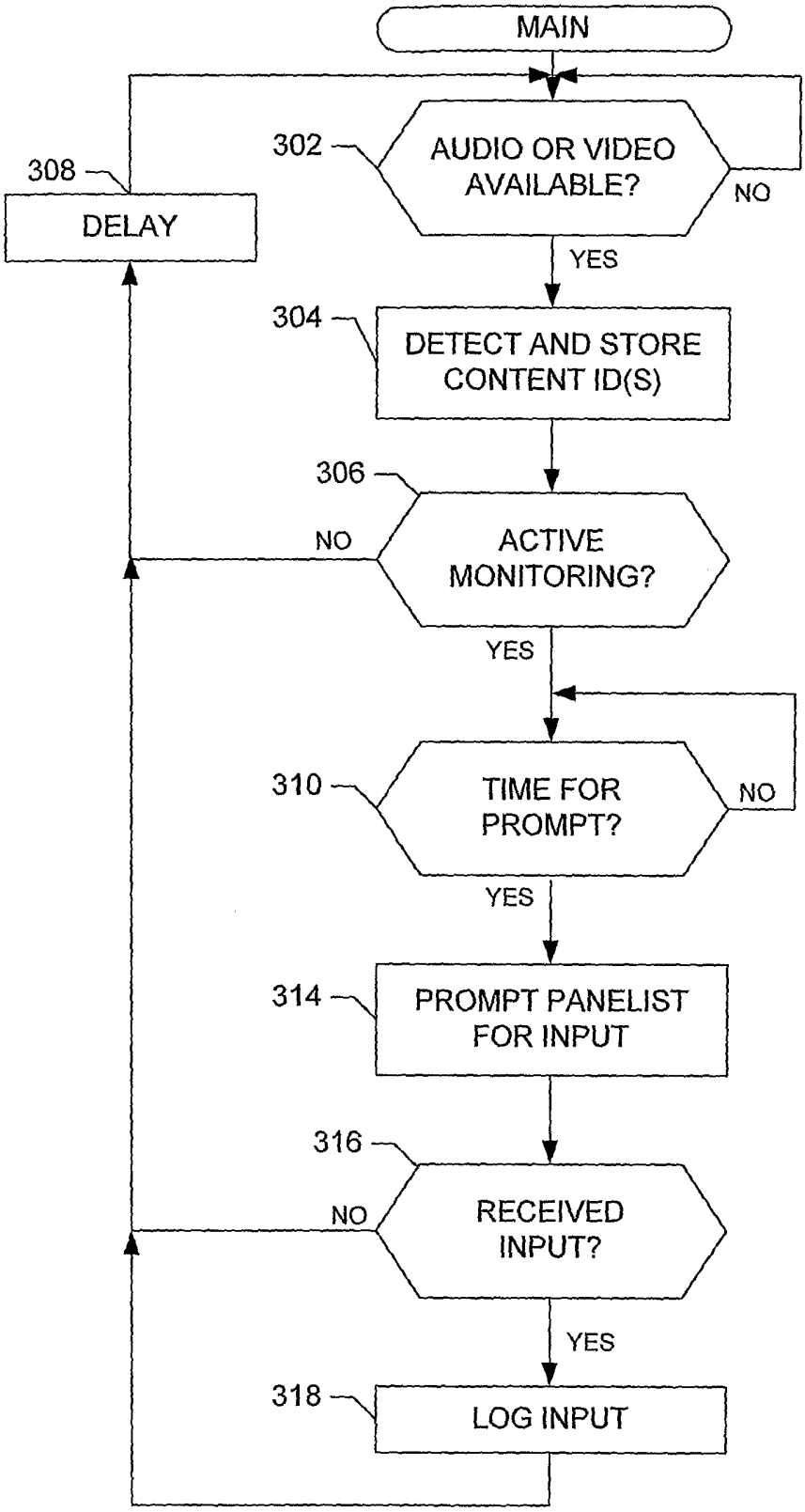
MAIN
302
AUDIO OR VIDEO AVAILABLE?
NO
YES
308
DELAY
304
DETECT AND STORE CONTENT ID(S)
306
NO
ACTIVE MONITORING?
YES
310
TIME FOR PROMPT?
NO
YES
314
PROMPT PANELIST FOR INPUT
316
NO
RECEIVED INPUT?
YES
318
LOG INPUT

FIG. 3

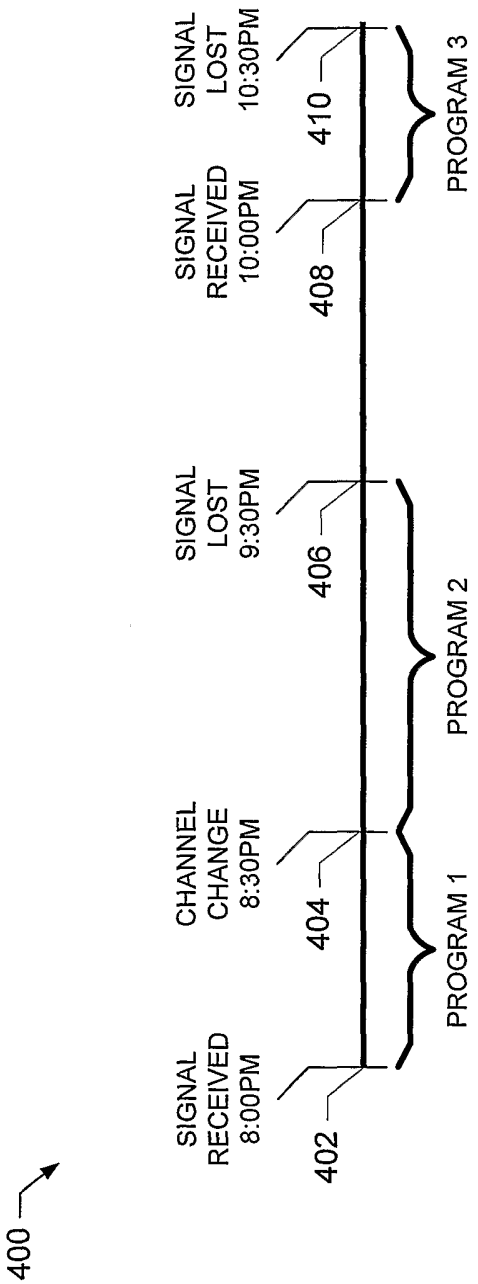
400
SIGNAL RECEIVED 8:00PM
CHANNEL CHANGE 8:30PM
SIGNAL LOST 9:30PM
SIGNAL RECEIVED 10:00PM
SIGNAL LOST 10:30PM
402
404
406
408
410
PROGRAM 1
PROGRAM 2
PROGRAM 3

FIG. 4

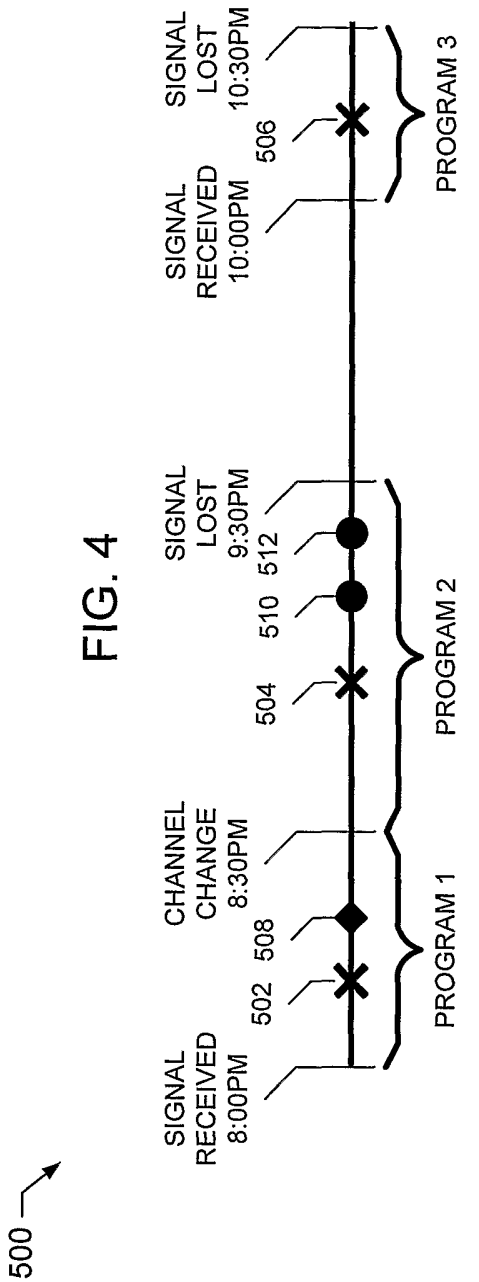
500
SIGNAL RECEIVED 8:00PM
CHANNEL CHANGE 8:30PM
SIGNAL LOST 9:30PM
SIGNAL RECEIVED 10:00PM
SIGNAL LOST 10:30PM
502
508
504
510
512
506
PROGRAM 1
PROGRAM 2
PROGRAM 3

FIG. 5

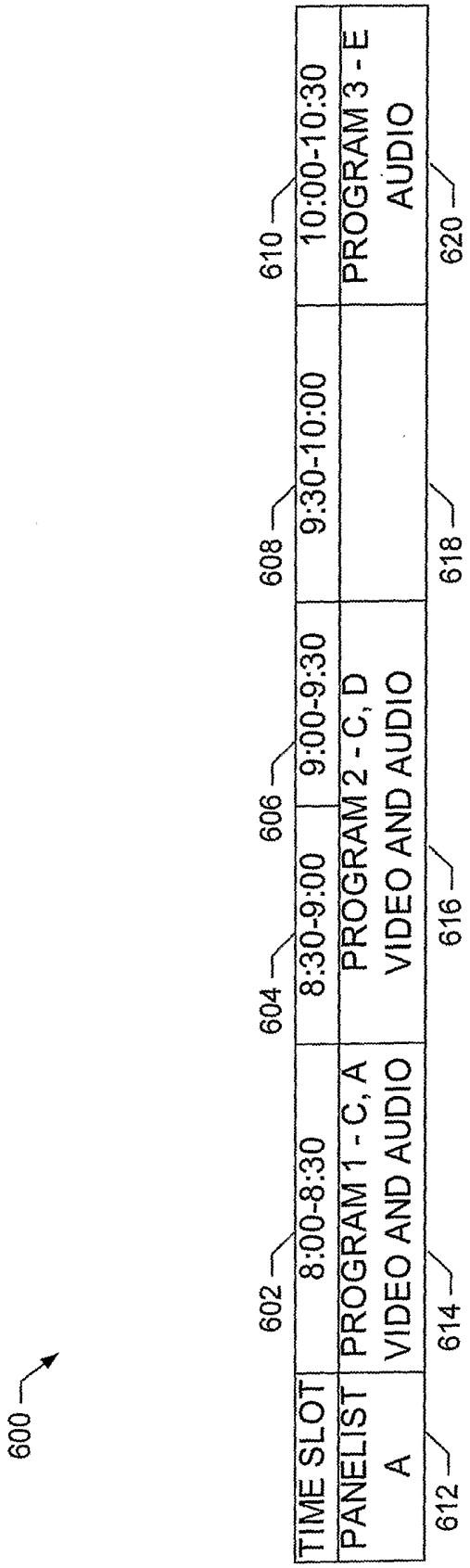
600
TIME SLOT
8:00-8:30
8:30-9:00
9:00-9:30
9:30-10:00
10:00-10:30
PANELIST A
PROGRAM 1 - C, A VIDEO AND AUDIO
PROGRAM 2 - C, D VIDEO AND AUDIO
PROGRAM 3 - E AUDIO
602
604
606
608
610
612
614
616
618
620

FIG. 6

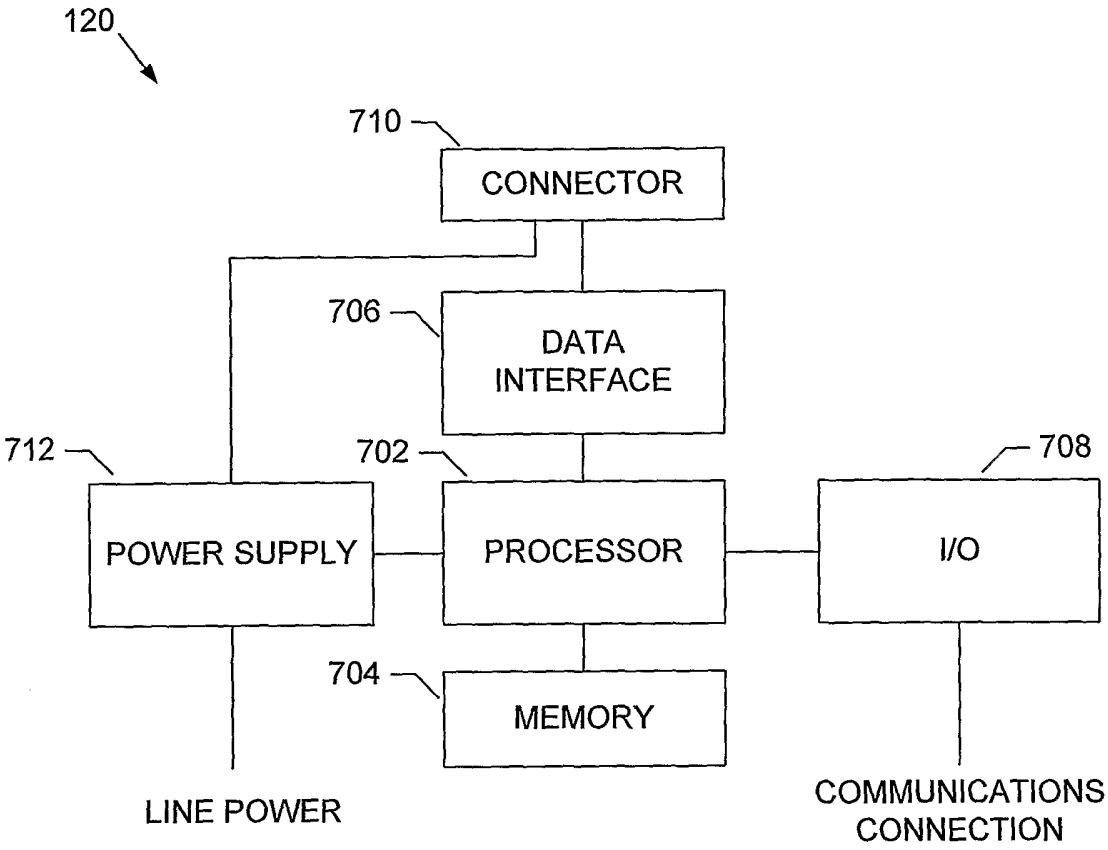
120
710
CONNECTOR
706
DATA INTERFACE
712
702
708
POWER SUPPLY
PROCESSOR
I/O
704
MEMORY
LINE POWER
COMMUNICATIONS CONNECTION

FIG. 7

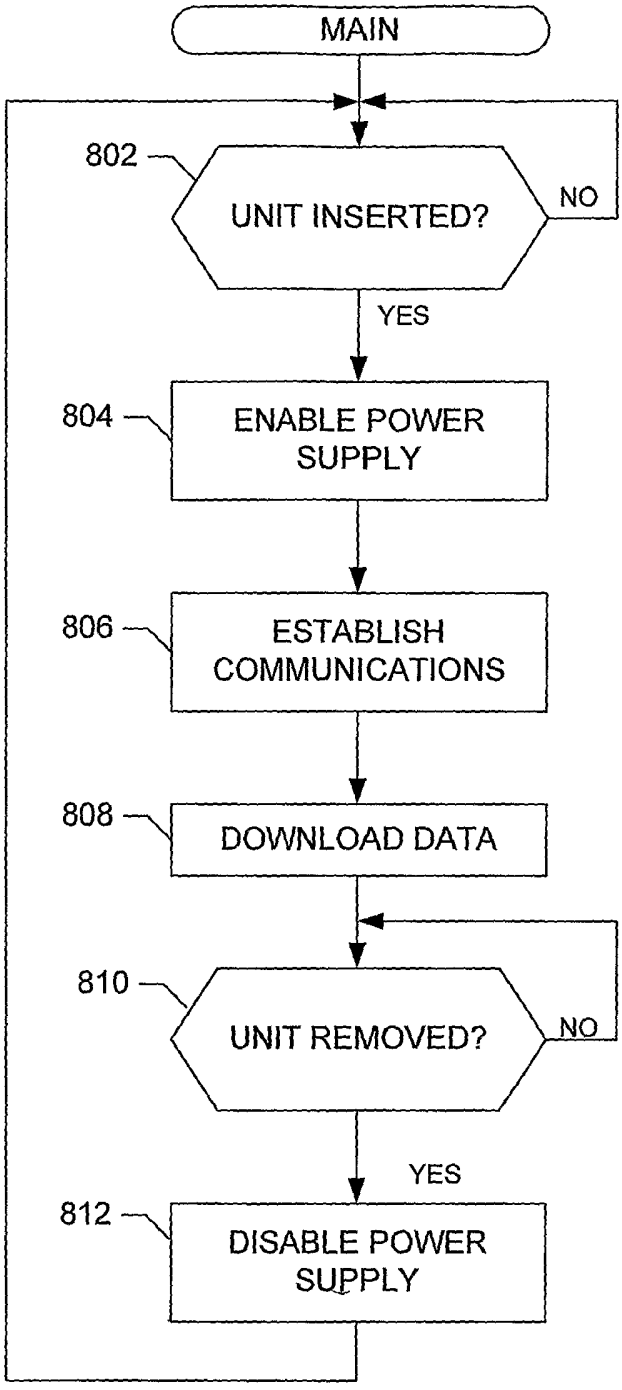
MAIN
802
UNIT INSERTED?
NO
YES
804
ENABLE POWER SUPPLY
806
ESTABLISH COMMUNICATIONS
808
DOWNLOAD DATA
810
UNIT REMOVED?
NO
YES
812
DISABLE POWER SUPPLY

FIG. 8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US03/27335

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : H04N 9/00, 7/16, 7/173
US CL : 725/9, 24

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)
U.S. : 725/9-20, 22, 24

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 5,483,276 (BROOKS et al) 09 January 1996 (09.01.1996), col. 4, lines 6-3462-67; col. 5, lines 1-16, col. 6, line 52 - col. 8, line 19; col. 8, lines 25-64; col. 9, lines 14-26, 44 - col. 10, line 6; col. 10, lines 50-61; col 15, lines 46-55; col. 16, lines 17-23.	1-4, 6-12, 14-20, 22-28, 30-32 --- 5, 13, 21, 29
Y	US 2003/0033600 A1 (CLIFF et al) 13 February 2003 (13.02.2003), page 2, col. 2, paragraph 0029.	5, 13, 21, 29
A	US 5,481,294 (THOMAS et al) 02 January 1996 (02.01.1996), col. 9, lines 21-35; col. 10, lines 21-67; col. 11, lines 1-14; col. 11, line 62 - col. 12, line 37; col. 14, lines 1-13; col. 15, lines 1-13	1, 6, 8, 10-11, 14, 17, 19-20, 23-27, 30, 32
A	US 6,421,445 B1 (JENSEN et al) 16 July 2002 (16.07.2002), col. 32, line 10 - col. 33, line 22.	1, 11, 20, 27
A	US 6,466,765 B1 (TANAKA et al) 15 October 2002 (15.10.2002), col. 6, line 49 - col. 16, line 25.	1-32
A	US 2003/0005430 A1 (KOLESSAR) 2 January 2003 (02.01.2003)	1, 6, 8, 10-11, 14, 17, 19-20, 23-27, 30, 32
A	US 2003/0101451 A1 (BENTOLILA et al) 29 May 2003 (29.05.2003)	1-32

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

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"E" earlier application or patent published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search
22 February 2004 (22.02.2004)

Date of mailing of the international search report
24 MAR 2004

Name and mailing address of the ISA/US
Mail Stop PCT, Attn: ISA/US
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Alexandria, Virginia 22313-1450
Facsimile No. (703) 305-3230

Authorized officer
John W. Miller

Telephone No. (703) 305-3900

Form PCT/ISA/210 (second sheet) (July 1998)

INTERNATIONAL SEARCH REPORT

C. (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A,E	US 6,647,548 B1 (LU et al) 11 November 2003 (11.11.2003), col. 6, lines 14-35; col. 7, line 6 - col. 8, line 35; col. 9, line 49 - col. 19	1-32
A	US 6,035,177 (MOSES et al) 07 March 2000 (07.03.2000)	1-32
X --- Y	US 6,467,089 B1 (AUST et al) 15 October 2002 (15.10.2002), col. 3, line 5 - col. 4, line 48; col. 5, line 33 - col. 6, line 36; col. 7, lines 13-31; col. 7, line 55 - col. 9, line 53.	1-4, 6-12, 14-20, 22-28, 30-32 --- 5, 13, 21, 29

Continuation of B. FIELDS SEARCHED Item 3:
USPTO internal - search terms: surveying, monitoring, observation, opinion, program characteristics, user response, reaction or feedback, pattern recognition, signature, exposure, consumption