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(54) Title of the Invention: **Entertainment system and method of user interaction**
Abstract Title: **A method of crediting users for use of broadcast media**

(57) An entertainment system (e.g. a games console)
includes a broadcast reception means (e.g. a TV tuner,
cable tuner, internet connection), a memory and a
processor that can monitor usage of the broadcast
reception means (e.g. by monitoring the channel tuned
to, embedded EPG information or data embedded in
the audio or video stream). If the usage satisfies a
usage criterion (e.g. percentage of media watched,
media recorded or media share via a peer to peer
network) the processor records to the memory means a
credit subsequently redeemable by the entertainment
system for goods or services (e.g. game content,
another broadcast item). A viewer may therefore be
rewarded for watching programs or adverts.
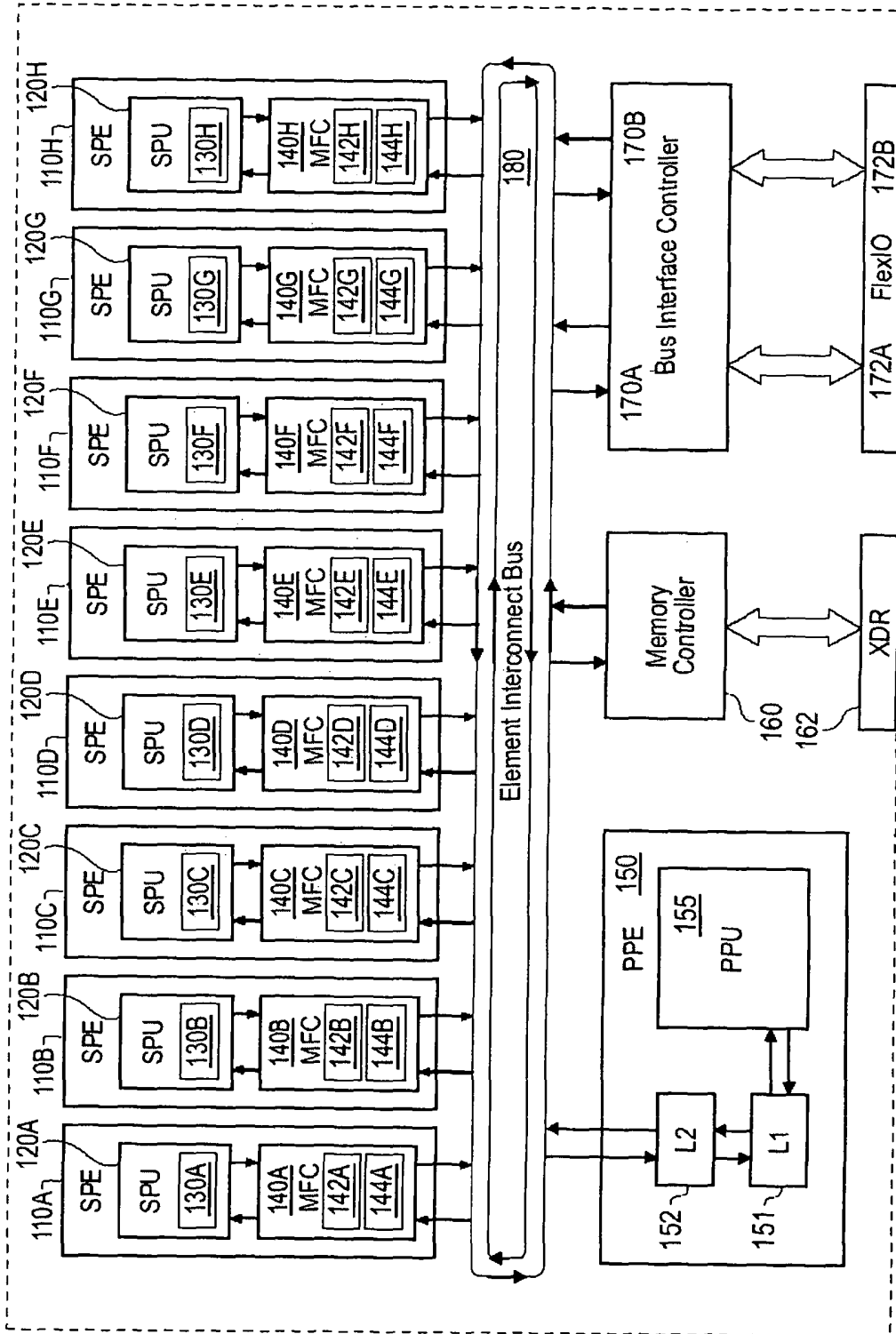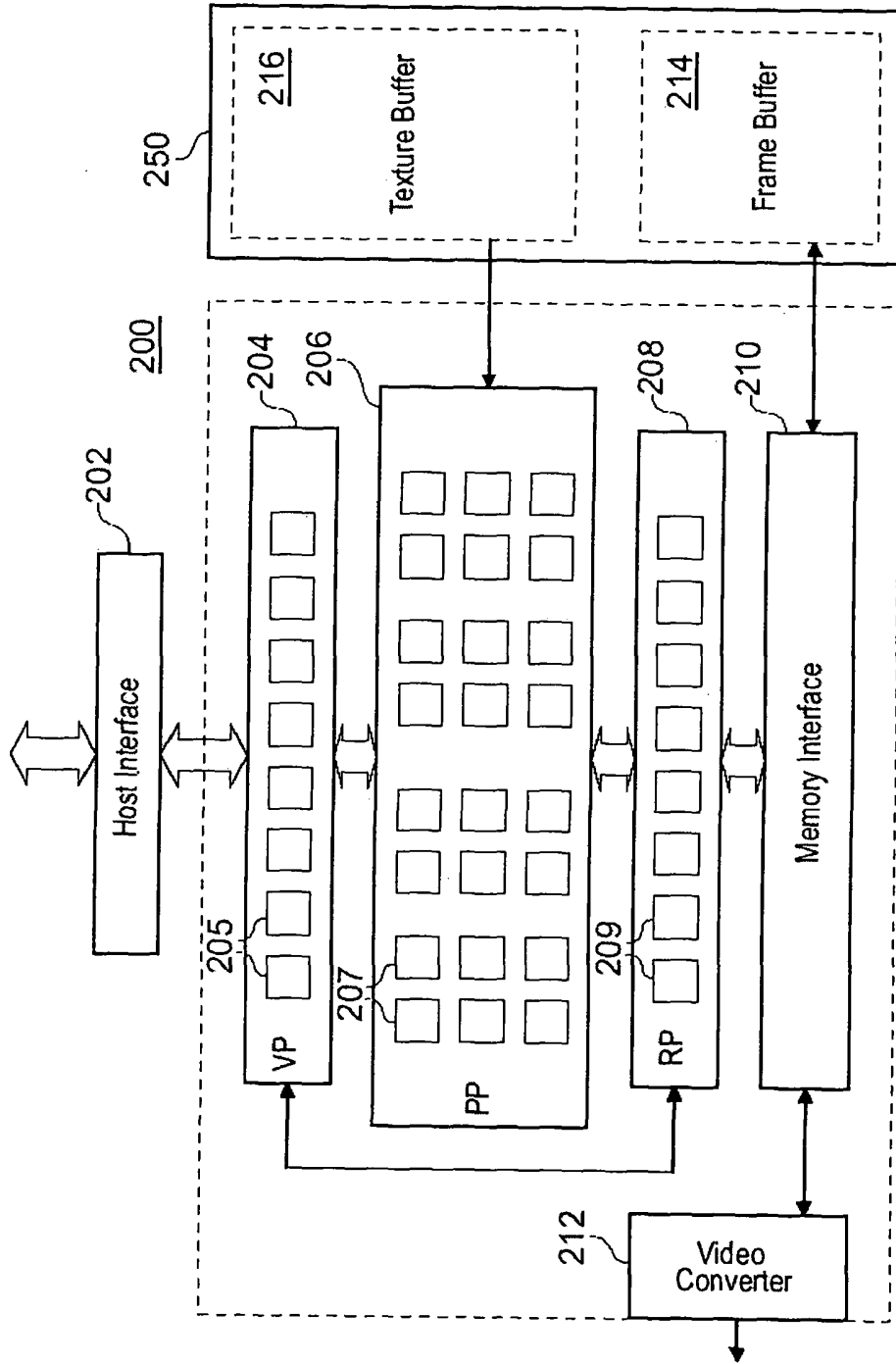

Figure 5

Fig. 1

Fig. 2

Fig. 3

900

910

920

USB

Figure 4

950

900

10

1010

1020

Figure 5

2020   2010

2030

Figure 6

Tune into a broadcast with a broadcast receiver | s10

Monitor usage of the broadcast receiver | s20

Detect if that usage satisfies a usage criterion | s30

And if so, record to a memory means of an entertainment system a credit subsequently redeemable via the entertainment system for goods or services | s40
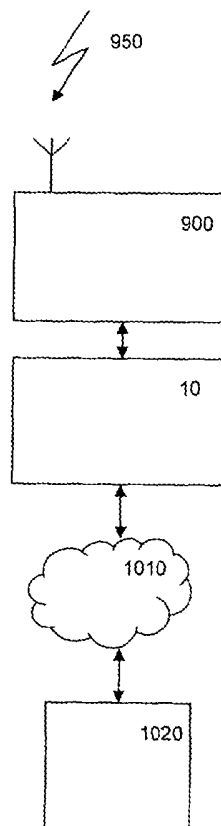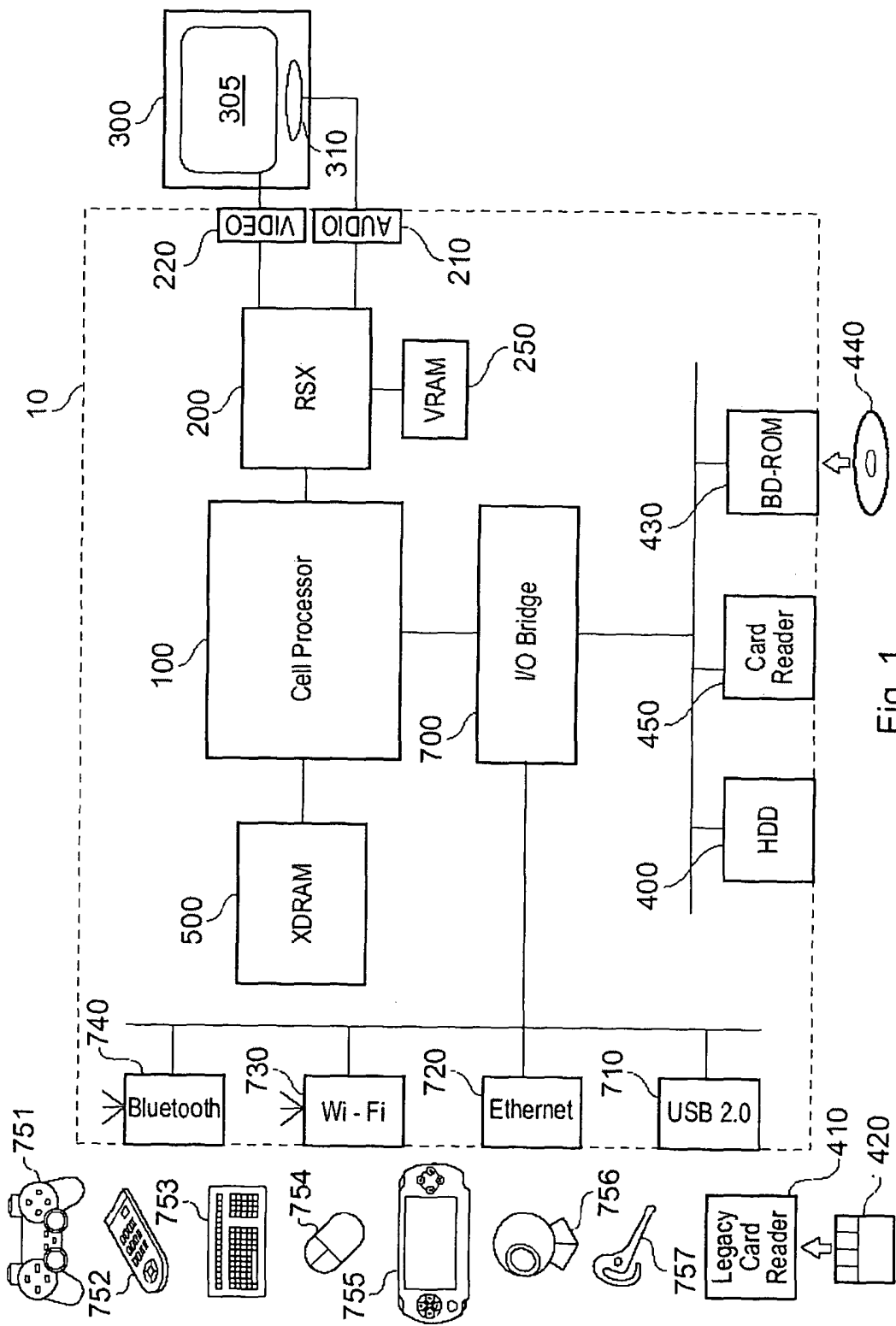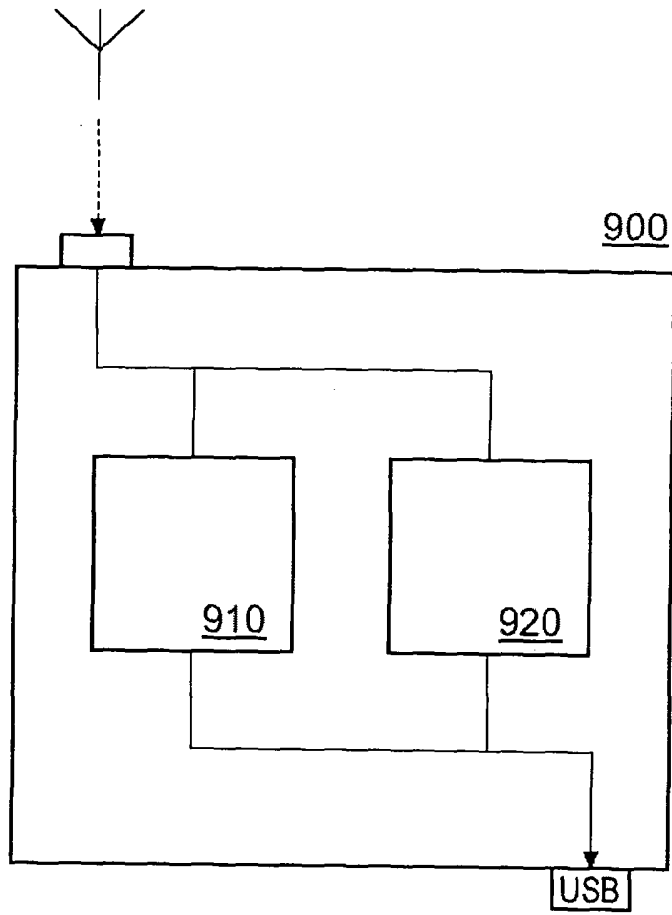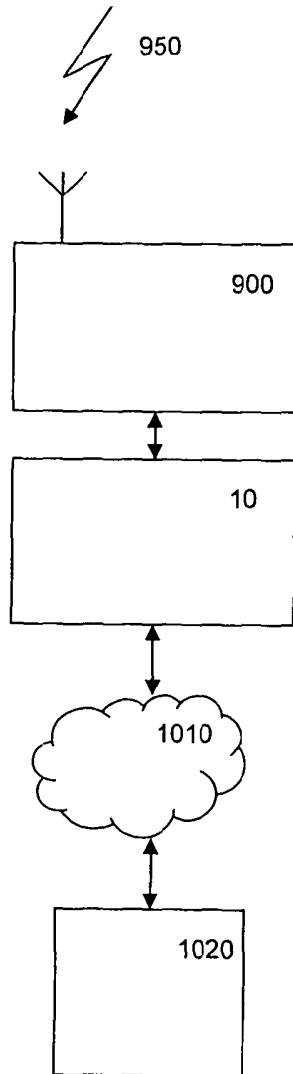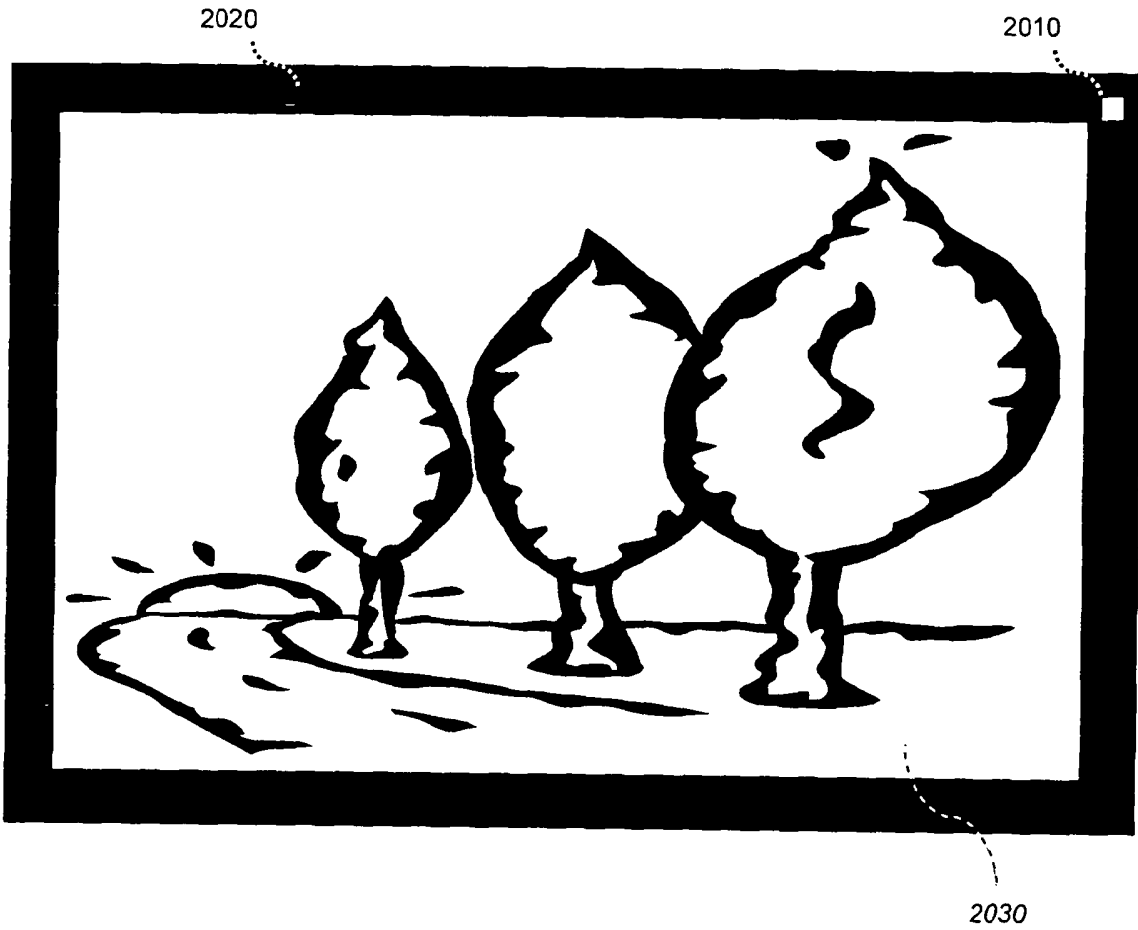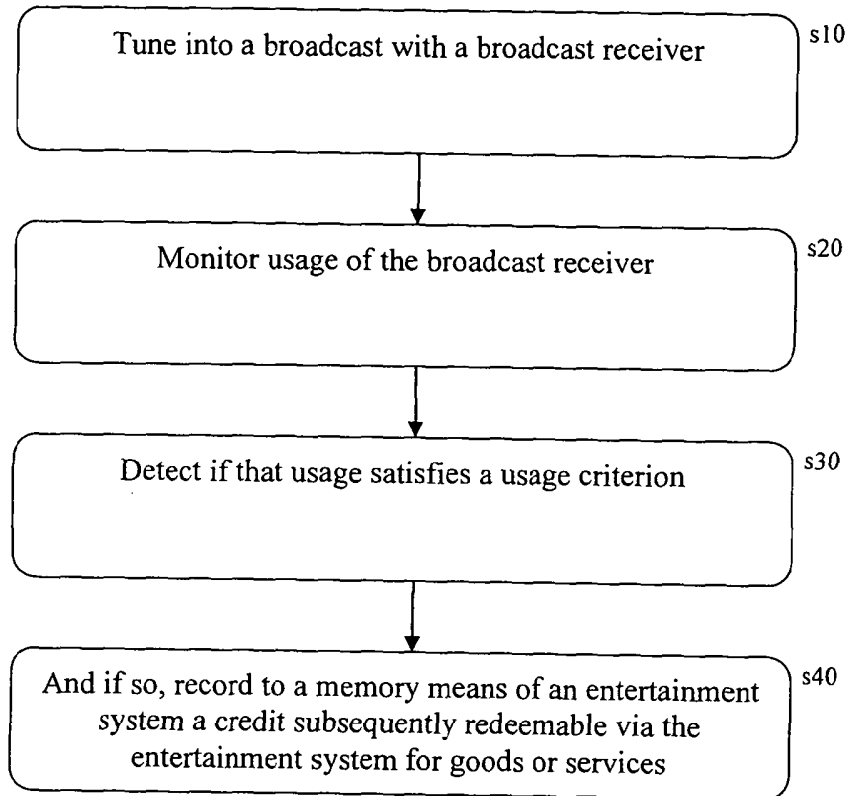
Figure 7

ENTERTAINMENT SYSTEM AND METHOD OF USER INTERACTION

The present invention relates to entertainment systems and methods of user interaction.

5   There are several known systems that monitor television viewing habits for the purposes of gauging, from a programme's audience figures, what to charge for adverts associated with that programme.

Set-top boxes such as those of Sky® television are able to determine what channel is watched at what times, and to report this information back to a central agency which can

10   determine overall viewing figures for different programmes.

Similarly, the Nielsen rating system uses a set-top box dedicated to the purpose of determining user viewing habits. An example of such a set-top box is a so-called 'people meter' (http://en.wikipedia.org/wiki/People_meter). Whilst most versions do not require participation from broadcasters, one option is for a broadcaster to include a signal in the

15   video and audio of their broadcast which a people meter can detect, enabling the determination of ratings when the meter reports its data.

However, whilst such systems are directed to measuring user viewing patterns they are not intended to influence them, even though this may be of significant interest to broadcasters or advertisers wishing to promote certain programmes or adverts.

20   Embodiments of the present invention aim to mitigate or alleviate the above problem.

In a first aspect, an entertainment system comprises a broadcast reception means, a memory means, a processor operable to monitor usage of the broadcast reception means, and operable to detect if that usage satisfies a usage criterion, and in which in response to the usage satisfying the usage criterion, the processor is operable to record to the memory means

25   a credit subsequently redeemable by the entertainment system for goods or services.

In another aspect, a method of user interaction comprising the steps of accessing a broadcast with a broadcast reception means, monitoring usage of the broadcast reception means, detecting if that usage satisfies a usage criterion, and in response to the usage satisfying the usage criterion, recording to a memory means of an entertainment system a

30   credit subsequently redeemable via the entertainment system for goods or services.

Advantageously, this enables viewers to be rewarded for viewing programmes or adverts, and/or provides a mechanism to entice viewers to view an advert or programme.

Further respective aspects and features of the invention are defined in the appended claims.

Embodiments of the present invention will now be described by way of example with reference to the accompanying drawings, in which:

5   Figure 1 is a schematic diagram of an entertainment device;

Figure 2 is a schematic diagram of a processor of the entertainment device;

Figure 3 is a schematic diagram of a video processor of the entertainment device;

Figure 4 is a schematic diagram of a dual channel television tuner;

Figure 5 is a schematic diagram of an entertainment system in accordance with an

10   embodiment of the present invention;

Figure 6 is a schematic diagram of a video frame in accordance with an embodiment of the present invention; and

Figure 7 is a flow diagram of a method of video interaction in accordance with an embodiment of the present invention.

15   An apparatus and method of video interaction are disclosed. In the following description, a number of specific details are presented in order to provide a thorough understanding of the embodiments of the present invention. It will be apparent, however, to a person skilled in the art that these specific details need not be employed to practise the present invention. Conversely, specific details known to the person skilled in the art are

20   omitted for the purposes of clarity where appropriate.

In an example embodiment of the present invention, an entertainment system comprises an entertainment device such as a Sony® PlayStation 3® device that is operably coupled to a television tuner. This system is arranged such that television broadcasts can be displayed via the PlayStation device and optionally recorded to its hard drive. The

25   PlayStation device is further able to detect if data indicates that a particular broadcast item is associated with a credit for viewing at least a minimum proportion of the broadcast item. The PlayStation device monitors the viewing behaviour of the user (by detecting what channel the tuner is tuned to and hence what is being displayed or recorded by the PlayStation device) and if the minimum proportion of the broadcast is viewed or recorded then a credit is

30   awarded and recorded by the PlayStation device. This credit can then be redeemed for all or part of other goods and services, such as further programmes / channels, new game content, or discounts on goods and services available on-line. An additional viewer behaviour that can earn credits is to distribute approved broadcasts to other entertainment devices via a

peer-to-peer internet connection, either between friends or as part of a distributed video-on-demand service.

Referring now to Figures 1 to 4, in an embodiment of the present invention the entertainment system comprises a Sony® PlayStation 3® entertainment device operably coupled to a dual digital TV tuner, as noted above.

Figure 1 schematically illustrates the overall system architecture of the Sony® PlayStation 3® entertainment device. A system unit 10 is provided, with various peripheral devices connectable to the system unit.

The system unit 10 comprises: a Cell processor 100; a Rambus® dynamic random access memory (XDRAM) unit 500; a Reality Synthesiser graphics unit 200 with a dedicated video random access memory (VRAM) unit 250; and an I/O bridge 700.

The system unit 10 also comprises a Blu Ray® Disk BD-ROM® optical disk reader 430 for reading from a disk 440 and a removable slot-in hard disk drive (HDD) 400, accessible through the I/O bridge 700. Optionally the system unit also comprises a memory card reader 450 for reading compact flash memory cards, Memory Stick® memory cards and the like, which is similarly accessible through the I/O bridge 700.

The I/O bridge 700 also connects to four Universal Serial Bus (USB) 2.0 ports 710; a gigabit Ethernet port 720; an IEEE 802.11b/g wireless network (Wi-Fi) port 730; and a Bluetooth® wireless link port 740 capable of supporting up to seven Bluetooth connections.

In operation the I/O bridge 700 handles all wireless, USB and Ethernet data, including data from one or more game controllers 751. For example when a user is playing a game, the I/O bridge 700 receives data from the game controller 751 via a Bluetooth link and directs it to the Cell processor 100, which updates the current state of the game accordingly.

The wireless, USB and Ethernet ports also provide connectivity for other peripheral devices in addition to game controllers 751, such as: a remote control 752; a keyboard 753; a mouse 754; a portable entertainment device 755 such as a Sony PlayStation Portable® entertainment device; a video camera such as an EyeToy® video camera 756; and a microphone headset 757. Such peripheral devices may therefore in principle be connected to the system unit 10 wirelessly; for example the portable entertainment device 755 may communicate via a Wi-Fi ad-hoc connection, whilst the microphone headset 757 may communicate via a Bluetooth link.

The provision of these interfaces means that the PlayStation 3 device is also potentially compatible with other peripheral devices such as digital video recorders (DVRs),

set-top boxes, digital cameras, portable media players, Voice over IP telephones, mobile telephones, printers and scanners.

In addition, a legacy memory card reader 410 may be connected to the system unit via a USB port 710, enabling the reading of memory cards 420 of the kind used by the PlayStation® or PlayStation 2® devices.

In the present embodiment, the game controller 751 is operable to communicate wirelessly with the system unit 10 via the Bluetooth link. However, the game controller 751 can instead be connected to a USB port, thereby also providing power by which to charge the battery of the game controller 751. In addition to one or more analogue joysticks and conventional control buttons, the game controller is sensitive to motion in 6 degrees of freedom, corresponding to translation and rotation in each axis. Consequently gestures and movements by the user of the game controller may be translated as inputs to a game in addition to or instead of conventional button or joystick commands. Optionally, other wirelessly enabled peripheral devices such as the PlayStation Portable device may be used as a controller. In the case of the PlayStation Portable device, additional game or control information (for example, control instructions or number of lives) may be provided on the screen of the device. Other alternative or supplementary control devices may also be used, such as a dance mat (not shown), a light gun (not shown), a steering wheel and pedals (not shown) or bespoke controllers, such as a single or several large buttons for a rapid-response quiz game (also not shown).

The remote control 752 is also operable to communicate wirelessly with the system unit 10 via a Bluetooth link. The remote control 752 comprises controls suitable for the operation of the Blu Ray Disk BD-ROM reader 430 and for the navigation of disk content.

The Blu Ray Disk BD-ROM reader 430 is operable to read CD-ROMs compatible with the PlayStation and PlayStation 2 devices, in addition to conventional pre-recorded and recordable CDs, and so-called Super Audio CDs. The reader 430 is also operable to read DVD-ROMs compatible with the PlayStation 2 and PlayStation 3 devices, in addition to conventional pre-recorded and recordable DVDs. The reader 430 is further operable to read BD-ROMs compatible with the PlayStation 3 device, as well as conventional pre-recorded and recordable Blu-Ray Disks.

The system unit 10 is operable to supply audio and video, either generated or decoded by the PlayStation 3 device via the Reality Synthesiser graphics unit 200, through audio and video connectors to a display and sound output device 300 such as a monitor or

television set having a display 305 and one or more loudspeakers 310. The audio connectors 210 may include conventional analogue and digital outputs whilst the video connectors 220 may variously include component video, S-video, composite video and one or more High Definition Multimedia Interface (HDMI) outputs. Consequently, video output may be in

5   formats such as PAL or NTSC, or in 720p, 1080i or 1080p high definition.

Audio processing (generation, decoding and so on) is performed by the Cell processor 100. The PlayStation 3 device's operating system supports Dolby® 5.1 surround sound, Dolby® Theatre Surround (DTS), and the decoding of 7.1 surround sound from Blu-Ray® disks.

10   In the present embodiment, the video camera 756 comprises a single charge coupled device (CCD), an LED indicator, and hardware-based real-time data compression and encoding apparatus so that compressed video data may be transmitted in an appropriate format such as an intra-image based MPEG (motion picture expert group) standard for decoding by the system unit 10. The camera LED indicator is arranged to illuminate in

15   response to appropriate control data from the system unit 10, for example to signify adverse lighting conditions. Embodiments of the video camera 756 may variously connect to the system unit 10 via a USB, Bluetooth or Wi-Fi communication port. Embodiments of the video camera may include one or more associated microphones and also be capable of transmitting audio data. In embodiments of the video camera, the CCD may have a

20   resolution suitable for high-definition video capture. In use, images captured by the video camera may for example be incorporated within a game or interpreted as game control inputs.

In general, in order for successful data communication to occur with a peripheral device such as a video camera or remote control via one of the communication ports of the

25   system unit 10, an appropriate piece of software such as a device driver should be provided. Device driver technology is well-known and will not be described in detail here, except to say that the skilled man will be aware that a device driver or similar software interface may be required in the present embodiment described.

Referring now to Figure 2, the Cell processor 100 has an architecture comprising four

30   basic components: external input and output structures comprising a memory controller 160 and a dual bus interface controller 170A,B; a main processor referred to as the Power Processing Element 150; eight co-processors referred to as Synergistic Processing Elements (SPEs) 110A-H; and a circular data bus connecting the above components referred to as the

Element Interconnect Bus 180. The total floating point performance of the Cell processor is 218 GFLOPS, compared with the 6.2 GFLOPs of the PlayStation 2 device's Emotion Engine.

The Power Processing Element (PPE) 150 is based upon a two-way simultaneous multithreading Power 970 compliant PowerPC core (PPU) 155 running with an internal clock of 3.2 GHz. It comprises a 512 kB level 2 (L2) cache and a 32 kB level 1 (L1) cache. The PPE 150 is capable of eight single position operations per clock cycle, translating to 25.6 GFLOPs at 3.2 GHz. The primary role of the PPE 150 is to act as a controller for the Synergistic Processing Elements 110A-H, which handle most of the computational workload. In operation the PPE 150 maintains a job queue, scheduling jobs for the Synergistic Processing Elements 110A-H and monitoring their progress. Consequently each Synergistic Processing Element 110A-H runs a kernel whose role is to fetch a job, execute it and synchronise with the PPE 150.

Each Synergistic Processing Element (SPE) 110A-H comprises a respective Synergistic Processing Unit (SPU) 120A-H, and a respective Memory Flow Controller (MFC) 140A-H comprising in turn a respective Dynamic Memory Access Controller (DMAC) 142A-H, a respective Memory Management Unit (MMU) 144A-H and a bus interface (not shown). Each SPU 120A-H is a RISC processor clocked at 3.2 GHz and comprising 256 kB local RAM 130A-H, expandable in principle to 4 GB. Each SPE gives a theoretical 25.6 GFLOPS of single precision performance. An SPU can operate on 4 single precision floating point members, 4 32-bit numbers, 8 16-bit integers, or 16 8-bit integers in a single clock cycle. In the same clock cycle it can also perform a memory operation. The SPU 120A-H does not directly access the system memory XDRAM 500; the 64-bit addresses formed by the SPU 120A-H are passed to the MFC 140A-H which instructs its DMA controller 142A-H to access memory via the Element Interconnect Bus 180 and the memory controller 160.

The Element Interconnect Bus (EIB) 180 is a logically circular communication bus internal to the Cell processor 100 which connects the above processor elements, namely the PPE 150, the memory controller 160, the dual bus interface 170A,B and the 8 SPEs 110A-H, totalling 12 participants. Participants can simultaneously read and write to the bus at a rate of 8 bytes per clock cycle. As noted previously, each SPE 110A-H comprises a DMAC 142A-H for scheduling longer read or write sequences. The EIB comprises four channels, two each in clockwise and anti-clockwise directions. Consequently for twelve participants,

the longest step-wise data-flow between any two participants is six steps in the appropriate direction. The theoretical peak instantaneous EIB bandwidth for 12 slots is therefore 96B per clock, in the event of full utilisation through arbitration between participants. This equates to a theoretical peak bandwidth of 307.2 GB/s (gigabytes per second) at a clock rate of 3.2GHz.

The memory controller 160 comprises an XDRAM interface 162, developed by Rambus Incorporated. The memory controller interfaces with the Rambus XDRAM 500 with a theoretical peak bandwidth of 25.6 GB/s.

The dual bus interface 170A,B comprises a Rambus FlexIO® system interface 172A,B. The interface is organised into 12 channels each being 8 bits wide, with five paths being inbound and seven outbound. This provides a theoretical peak bandwidth of 62.4 GB/s (36.4 GB/s outbound, 26 GB/s inbound) between the Cell processor and the I/O Bridge 700 via controller 170A and the Reality Simulator graphics unit 200 via controller 170B.

Data sent by the Cell processor 100 to the Reality Simulator graphics unit 200 will typically comprise display lists, being a sequence of commands to draw vertices, apply textures to polygons, specify lighting conditions, and so on.

Referring now to Figure 3, the Reality Simulator graphics (RSX) unit 200 is a video accelerator based upon the NVidia® G70/71 architecture that processes and renders lists of commands produced by the Cell processor 100. The RSX unit 200 comprises a host interface 202 operable to communicate with the bus interface controller 170B of the Cell processor 100; a vertex pipeline 204 (VP) comprising eight vertex shaders 205; a pixel pipeline 206 (PP) comprising 24 pixel shaders 207; a render pipeline 208 (RP) comprising eight render output units (ROPs) 209; a memory interface 210; and a video converter 212 for generating a video output. The RSX 200 is complemented by 256 MB double data rate (DDR) video RAM (VRAM) 250, clocked at 600MHz and operable to interface with the RSX 200 at a theoretical peak bandwidth of 25.6 GB/s. In operation, the VRAM 250 maintains a frame buffer 214 and a texture buffer 216. The texture buffer 216 provides textures to the pixel shaders 207, whilst the frame buffer 214 stores results of the processing pipelines. The RSX can also access the main memory 500 via the EIB 180, for example to load textures into the VRAM 250.

The vertex pipeline 204 primarily processes deformations and transformations of vertices defining polygons within the image to be rendered.

The pixel pipeline 206 primarily processes the application of colour, textures and lighting to these polygons, including any pixel transparency, generating red, green, blue and

alpha (transparency) values for each processed pixel. Texture mapping may simply apply a graphic image to a surface, or may include bump-mapping (in which the notional direction of a surface is perturbed in accordance with texture values to create highlights and shade in the lighting model) or displacement mapping (in which the applied texture additionally
5   perturbs vertex positions to generate a deformed surface consistent with the texture).

The render pipeline 208 performs depth comparisons between pixels to determine which should be rendered in the final image. Optionally, if the intervening pixel process will not affect depth values (for example in the absence of transparency or displacement mapping) then the render pipeline and vertex pipeline 204 can communicate depth
10   information between them, thereby enabling the removal of occluded elements prior to pixel processing, and so improving overall rendering efficiency. In addition, the render pipeline 208 also applies subsequent effects such as full-screen anti-aliasing over the resulting image.

Both the vertex shaders 205 and pixel shaders 207 are based on the shader model 3.0 standard. Up to 136 shader operations can be performed per clock cycle, with the combined
15   pipeline therefore capable of 74.8 billion shader operations per second, outputting up to 840 million vertices and 10 billion pixels per second. The total floating point performance of the RSX 200 is 1.8 TFLOPS.

Typically, the RSX 200 operates in close collaboration with the Cell processor 100; for example, when displaying an explosion, or weather effects such as rain or snow, a large
20   number of particles must be tracked, updated and rendered within the scene. In this case, the PPU 155 of the Cell processor may schedule one or more SPEs 110A-H to compute the trajectories of respective batches of particles. Meanwhile, the RSX 200 accesses any texture data (e.g. snowflakes) not currently held in the video RAM 250 from the main system memory 500 via the element interconnect bus 180, the memory controller 160 and a bus
25   interface controller 170B. The or each SPE 110A-H outputs its computed particle properties (typically coordinates and normals, indicating position and attitude) directly to the video RAM 250; the DMA controller 142A-H of the or each SPE 110A-H addresses the video RAM 250 via the bus interface controller 170B. Thus in effect the assigned SPEs become part of the video processing pipeline for the duration of the task.

30   In general, the PPU 155 can assign tasks in this fashion to six of the eight SPEs available; one SPE is reserved for the operating system, whilst one SPE is effectively disabled. The disabling of one SPE provides a greater level of tolerance during fabrication of the Cell processor, as it allows for one SPE to fail the fabrication process. Alternatively if

all eight SPEs are functional, then the eighth SPE provides scope for redundancy in the event of subsequent failure by one of the other SPEs during the life of the Cell processor.

The PPU 155 can assign tasks to SPEs in several ways. For example, SPEs may be chained together to handle each step in a complex operation, such as accessing a DVD, video and audio decoding, and error masking, with each step being assigned to a separate SPE. Alternatively or in addition, two or more SPEs may be assigned to operate on input data in parallel, as in the particle animation example above.

Software instructions implemented by the Cell processor 100 and/or the RSX 200 may be supplied at manufacture and stored on the HDD 400, and/or may be supplied on a data carrier or storage medium such as an optical disk or solid state memory, or via a transmission medium such as a wired or wireless network or internet connection, or via combinations of these.

The software supplied at manufacture comprises system firmware and the PlayStation 3 device's operating system (OS). In operation, the OS provides a user interface enabling a user to select from a variety of functions, including playing a game, listening to music, viewing photographs, or viewing a video. The interface takes the form of a so-called cross media-bar (XMB), with categories of function arranged horizontally. The user navigates by moving through the function icons (representing the functions) horizontally using the game controller 751, remote control 752 or other suitable control device so as to highlight a desired function icon, at which point options pertaining to that function appear as a vertically scrollable list of option icons centred on that function icon, which may be navigated in analogous fashion. However, if a game, audio or movie disk 440 is inserted into the BD-ROM optical disk reader 430, the PlayStation 3 device may select appropriate options automatically (for example, by commencing the game), or may provide relevant options (for example, to select between playing an audio disk or compressing its content to the HDD 400).

In addition, the OS provides an on-line capability, including a web browser, an interface with an on-line store from which additional game content, demonstration games (demos) and other media may be downloaded, and a friends management capability, providing on-line communication with other PlayStation 3 device users nominated by the user of the current device; for example, by text, audio or video depending on the peripheral devices available. The on-line capability also provides for on-line communication, content download and content purchase during play of a suitably configured game, and for updating

the firmware and OS of the PlayStation 3 device itself. It will be appreciated that the term "on-line" does not imply the physical presence of wires, as the term can also apply to wireless connections of various types.

Referring now to Figure 4, a dual digital TV tuner 900 comprises a first tuner 910 and a second tuner 920 each operably coupled to an aerial, cable, network or satellite input. Each tuner can independently tune in to digital TV and radio channels available via the input signal, and outputs a respective audio-video data stream. A USB link to a USB port 710 of the PS3 device 10 provides control of the tuners, and routes the output of the tuners to the PS3 device 10. The PS3 device processes any required non-AV data (such as electronic programme guides (EPG), teletext, or parental control data), and routes the AV data to the Reality Simulator graphics unit 200 for output to a display. It will be appreciated that alternatively only a single digital tuner may be provided, and/or that the signals received may be analogue signals which are converted to digital form as part of the processing carried out by the respective tuner or the PS3 device. Furthermore, it will be appreciated that the term "tuner" and the verb to "tune" are used generically, simply to refer to the selection of a desired broadcast item. The terms therefore include but do not necessarily imply an operation to change the carrier frequency detected by a radio-frequency reception arrangement. Other examples of "tuning" in this generic context could include (for example) the selection of a particular digital or analogue cable stream or the selection of one or more particular packetised data streams carrying broadcast items over the internet.

In an embodiment of the present invention, the PS3 device provides user interfaces for operation of the TV tuner, such as for example a presentation of electronic programme guide data, and the interpretation of input data from wireless game controller 751 or remote control 753 to control viewing.

Additionally, the PS3 device monitors the usage of the TV tuner 900.

In particular, it detects whether a specific television broadcast item (being for example either a television or radio programme, an advert, or a particular part of any of these) has been watched or recorded, as inferred by whether the TV tuner was tuned to the specific broadcast item.

The PS3 device then determines whether the TV tuner was tuned to the specific television broadcast item for a significant proportion of that broadcast item.

This criterion can be defined as whether the TV tuner was tuned to the specific broadcast item for at least a threshold proportion of the full duration of the broadcast item.

The threshold may be any fractional value (e.g. between 1% and 100%), but may typically be 75% or above.

Alternatively, the proportion can be implicitly set by whether the TV tuner was tuned to the specific broadcast item for a threshold absolute period of time, or was tuned in at some point during the first n minutes and tuned out at some point in the last m minutes of the broadcast, where n and m might be 5, for example.

Referring now to Figure 5, a specific broadcast item can be indicated as such in several ways, and broadcasters on different channels may potentially use different alternatives. Consequently a PS3 device may be operable to employ one or more of the following:

In a first instance, the PS3 device 10 accesses an authorised server 1020 via the internet 1010 to download a list indicating one or more specific broadcast items to which one of the above usage criteria can be applied. Such lists may be accessed periodically, for example daily or weekly.

In a second instance, a broadcast signal 950 comprises EPG information, comprising in turn supplementary information that indicates whether a broadcast item is to be considered a specific broadcast item (EPG formats typically provide space for such supplementary information as age rating information or series periodicity). This information can be accessed by the PS3 device via the TV tuner 900. Note that the broadcast signal is shown in Figure 5 (purely for schematic purposes) in the form of a radio frequency signal, but as discussed elsewhere in the present description, the broadcast signal could be a cable or other type of signal.

In a third instance, and referring now also to figure 6, data indicating a specific broadcast item is embedded within the audio and/or video data of the specific broadcast item itself, from where it can be extracted by the PS3 device. For example, a specific macroblock 2010 in an undisplayed area (such as an extremity) 2020 of an MPEG2 video image 2030 may contain the relevant data, or alternatively or in addition the data may be embedded in a high frequency region of the audio data such as in MPEG 1 Layer 2 or Dolby Digital audio, and subsequently removed from audio reproduction by a low-pass filter. Whilst potentially more complex to implement, this third instance has the additional advantage that individual sections of a television or radio programme or advert, or even individual frames in the case of television, can be used to define the specific broadcast item.

Other means of embedding data within image or audio data will be apparent to a person skilled in the art, such as for example invisible/inaudible watermarking or the use of custom or user-definable data fields in A/V formats that support such facilities.

In particular, in an embodiment of the present invention a barcode-style pattern or similar may be embedded in the border of the video image, typically within the RGB colour range 16-235 accepted by MPEG-2 or AVC encoding schemes. Such a pattern is of a scale sufficient to enable the data it represents to be detectable at the compression ratios used for broadcast, and optionally for the compression ratios used for domestic digital video recording if these are greater. Notably such a so-called 'edgemark' can also be included in an analogue broadcast signal and where received can be detected by analysis of the image.

The edgemark may be a one or two dimensional barcode or other pattern in which data can be represented, and may duplicate data on all three RGB channels to provide redundancy and / or high contrast, or may place different data in one or more colour channels to increase the data payload for a given area of image. The edgemark may occupy the equivalent of one or more macro-blocks, or may be a $1 \times N$ pixel strip, or any suitable set of dimensions for unobtrusively conveying the data within the image.

It will be appreciated that whilst the data is preferably embedded in a portion of the image not shown on-screen, this is not necessary, particularly in the case of watermarks or narrow edgemarks using a comparatively neutral colour range.

In this third instance, the data can be embedded in the image or audio at any point in the production stream from content creation to transmission. It will be appreciated by a person skilled in the art that the data should be in a format robust to the levels of compression normally found in the broadcast environment and/or a personal digital video recorder. Such formats are known to a person skilled in the art.

In any of the above schemes, the indicative data can also include a parameter which defines the desired usage criterion. Thus the data relating to one specific broadcast item may indicate that the usage criterion is satisfied if 50% of the broadcast item is watched/heard, whilst another may require that 99% of the item is watched/heard in order to satisfy the usage criterion. Optionally such time may be continuous or aggregated. Alternatively a minimum absolute viewing time for the broadcast item may be indicated, and/or minimum start and end points (i.e. the broadcast item must be accessed no more than a certain time after its start, and must then be accessed until no less than another certain time before its end).

Likewise the full duration of the specified broadcast item can be included in the indicative data, to enable a determination by the PS3 device of what proportion is watched/heard. This can be useful where the specified broadcast is an advert or a portion of a programme, which conventionally does not have a separate EPG entry from which the full duration can be calculated. For whole programmes, alternatively or in addition the EPG can be used to determine the full duration of a specific broadcast, and/or this information can be included in the list downloaded from the server.

When a usage criterion has been satisfied, the PS3 device records a credit on the hard drive 400, or optionally on another memory such as a flash card.

The credit acts as a record that the usage criterion was satisfied. By tuning in to a plurality of specified broadcast items, a plurality of credits can be accumulated. Optionally credits may be differentiated by broadcaster, by specific broadcast item, by security level, by value and/or by sponsor.

Such credits can then be redeemed by the user of the entertainment device for goods and services, optionally according to credit type.

Typically the services will be directly consumable by or through use of the entertainment device, and include access to a further broadcast item or television/radio channel, possibly for a limited period. In these cases one or more credits can be used to authorise access, with the number of credits required optionally stipulated in the EPG or in data provided by the authorised server 1020.

After use, the credits are deleted, or alternatively are modified to indicate that a specific service has been accessed, thereby preventing further access or only allowing access for a predetermined number of times.

Thus, for example, a documentary detailing the production of a film could be made available to a person who had gained a credit for viewing the film.

Another item for which the credits may be redeemed is access to game content playable on the entertainment system, where the entertainment system is capable of playing games (as in the case of the PS3 device). This access may take the form of allowing further content to be downloaded from the authorised server 1020 (or an authorised third party server, not shown), or by unlocking game content already installed on the entertainment system.

Thus, for example, an on-line gaming community could be encouraged to watch a new show which offers them new game content if they watch three episodes, by requiring three credits relating to that show in order to access the new content.

Again, credits can be subsequently deleted or updated according to the desired

5   reward model.

In addition, other goods and services may be made available in return for credits. For example, a purchase discount could be offered for any goods or services ordered online in return for a stipulated number (and optionally a stipulated type) of credits.

Thus, for example, a manufacturer could offer a 10% discount to a person who had

10   gained a credit for viewing that manufacturer's advert.

Because of the redeemable value of credits, preferably they are represented by secure and verifiable codes. Again, different broadcasters or sponsors may use different schemes to obtain or generate such codes.

In an embodiment of the present invention, credit codes are issued to the

15   entertainment device by the authorised server 1020. In this case, the data identifying the specific broadcast item may also comprise a key or other encrypted data; if the usage criterion is satisfied for this specific television broadcast, the entertainment device submits this key/data to the server, optionally with further identifying information such as a user ID and/or a hardware serial number accessible by the entertainment device. Optionally there is a

20   restricted period of time after the broadcast in which such a submission can occur.

Upon receipt of a valid submission, the server issues a credit in the form of an encrypted code, such as a 512 bit public key encrypted code. When the credit is subsequently redeemed the server acts to validate the code using a private key (either as part of the provision of a service from the server or as a validation for a third party). Optionally the

25   credit contains some or all of the identifying information relating to the user and/or the entertainment device.

Alternatively or in addition, the role of the server may be performed by an application on the entertainment device, for example provided as part of the firmware. In this case therefore submissions are internal to the entertainment device. However, subsequent

30   redemption of a credit may still be validated by a separate server.

Alternatively or in addition, in another embodiment of the present invention the credit code is itself embedded within the audio and/or video data of the specific television broadcast, either as part of the indication data or separately but in a similar manner.

Optionally, parts of the credit code can be distributed over the course of the specific television broadcast, for example requiring a minimum of 10 minutes' viewing to acquire the full code.

Optionally, upon subsequent redemption, identification information is submitted by the entertainment device in addition to the credit.

It will be appreciated that the key/data may therefore be provided by a list from an authorised server, as part of an EPG transmission, or embedded within the audio or video of the specific broadcast as described previously

In other circumstances, the redemption value of the credit is of less significance, for example when wishing to access existing but locked game content. In this case the credit may simply be generated by the entertainment device, or be included with the indication data. Indeed the security requirements may be lower still, as in the case of accessing the above mentioned film production documentary, in which case the credit can be simply a flag or logical switch set in response to the satisfaction of the usage criterion.

Typically, such low-security credits will not be redeemable for other goods or services, such as the above mentioned 10% purchase discount.

Alternatively or in addition, in an embodiment of the present invention another activity that can earn one or more credits is the distribution of a recorded specific broadcast item to another entertainment device via a peer-to-peer internet connection. In this case, the indication data for the specific broadcast item includes a permission flag for such distribution.

In a first instance, a user chooses to forward such a specific broadcast item (as recorded on the user's PS3 device) to a friend by logging into a network (such as the Sony PlayStation Network®), determining if their friend is online, and then offering to commence the data transfer. Once completed, a credit is issued according to one of the above techniques, optionally involving further verification of a successful download or stream and/or identification data from the recipient entertainment device. Such a scheme may for example be useful to promote so-called 'viral' adverts, or to increase the audience of a pilot episode of a new show.

In a second instance, a user chooses to set his entertainment device to record any broadcast item that the broadcaster nominates for distribution (using indication data as described above), and allows such nominated broadcast items to be distributed in a peer-to-peer fashion upon a request either from an individual remote entertainment device or by

assignment to an individual remote entertainment device by a central server such as server 1020.

The request can include a code to verify that the remote entertainment device is entitled to or has paid for a video-on-demand service, and this verification can be confirmed either by firmware on the entertainment device or by reference to the server 1020.

The entertainment device can then provide the recorded nominated broadcast item for download or streaming. Once completed, again a credit is issued according to one of the above techniques, optionally involving further verification of a successful download or stream, and/or identification data, from the recipient entertainment device.

In this way a user can gain credits for employing his entertainment device as part of a distributed video on demand system for a broadcaster.

In each of the above instances, the usage criterion for receiving a credit therefore extends to both tuning into the television broadcast for a sufficient proportion of it, but also to recording it and subsequently supplying it to a remote entertainment device/system. The user may get separate credits for each of watching and forwarding a broadcast item, depending on the broadcaster's reward model. Similarly, the user may potentially get separate credits for each of watching and recording a broadcast item.

In general, a user will only receive a credit for specified broadcast items that are displayed, recorded or forwarded; where a dual tuner is available but the second tuned channel is effectively idle (i.e. not being displayed, recorded or forwarded) then no credit would be awarded in the event that it received a specified broadcast item.

It will be understood that references to receiving 'broadcast items' herein encompass broadcast digital television and radio, but also encompass analogue broadcast items and real-time or non-real-time IP broadcast items (example broadcasters include the BBC iplayer ®, YouTube ® and internet radio stations) where similarly adapted, with embodiments applicable to a suitable extent that will be apparent to the skilled person in the art. The term "real-time" here implies that the system is arranged so that multiple users are able to receive a broadcast item at substantially the same time, the simultaneity being subject only to propagation delays and the like.

For example, indication data clearly cannot be embodied in image data for digital radio, but can still be embodied in audio data, EPG data and downloaded lists, whilst the format of an edgemark may need to be more robust for an item broadcast as a YouTube item than on a more conventional satellite broadcast, due to greater compression levels. Similarly,

therefore, embodiments of the present invention may utilise audio-only tuners, or internet based audio and/or video reception means.

Referring to figure 7, a method of user interaction comprises:

In a first step s10, tuning into a broadcast with a broadcast receiver;

In a second step s20, monitoring usage of the receiver;

In a third step s30, detecting if that usage satisfies a usage criterion; and

in response to the usage satisfying the usage criterion,

In a fourth step s40 recording to a memory means of an entertainment system a credit subsequently redeemable via the entertainment system for goods or services.

It will be appreciated that the order of the first two steps is changeable; for example, usage of a receiver may also be monitored before it tunes into or accesses a particular broadcast.

It will be apparent to a person skilled in the art that variations in the above method corresponding to operation of the various embodiments of the apparatus described above are considered within the scope of the present invention, including but not limited to:

- the usage criterion being that the receiver receives a specified broadcast item for at least a threshold proportion of that specific broadcast items's duration;

- the usage criterion further requiring that the entertainment system records the received specified broadcast item to the memory means, and subsequently supplies it to a remote entertainment system;

- the data indicating the specified broadcast item being obtained by the entertainment system via the internet from an authorised server;

- the data indicating the specified broadcast item is obtained by the entertainment system from data incorporated within one or more selected from the list consisting of:

  - a non-visible portion of the video image of the specified broadcast item;

  - a high frequency portion of the audio data of the specified broadcast item; and

  - broadcast electronic programme guide data;

- the credit comprising a code generated by an application of the entertainment device;

- the credit comprising a code responsive to data incorporated within one or more selected from the list consisting of:

  - a non-visible portion of the video image of the specified broadcast item;

  - a high frequency portion of the audio data of the specified broadcast item; and

  - broadcast electronic programme guide data;

- the goods or services are all or part of one or more selected from the list consisting of:

  - access to game content playable on the entertainment system;

  - access to a broadcast item;

  - access to a broadcast channel;

  - receipt by a user of the entertainment system of a product; and

  - receipt by a user of the entertainment system of a service.

Finally, it will be appreciated that the methods disclosed herein may be carried out on conventional hardware suitably adapted as applicable by software instruction or by the inclusion or substitution of dedicated hardware.

Thus the required adaptation to existing parts of a conventional equivalent device may be implemented in the form of a computer program product comprising processor implementable instructions stored on a data carrier or storage medium such as a floppy disk, optical disk, hard disk, PROM, RAM, flash memory or any combination of these or other storage media, or transmitted via data signals on a network such as an Ethernet, a wireless network, the Internet, or any combination of these of other networks, or realised in hardware as an ASIC (application specific integrated circuit) or an FPGA (field programmable gate array) or other configurable circuit suitable to use in adapting the conventional equivalent device.

CLAIMS

1.   An entertainment system, comprising:

a broadcast reception means;

a memory means;

a processor operable to monitor usage of the broadcast reception means, and operable to detect if that usage satisfies a usage criterion; and in which

in response to the usage satisfying the usage criterion, the processor is operable to record to the memory means a credit subsequently redeemable by via the entertainment system for goods or services.

2.   A system according to claim 1, in which the usage criterion is that the broadcast reception means receives a specified broadcast item for at least a threshold proportion of that specified broadcast item's duration.

3.   A system according to claim 2, in which data identifying the specified broadcast item is obtained by the entertainment system via a network from an authorised server.

4.   A system according to claim 2, in which data indicating the specified broadcast item is obtained by the entertainment system from data incorporated within one or more selected from the list consisting of:

i.   a portion of the video image of the specified broadcast item;

ii.   a non-displayed portion of the video image of the specified broadcast item;

iii.   a high frequency portion of the audio data of the specified broadcast item; and

iv.   broadcast electronic programme guide data.

5.   A system according to any one of the preceding claims, in which the credit comprises a code generated by the entertainment system.

6.   A system according to any one of the preceding claims, in which the credit comprises a code obtained via a network from an authorised server.

7.   A system according to any one of claims 1 to 5, in which the credit comprises a code responsive to data incorporated within one or more selected from the list consisting of:

    i.   a portion of the video image of the specified broadcast item;

    ii.   a non-displayed portion of the video image of the specified broadcast item;

    iii.   a high frequency portion of the audio data of the specified broadcast item; and

    iv.   broadcast electronic programme guide data.

8.   A system according to any one of the preceding claims, in which:

    the entertainment system is operable to record a specified broadcast item to the memory means;

    the entertainment system is operable to supply the recording of the specified broadcast item to a remote entertainment system via a network connection; and

    the usage criterion is that the broadcast reception means receives a specified broadcast item for at least a threshold proportion of that specific broadcast item's duration and the entertainment system records the received specified broadcast item to the memory means, and then subsequently supplies the received specified broadcast item to a remote entertainment system.

9.   A system according to any one of the preceding claims, in which the goods or services are one or more selected from the list consisting of:

    i.   access to game content playable on the entertainment system;

    ii.   access to another specified broadcast item;

    iii.   access to a broadcast channel;

    iv.   receipt by a user of the entertainment system of a product; and

    v.   receipt by a user of the entertainment system of a service.

10.   A method of user interaction, the method comprising the steps of:

    receiving a broadcast item with a broadcast reception means;

    monitoring usage of the broadcast reception means;

    detecting if that usage satisfies a usage criterion; and

    in response to the usage satisfying the usage criterion, recording to a memory means of an entertainment system a credit subsequently redeemable via the entertainment system for goods or services.

11. A method according to claim 10, in which the usage criterion is that the broadcast reception means receives a specified broadcast item for at least a threshold proportion of that specified broadcast item's duration.

12. A method according to claim 11, in which data indicating the specified broadcast item is obtained from data incorporated within one or more selected from the list consisting of:

i. a portion of the video image of the specified broadcast item;

ii. a non-displayed portion of the video image of the specified broadcast item;

iii. a high frequency portion of the audio data of the specified broadcast item; and

iv. broadcast electronic programme guide data.

13. A method according any one of claims 10 to 12, in which the credit comprises a code responsive to data incorporated within one or more selected from the list consisting of:

i. a portion of the video image of the specified broadcast item;

ii. a non-displayed portion of the video image of the specified broadcast item;

iii. a high frequency portion of the audio data of the specified broadcast item; and

iv. broadcast electronic programme guide data.

14. A method according any one of claims 10 to 13, comprising the steps of:

recording a specified broadcast item to the memory means of the entertainment system; and

supplying the recording of the specified broadcast item to a remote entertainment system via a network connection; and in which

the usage criterion is that the broadcast reception means receives a specified broadcast item for at least a threshold proportion of that specific broadcast item's duration and the entertainment system records the received specified broadcast item to the memory means, and then subsequently supplies the received specified broadcast item to a remote entertainment system.

15. A computer program for implementing a method according to any one of claims 10 to 14.

16.   An entertainment system substantially as described herein with reference to the accompanying drawings.

5   17.   A method of user interaction substantially as described herein with reference to the accompanying drawings.

1.   An entertainment system, comprising:

a broadcast reception means;

5   a memory means; and

a processor operable to monitor usage of the entertainment system, and operable to detect if that usage satisfies a usage criterion;

in which

in response to the usage satisfying the usage criterion, the processor is operable to
10   record to the memory means a credit subsequently redeemable by via the entertainment system for goods or services, wherein

the entertainment system is operable to record to the memory means a permitted broadcast item received by the broadcast reception means;

the entertainment system is operable to supply a recording of the permitted broadcast
15   item to a remote entertainment system via a network connection; and

the usage criterion is that the broadcast reception means receives the permitted broadcast item for at least a threshold proportion of that permitted broadcast item's duration, the entertainment system records the received permitted broadcast item to the memory means, and then subsequently supplies the received permitted broadcast item to a remote
20   entertainment system.

2.   A system according to claim 1, in which data identifying the permitted broadcast item is obtained by the entertainment system via a network from an authorised server.

25   3.   A system according to claim 1, in which data indicating the permitted broadcast item is obtained by the entertainment system from data incorporated within one or more selected from the list consisting of:

i.   a portion of the video image of the permitted broadcast item;

ii.   a non-displayed portion of the video image of the permitted broadcast item;

30   iii.   a high frequency portion of the audio data of the permitted broadcast item; and

iv.   broadcast electronic programme guide data.

4.   A system according to any one of the preceding claims, in which the credit comprises a code generated by the entertainment system.

5.   A system according to any one of the preceding claims, in which the credit comprises a code obtained via a network from an authorised server.

7.   A system according to any one of claims 1 to 4, in which the credit comprises a code responsive to data incorporated within one or more selected from the list consisting of:
   i.   a portion of the video image of the permitted broadcast item;
   ii.   a non-displayed portion of the video image of the permitted broadcast item;
   iii. a high frequency portion of the audio data of the permitted broadcast item; and
   iv.   broadcast electronic programme guide data.

8.   A system according to any one of the preceding claims, in which the goods or services are one or more selected from the list consisting of:
   i.   access to game content playable on the entertainment system;
   ii.   access to another specified broadcast item;
   iii. access to a broadcast channel;
   iv.   receipt by a user of the entertainment system of a product; and
   v.   receipt by a user of the entertainment system of a service.

9.   A method of user interaction with an entertainment system, the method comprising the steps of:
   receiving a permitted broadcast item with a broadcast reception means of the entertainment system;
   recording the permitted broadcast item to the memory means of the entertainment system;
   supplying the recording of the permitted broadcast item to a remote entertainment system via a network connection;
   monitoring usage of the of the entertainment system;
   detecting if that usage satisfies a usage criterion; and

in response to the usage satisfying the usage criterion, recording to a memory means of an entertainment system a credit subsequently redeemable via the entertainment system for goods or services, wherein

the usage criterion is that the broadcast reception means receives the permitted broadcast item for at least a threshold proportion of that permitted broadcast item's duration, the entertainment system records the received permitted broadcast item to the memory means, and then subsequently supplies the received permitted broadcast item to a remote entertainment system.

10.   A method according to claim 9, in which the usage criterion is that the broadcast reception means receives a permitted broadcast item for at least a threshold proportion of that permitted broadcast item's duration.

11.   A method according to claim 10, in which data indicating the permitted broadcast item is obtained from data incorporated within one or more selected from the list consisting of:

i.   a portion of the video image of the permitted broadcast item;

ii.   a non-displayed portion of the video image of the permitted broadcast item;

iii.   a high frequency portion of the audio data of the permitted broadcast item; and

iv.   broadcast electronic programme guide data.

12.   A method according any one of claims 9 to 11, in which the credit comprises a code responsive to data incorporated within one or more selected from the list consisting of:

i.   a portion of the video image of the permitted broadcast item;

ii.   a non-displayed portion of the video image of the permitted broadcast item;

iii.   a high frequency portion of the audio data of the permitted broadcast item; and

iv.   broadcast electronic programme guide data.

13.   A computer program for implementing a method according to any one of claims 9to 12.

14.   An entertainment system substantially as described herein with reference to the accompanying drawings.

15.   A method of user interaction substantially as described herein with reference to the
5   accompanying drawings.

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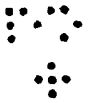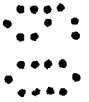
Application No:	GB0818154.7		Examiner:	Dr Russell Maurice
Claims searched:	1-15		Date of search:	12 February 2009

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1-15	US 2004/093615 A1 (IBM) see eg the Abstract and paragraphs 5, 19 and 28-33
X	1-15	EP 1460787 A2 (WEINBLATT LEE S) see eg paragraphs 20- 43
X	1, 2, 10 & 11	US 2007/288951 A1 (FIRST DATA CORP) see eg paragraphs 19-24

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^X :

Worldwide search of patent documents classified in the following areas of the IPC
G06Q

The following online and other databases have been used in the preparation of this search report
WPI, EPODOC

International Classification:

Subclass	Subgroup	Valid From
G06Q	0030/00	01/01/2006