A method and configuration allows storing and playing back TV programs, in particular an improved method and configuration for operating a network PVR. The novel configuration for storing and playing back TV programs includes a PVR server capable of receiving digitally encoded TV channels, of feeding several terminals, and of recording storable TV programs. The terminals are provided with means for selecting storable TV programs and means for transmitting the choice to the PVR server. The inventive configuration also comprises means for detecting particular contents (for example, advertising) associated with received TV programs and means for identifying said contents in the recordings of said TV programs. Said identifications can be used for preventing said particular content jump during playing back the TV programs recorded on the terminal and for substituting the particular contents by updated particular contents.
METHOD AND CONFIGURATION FOR STORING AND PLAYING BACK TV PROGRAMS

[0001] The present invention relates to a method and a configuration for the storage and playback of TV programs. In particular, the present invention provides an improved method and an improved configuration for operating a network PVR.

[0002] After decades of tape-based analog video recorders being the only means whereby home users could record and conveniently store programs screened on antenna, cable or satellite TV, with the advent of fast and at the same time inexpensive video processors and high-performance video codecs such as MPEG2 (1994) and MPEG4 (1998) a number of mainly hard-disk-based digital machines providing not only straight video recording but also a number of convenience features have become available in recent years.

[0003] The term personal video recorder (PVR), or sometimes digital video recorder (DVR), is frequently used for this new generation. While these modern machines can of course be used like conventional VCRs for simple recording and subsequent playback of programs, they are capable of much more than that. For example, a frequently used feature of a PVR is time shifting whereby the user can begin replaying a program while it is still recording. Thanks to the high-performance hardware of a modern PVR, the picture quality achieved is superior to that of a conventional VHS or S-VHS tape machine.

[0004] Time-shifted viewing also allows the user to “pause” a program being viewed live, e.g. to take a telephone call, and to resume playback later, it appearing to the user that he has actually paused the live screening and continued it later. In the background, however, pressing the “Pause” button by the user has caused the user’s PVR to record the current program, and pressing the “Pause” button again results, on the one hand, in the recorded program continuing to be recorded and, on the other, allows it to played back already.

[0005] Another very popular feature of a PVR is the ability to skip lengthy sections in a recording with minimal delay. This is often used to skip blocks of commercials contained in the program during playback. A number of services have become established around this capability which facilitate locating the boundaries of the blocks of commercials, e.g. by storing the start and end of a block as points in time relative to the beginning of a program as a recording index, thereby enabling the commercials to be automatically skipped during playback.

[0006] In addition to specially adapted entertainment electronics, multimedia PCs with suitable software are also increasingly being used as PVRs (known as home theater PCs, HTPCs). Technically there is virtually no difference between a PVR and PC-PVR; both have a large (disk) memory, sufficient processor power and suitable video codecs.

[0007] By means of configurable software or firmware, both platforms are able to offer the user additional functions, such as program search, thematically geared to his favorite programs. The common feature of both platform variants is that recording takes place locally on the user’s premises and the quantity of recordable programs is limited by the local disk memory. It is therefore often possible to transfer recorded programs from the device’s internal memory to writable media such as re(writable) CDs or DVDs. However, this involves a cost factor and, not least, the price of a PVR is also considerable. And even PVRs suffer from the problem that recording several programs simultaneously also requires a plurality of PVRs. Expensive multi-tuner machines solve this problem only to a limited extent, as there will always be fewer tuners than TV stations and, in addition, PVR hardware that is of sufficiently high performance for one channel reveals its limitations when required to record a plurality of channels simultaneously.

[0008] To be able to offer users all the advantages of a PVR without them having to invest in a PVR, the White Paper “Network PVR: Everything on Demand”, Jay Schiller, nCube Corporation, available on the internet at http://www.ncube.com/pressroom/downloads/nvr-whitepaper.pdf proposes a network PVR whereby storage, encoding logic and codecs are held available in the cable network by a provider. The user gets a unit with which he can select programs to be stored and can retrieve stored programs which are then transmitted to the user in real time by means of a broadband connection. Such a device can be much less powerful than a PVR or an HTTP server. At the same time the user can rent virtually unlimited storage space on the PVR server, while the operator of the PVR server only needs to keep one copy of each program which is then distributed as required to those users who have stored that program in their (virtual) store.

[0009] In a further development, such a network PVR can be designed so as to eliminate “programming” of the network PVR by the user, instead of which the user has access to all the shows in its program bouquet of the last four weeks, for example.

[0010] As already mentioned, the ability of PVRs to completely skip advertising embedded in TV programs automatically or at least manually means that conventional advertising-financed TV is deprived of the basis on which it is financed.

[0011] An object of the invention is therefore to specify a method and configuration for the storage and playback of TV programs which prevents advertising and other special content from being skipped.

[0012] This object is achieved by a TV program storage and playback configuration comprising the following:

[0013] a PVR server with means for receiving a plurality of digitally encoded TV channels, means for supplying a plurality of user terminals and means for recording TV programs to be stored;

[0014] at least one user terminal with means for selecting TV programs to be stored, means for transmitting the selection to the PVR server and means for playing back TV programs recorded by the PVR server; and

[0015] means for detecting special content associated with received TV programs and means for marking said content in the recordings of said TV programs.

[0016] The invention further relates to a method for the storage and playback of TV programs, comprising the following steps:

[0017] reception of a plurality of digitally encoded TV channels by a PVR server which supplies a plurality of user terminals and records TV programs to be stored;

[0018] selection by a user terminal of TV programs to be stored and transmission of said selection to the PVR server;
[0019] detection of special content associated with received TV programs and marking of said content in the recordings of said TV programs; and
[0020] playback on the user terminal of TV programs recorded by the PVR server.
[0021] The abovementioned marking can then be included in the data stream from the PVR to the user terminal, said user terminal ignoring the actuation of buttons having a fast forward or skip function if the marking is present when marked content is played back or a skip is to be executed to a time marker coming after the marked content in the recording.
[0022] Alternatively it can be provided that, to make the user terminal as simple as possible and eliminate tampering with the user terminal, the PVR server ignores the instruction sequence generated by actuating fast-forward or skip-forward keys when a marked content is played back or a skip is to be executed to a time marker coming after the marked content in the recording.
[0023] Special content can include, for example: advertising and other consumer information in any form, such as blocks of commercials within, before or after TV programs; product placements within TV programs; editorial announcements of other TV programs, new products/services and similar, e.g. in advice programs, etc.
[0024] The abovementioned marking can be used to replace the generic special content included in the TV signal by user-related and/or regionalized special content, e.g. generic advertising by user-related. Said user-related advertising can change each time the underlying recording is played back.
[0025] It can be provided that, on the user terminal, the special content must be played back once in its entirety before the fast forward or skip forward function can be enabled for the special content also.
[0026] In addition, the invention can be used to mark one or more advertising spots as special content within a block of commercials (which as a whole is not marked as special content), so that skipping or fast-forwarding of advertising is basically possible, but the particular spots (which can be correspondingly more expensive marketed) cannot be skipped and fast-forwarded and are mandatorily presented to the user.
[0027] Lastly it can be provided that users prepared to pay a separate fee can also basically skip marked content or view it in fast-forward.
[0028] Preferred embodiments of the present invention will now be explained in greater detail with reference to the accompanying drawings.
[0029] The single FIGURE shows a configuration comprising a network PVR or PVR server 102 and user terminals 104A . . . 104N supplied by same. The PVR server 102 receives digitally encoded TV channels from an encoder 120. The encoder in turn receives the TV channels from a receiver 122 which receives suitable TV signals via terrestrial antenna 124 and/or satellite antenna 126 and/or TV cable 128. In this configuration the encoder 120 and the receiver 122 can be designed as a single unit. The encoder 120 uses a codec such as MPEG2 or MPEG4 or codecs derived therefrom to convert the TV signals initially present in analog form into an efficient digital data format. If a TV channel is already present as a digital data stream, e.g. as digital video broadcast DVB, received terrestrially as DVB-T, via cable as DVB-C or via satellite as DVB-S, the encoder 120 can forward this data stream unmodified to the PVR server 102 or modify it prior to forwarding, e.g. by adapting the bandwidth of the data stream to the bandwidth of the connection to the user terminals 104.
[0030] The PVR server 102 is linked to a mass storage device 108 such as a hard disk drive array or HDD array. Numerous methods of creating redundant hard disk mass storage arrays which can nevertheless completely deliver the stored data in the event of failure of individual hard disks are well known in the technology. The use of such a redundant array, e.g. a redundant array of independent disks (RAID), is advantageous in relation to the present invention, as a PVR server 102 and the attached mass storage device 108 stores all or at least a large portion of the data of the TV recordings of a large number of users.
[0031] The user terminals 104 are connected to the PVR server 102 via the TV cable network or via a DSL link, for example. Modern codecs permit an acceptable video quality and transmission rates of a few hundred kbit/s or more. With the bandwidths of several Mbit/s technically possible via DSL links, two or more parallel video streams (for different playback devices in the user’s household) or a single high-quality video stream are conceivable.
[0032] The user terminals 104 can be equipped with or linked to local memory 110 which is implemented as a conventional hard disk and/or as flash memory and/or as RAM. Special forms such as micro hard drives available in flash memory card format are of course also conceivable, flash memory having the advantage that data can be stored independently of the presence of a supply voltage while at the same time enabling particularly quiet user terminals 104 to be created, as flash memory has no rotating or other mechanical parts.
[0033] The memory 110 can be permanently connected to the user terminal 104 or embodied as a replaceable medium. The memory 110 of the user terminals 104 is subject to less stringent requirements than the mass storage device 108 in terms of redundancy and failsafe operation. The user terminal memory 110 can be used to store user preferences and other settings in so far as these are not administered centrally by the PVR server 102.
[0034] The user terminal or CPE 104 can be a set-top box which is connected to a video playback device 116. Alternatively, the user terminal 104 can be incorporated in the video playback device 116. The video playback device 116 can be a conventional TV. Alternatively, it can be a monitor which does not have a TV tuner of its own. The user terminal 104 has a user interface 116 allowing the user to manage his archive of recorded TV programs, possibly his personal TV listing and other personal settings. This user interface can, as is usual in the set-top box field, be implemented such that the user makes inputs via a remote control and outputs are displayed to him on the video playback device 116.
[0035] A user’s inputs relating to the recording of TV programs are sent to the PVR server 102 which generates data records identifying the TV program(s) to be recorded from the data received. The corresponding TV program is earmarked for recording by means of a scheduler. The database 130, e.g. a user database, manages the programs earmarked by a user for recording and checks the user’s authorizations, e.g. whether the user has subscribed to the corresponding TV channel.
[0036] When a TV program is transmitted, the PVR server 102 checks in conjunction with the database 130 whether a user (one suffices) has earmarked that program for recording. If this is the case, recording is performed, the data arising
from the recording being able to be stored completely in the storage array 108 of the PVR server or subdivided into a local and a central part and stored accordingly in the memory 110 of the user terminal 104 or in the mass storage device 108. If the program has been programmed for recording on a plurality of user terminals 104, either a common copy can be provided, all or the central portion of which is stored in the storage array 108 of the PVR server 102, or a separate copy is created for each user terminal. For each user terminal which had earmarked the program for recording, address information relating to the common or separate copy, e.g. a filename or other index information, is stored in the first database 130. A user-related entry of this kind can contain further information about the program in the form of metadata such as an expiration date or the positions of any blocks of commercials or other special content in order to prevent this being skipped, as will be explained in greater detail below.

[0037] If the recording data is subdivided into central and local data, the local data is accordingly sent to all the user terminals 104 on which the program is to be included in the personal TV listing, the subdivision of the data being implementable in such a way that at least the central data stream, on its own, no longer supplies a decodable video signal (picture and sound). Only when the two volumes of data (from the memory 110 of the user terminal 104 and the mass storage 108) are combined can the program be played back in its entirety.

[0038] To initiate playback, a user requests, by means of user interface 106 on the user terminal 104, the archive of available programs which is transmitted from the database 130 to the user terminal 104 for display by means of the user interface, e.g. on the screen 116. From the archive, the user can select a recording and initiate playback by appropriate input. The user terminal transmits this request to the PVR server 102 which locates the corresponding video data in the mass storage 108 by means of the database 130 and sends this as a video stream to the corresponding user terminal 104.

[0039] If the recording data has been subdivided into central and local data, the parts of the recording stored in the memory 110 of the selecting user terminal 104 and in the mass storage device 108 can be combined in the PVR server 102. For this purpose the data stored in the user terminal is first transmitted to the PVR server and combined there. The completed video data is then transmitted to the user terminal 104 for playback as a real-time data stream.

[0040] Alternatively, the parts of the recording stored in the memory 110 of the selecting user terminal 104 and in the mass storage device 108 can be combined in real time in the user terminal 104. In response to appropriate user input, by means of the PVR server 102 the incomplete video data is transmitted as a near-real-time data stream from the mass storage device 108 to the user terminal 104 where it is supplemented by the data stored in the user terminal 104 and played back, near-real-time data stream meaning that, depending on the selected subdivision of data between local memory 110 and mass storage 108, comparatively large volumes of data can be present in the local memory, e.g. intro sequences which are played back first before the possibly hitherto buffered data from the mass storage 108 is prepared for playback.

[0041] Programs of particular channels are transmitted with advertising or other special content, for which the TV channel operator has an interest in users of user terminals 104 playing back said advertising or special content and not using the skip or fast-forward function of "their" network PVR. This content is recorded by the PVR server 102 along with the TV program in which said content is embedded or with which it is otherwise associated, such as advertising or copyright details before or after the TV program.

[0042] Such special content is detected by the present invention and marked in the volume of recorded data. Detection can take place by the signal embedded in the TV signal being detected by the receiver 122 which then causes the encoder 120 and/or the PVR server to perform appropriate marking of the digital recording data. A commonly used signal which can be used for this purpose is the VPS signal.

This type of detection and marking has the disadvantage, however, that the signal embedded in the TV signal is generally contained in the sent-out signal and could be used by users of freely programmable standalone PVR or HTTP/solution to filter out the specially marked special content—contrary to the intentions of the TV channel operator.

[0043] In an alternative it is therefore provided to supply the information concerning special content 140 to the PVR server 102 or the encoder 120 separately from the actual TV signals, e.g. by means of the internet. This information 140 can be provided by the TV station, for example, by special content being characterized by a start and end time and said start and end time being sent, simultaneously with the transmission of the special content, to the PVR server 102 or encoder 120 where it is detected and used for marking the content. Of course it is also possible for this information to be sent in advance or subsequently to the PVR server 102 or encoder 120.

[0044] It is advantageous that control over the stored recordings and the associated information about special content can be exercised by the PVR server operator alone, thereby enabling use of the sensitive data provided by TV stations for purposes of avoiding advertising to be eliminated.

[0045] Another form of detection consists of analyzing particular features of the received TV signals, such as abruptly changing volume levels, picture brightnesses, colors, saturation, picture format changes, changes in the audio coding, e.g. multichannel sound 5.1 to stereo sound 2.0 or similar, as advertising often differs from the rest of the program in these features. In response to such detection, the content can again be marked accordingly, a degree of inaccuracy at the boundaries with the actual transmission (i.e. too early marking and/or marking lasting too long) being harmless, as the user is unlikely to want to skip or fast-forward the actual program.

[0046] Finally it is also possible, of course, for all the channels to be monitored by employees and the advertising or other special content to be determined by employees. In this case corresponding information about special content 140 is supplied via the internet or proprietary interfaces to PVR servers 102 or encoders 120 where it is detected and used for marking the recorded data.

[0047] As already mentioned, the detection and marking of blocks of commercials or special content can also be used to replace advertising or special content present in the recording by other special content, such as other advertising. This is useful, for example, for replacing generic advertising by user-specific advertising. For this purpose it can also be provided that the operator of the network PVR 102—if necessary with the agreement of the relevant user—carries out user behavior analysis. To determine user behavior, the following can be analyzed, for example, in an automated manner:
film genres, subject areas of reports and documentations contained in a user's personal TV listing or archive,

user-provided information about interests and inclinations,

changing channels, forwarding and rewinding by
the user while viewing the recorded content, and/or

video on demand packages so far consumed.

Instead of user-specific advertising, regional advertising can also be inserted in place of the generic advertising.

In addition, the detection and marking of special content can also be used to replace out-of-date advertising by current advertising in archived programs. In general, outdated parts of programs can also be replaced by updated material in this way, replacement by zero length content also being conceivable, i.e. deletion of particular content. This is helpful, for example, in programs in which viewers are e.g. requested to call a telephone number which, however, is only obtainable during the original broadcast. If corresponding sequences of the program are marked as special content and replaced by new special content (e.g. of zero length), no out-of-date telephone numbers will be announced or displayed to the user.

It can be provided to relax or lift restrictions in respect of skipping and/or fast forwarding for users who pay an appropriate separate fee. It is additionally possible to maintain the restrictions in respect of skipping and/or fast-forwarding for all or selected users only during the first viewing of the special content and then to allow skipping and/or fast forwarding for said special content also. The information that specific advertising has already been shown to a user can be managed in the database.

The content provider is free to make only selected commercials subject to the abovementioned user restrictions, instead of the entire block. This can be combined with any user profiles available, so that users can skip the generic advertising which is irrelevant to them anyway, but not the generic advertising spots that are relevant to them.

It is self-evident that the abovementioned restrictions can be enforced by the PVR server even for special forms of skipping or fast-forwarding of content such as time shifting.

The invention can be used commercially in different ways. For example, a content provider can market advertising spots which are marked as unskippable more expensively than regular advertising spots. Combining this with user profiles reduces the amount of advertising that is irrelevant to the user who therefore on the one hand finds the advertising less intrusive and also—due to the elimination of irrelevant advertising—is presented with less advertising overall. If the generic advertising is totally replaced by user-specific regional advertising, it can be provided that the—compared to generic advertising—higher income due to more selective advertising is split between the TV stations (whose advertising is substituted and which can generate no income thereby), the provider of the user-specific/ regional advertising and the operator of the network PVR.

It can also be provided to refund a fraction of the higher revenue resulting from the more selective advertising, e.g. by way of a lower basic monthly fee or similar, to users who are prepared to provide a user profile.

A configuration for storing and playing back TV programs, comprising:

a PVR server having means for receiving a plurality of digitally encoded TV channels, means for supplying a plurality of user terminals, and means for recording TV programs to be stored;
at least one user terminal having means for selecting TV programs to be stored, means for transmitting a selection to said PVR server, and means for playing back TV programs recorded by said PVR server; and
means for detecting special content associated with received TV programs and means for marking the special content in the recordings of the TV programs.

The configuration according to claim 9, which further comprises means configured to replace, in conjunction with said PVR server, the special content associated with a TV program by different special content during a playback of the TV program on said user terminal.

The configuration according to claim 9, which further comprises means configured to prevent, in conjunction with said PVR server, requests to skip or fast-forward the special content during playback of a TV program associated with the special content on said user terminal.

The configuration according to claim 11, wherein said means for preventing skipping or fast-forwarding of the special content are configured to prevent skipping or fast-forwarding of special content only a first time the special content is played back.

A method for storing and playing back TV programs, which comprises the following steps:

receiving a plurality of digitally encoded TV channels with a PVR server configured to supply a plurality of user terminals and to record TV programs to be stored;
selecting, at a user terminal, TV programs to be stored and transmitting a selection to the PVR server;
detecting special content associated with received TV programs and marking the special content in the recordings of the TV programs; and
playing back, on the user terminal, TV programs recorded by the PVR server.

The method according to claim 13, which comprises, in conjunction with the PVR server, replacing the special content by other special content during playback of the recording of a TV program associated with the special content on the user terminal.

The method according to claim 13, which comprises, in conjunction with the PVR server, refusing a request to skip or fast-forward the special content during playback of the recording of a TV program associated with the special content on the user terminal.

The method according to claim 15, which comprises refusing the request for skipping or fast-forwarding of the special content only during a first playback of the TV program.