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(54) **ENHANCED TELEVISION RECORDER AND PLAYER**

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(57) **ABSTRACT**

An enhanced television recorder and player includes a trigger inserter unit that inserts triggers into vertical blanking intervals of audio/video signals. The triggers point to resources that are stored in a storage medium or are available from a network, where the triggers, audio/video signals, and resources together can comprise a Transport Type B transmission. The audio/video signals having triggers in the vertical blanking intervals are stored in the storage medium, and during playback by a stream simulator unit, simulate a Transport Type A transmission, transformed from the Transport Type B transmission. Requested resources may be retrieved from the storage medium or from the network by a proxy unit of the receiver unit.
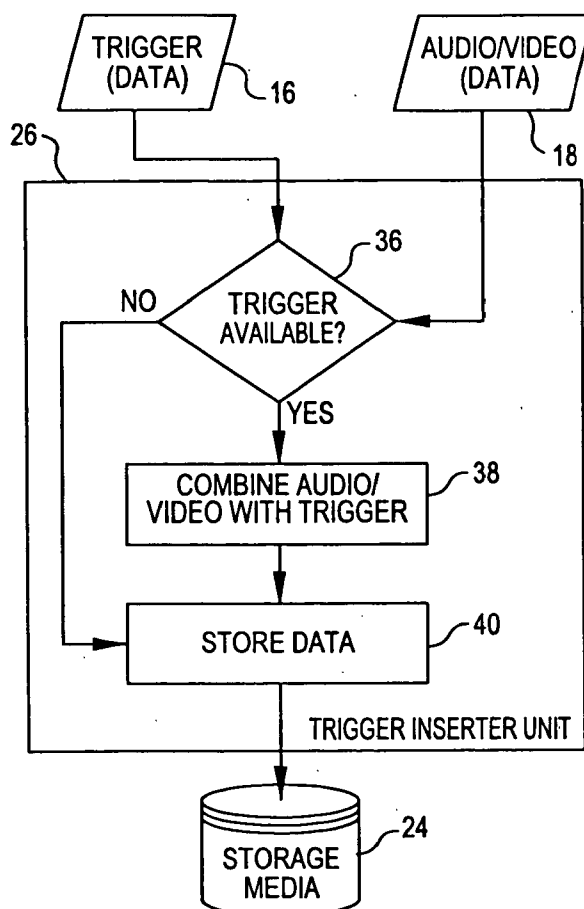
# FIG. 1

## FIG. 2

TRIGGER (DATA) ⎯16

AUDIO/VIDEO (DATA) ⎯18

26

TRIGGER INSERTER UNIT

TRIGGER AVAILABLE? ⎯36

NO

YES

COMBINE AUDIO/ VIDEO WITH TRIGGER ⎯38

STORE DATA ⎯40

STORAGE MEDIA ⎯24

## FIG. 3

STORAGE MEDIA ⎯24

28

STREAM SIMULATOR UNIT

READ AUDIO/VIDEO + TRIGGER STREAM ⎯42

FORMAT INTO TRANSPORT A TYPE STREAM ⎯44

RECEIVER UNIT

ENHANCED TELEVISION MODULE ⎯46

⎯48

34

## FIG. 4

URL REQUEST USING HTTP: PROTOCOL ⎯50

30

PROXY UNIT

URL RESOURCE IN LOCAL CACHE ? ⎯52

NO

RETRIEVE RESOURCE FROM NETWORK ⎯56

YES

RETRIEVE RESOURCE FROM CACHE ⎯54

RETRIEVE SUCCEEDED ? ⎯58

YES

STORE IN LOCAL CACHE ⎯60

NO

ATVEF RECEIVER ⎯34
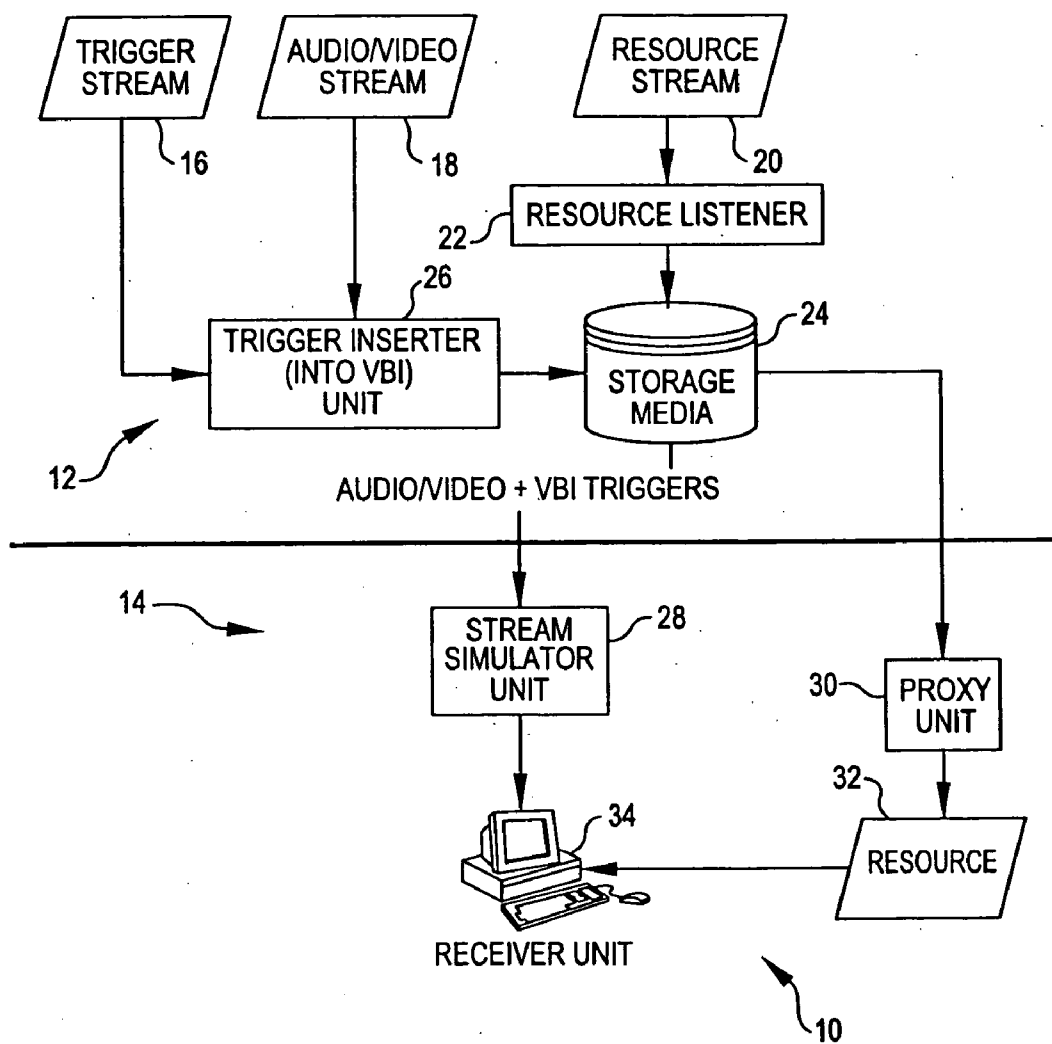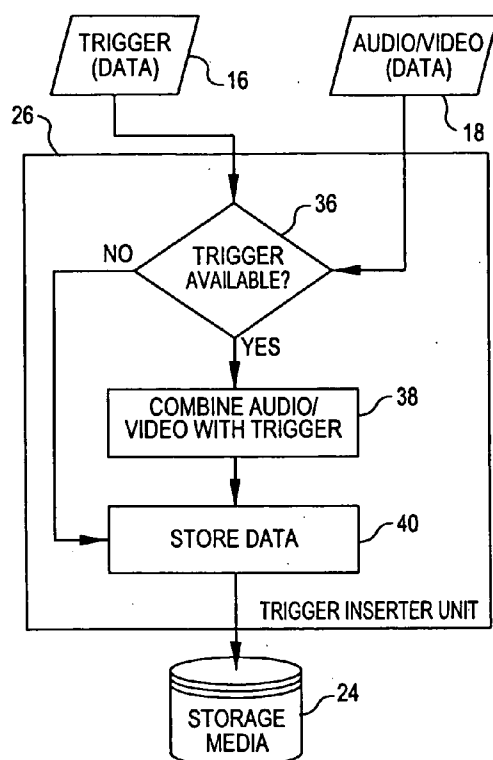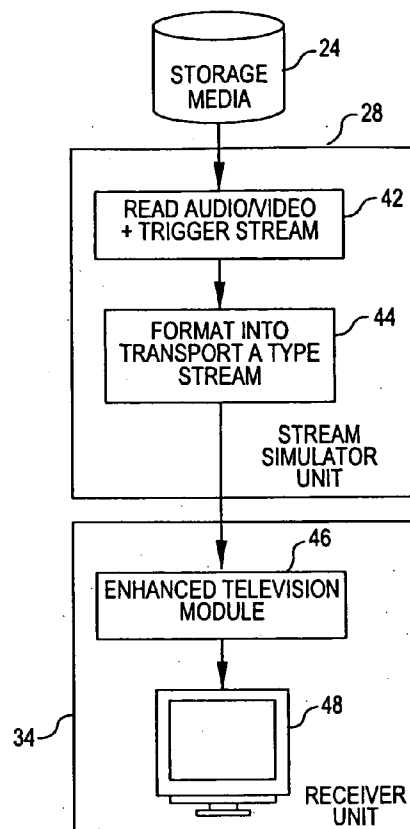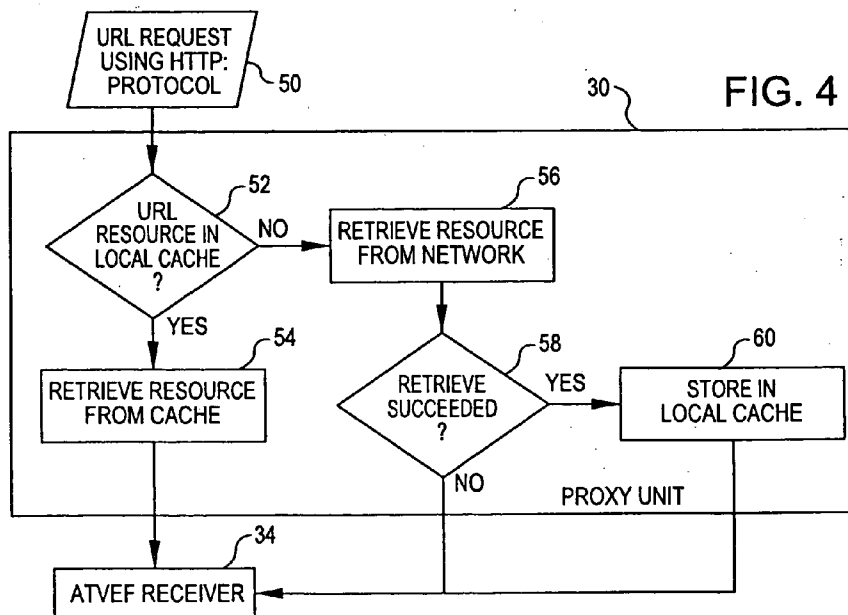
# ENHANCED TELEVISION RECORDER AND PLAYER

## CROSS REFERENCE TO RELATED APPLICATIONS

[0001] The present application is a Continuation of application Ser. No. 09/579,244, filed May 25, 2000.

## BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates generally to communications, and in particular relates to a recorder and player for enhanced television systems.

[0004] 2. Background Information

[0005] The Internet and the World Wide Web provide users with a rich source of information. Indeed, the Internet has infiltrated many aspects of everyday life, and is extremely popular because of its ease of access and ease of use.

[0006] There is an increasing integration of Internet technology/features with conventional communication media. Enhanced or interactive television, for example, merges Internet capabilities with television broadcasts. With enhanced television technology, content creators (e.g., broadcasters) transmit hypertext mark-up language (HTML) data along with the traditional audiovisual signals, thereby allowing viewers to interact with the television broadcast via the Internet. For instance, while watching an enhanced television program broadcasted by a particular network, the viewer may be provided with enhanced features on the television screen that allows the viewer to access the network's web site for additional programming information.

[0007] With other systems, the viewer may be provided with appliances or "receivers" that store the programming content as it is broadcasted. Such programming content is stored in the user's computer hard drive, for example, without having to use a videocassette recorder and videocassette. ReplayTV™ and TiVo™ systems are examples.

[0008] The Advanced Television Enhancement Forum's (ATVEF) Enhanced Content Specification, version 1.1, revision 26, 1998-1999 (hereinafter referred to as "ATVEF specification") has been published to provide uniformity among different enhanced television content creators, transport operators, and receivers. The ATVEF specification provides standards for the transmission and processing of triggers, resources, announcements and content that are associated with an enhanced television transmission.

[0009] However, even with the ATVEF specifications, existing enhanced television technologies still suffer from a number of drawbacks. There is often a lack of satisfactory synchronization between announcements, triggers, and content. There are also, at times, incompatibility issues between Transport Type A and Transport Type B (e.g., ATVEF transport types) transmission and reception hardware and software used by these existing enhanced television systems, including the inability to satisfactorily record incoming triggers and/or resources. Furthermore, complex components or complicated customization may need to be provided to existing users' receivers in order to provide users with the full benefits/features of enhanced television.

[0010] Accordingly, improvements in enhanced television systems are desirable.

## BRIEF DESCRIPTION OF THE DRAWINGS

[0011] Non-limiting and non-exhaustive embodiments of the present invention will be described in the following figures, wherein like reference numerals refer to like parts throughout the various views unless otherwise specified.

[0012] FIG. 1 is a functional block diagram illustrating an embodiment of the invention.

[0013] FIG. 2 is a flow diagram showing operation of an illustrative type of trigger inserter unit that can be used with the embodiment shown in FIG. 1.

[0014] FIG. 3 is a flow diagram showing operation of an illustrative type of stream simulator unit that can be used with the embodiment shown in FIG. 1.

[0015] FIG. 4 is a flow diagram showing operation of an illustrative type of proxy unit that can be used with the embodiment shown in FIG. 1.

## DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

[0016] Embodiments of an apparatus and method for recording and playing enhanced television information are described in detail herein. In the following description, numerous specific details are provided, such as the description of various client-side components in FIG. 1, to provide a thorough understanding of embodiments of the invention. One skilled in the relevant art will recognize, however, that the invention can be practiced without one or more of the specific details, or with other methods, components, etc. In other instances, well-known structures or operations are not shown or described in detail to avoid obscuring aspects of various embodiments of the invention.

[0017] Reference throughout this specification to "one embodiment" or "an embodiment" means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment of the present invention. Thus, the appearances of the phrases "in one embodiment" or "in an embodiment" in various places throughout this specification are not necessarily all referring to the same embodiment. Furthermore, the particular features, structures, or characteristics may be combined in any suitable manner in one or more embodiments.

[0018] As an overview, an embodiment of the invention may be based on the ATVEF specification, for example, to provide enhanced television information to a viewer or user. Specifically, an embodiment of the invention provides an enhanced television recorder and player, where Transport Type B and Transport Type A broadcast data may be recorded (into a cache, for example), and then the Transport Type B data is transformed into a simulated Transport Type A stream. As will be described in further detail below, this transformation takes advantage of synchronization features present in Transport Type A streams and takes advantage of the fact that many enhanced television receivers are well suited as Transport Type A receivers.

[0019] Referring first to FIG. 1, shown generally at 10 is a system according to an embodiment of the invention. In

this embodiment, the system **10** may be located at the client (e.g., user) side of the transmission (e.g., as a unit coupled to a computer, television, etc.). The system **10** may operate based on the ATVEF specification, and it is to be appreciated that principles of embodiments of the invention may be applicable to variations of the ATVEF specification or to other specifications. Accordingly, specifications, protocols, and/or components such as hypertext transfer protocol (http), file transfer protocol (ftp) ECMAScript and Document Object Model (DOM), Internet Protocol (IP), cascading style sheets (CSS), and various media and video standards, such as National Television Standards Committee (NTSC), can be utilized by the system **10** to provide an enhanced television experience to the user.

[0020] In **FIG. 1**, the system **10** includes a recording component or "recorder"**12**, and a playback component or "player"**14**. According to one embodiment of the invention, the recorder **12** stores Transport Type B streams (and can also store Transport Type A streams), while the player **14** can transform and play the stored streams as Transport Type A streams.

[0021] As is known, an enhanced television Transport Type B transmission includes a trigger stream **16**, an audio/video stream **18**, a resource stream **20**, and an announcement stream (not shown). The audio/video stream **18** is generally an NTSC signal. A "trigger" is typically a real-time event, in the form of a uniform resource locator (URL) followed by attribute/value pairs, that is sent from the broadcaster (e.g. from a head-end) to a receiver to initiate enhanced television features, either automatically or with user confirmation. A "resource", sometimes referred to "enhancement" or "enhanced content" is a generic term for any type of information or data that may go into a web page, such as HTML files, GIF files, TIF files, hypertext links, etc. In operation, announcements are sent before or during a television program to a well-known IP address and port number to announce the availability of enhancements. The receiver tunes in to this IP address/port and receives other information as to where to "listen" to receive trigger and resource information, where the trigger typically includes a URL that points to a location of the resource(s).

[0022] If resources in the resource stream **20** are extracted by a resource listener **22**, such resources are typically stored in a storage medium **24**, which may be a cache, for example. The storage medium **24** may also be a hard disk, floppy disk, digital versatile disk, random access memory (RAM), compact disk, or other suitable machine-readable storage medium. The resource listener **22** may be programmed to reject duplicate or outdated resources, such that only the necessary resources are stored in the storage medium **24**.

[0023] If the resources are stored in the storage medium **24**, the trigger(s) corresponding to the various stored resources typically include a local identifier URL (e.g., a lid: URL), meaning that the resources were delivered using a one-way broadcast and are not available on-demand. As such, Transport Type B is used for a true broadcast of both resource data and triggers and can run without an Internet connection. An optional Internet connection can provide a return path if the triggers point (e.g., by using http: or ftp: URLs) to resources that are available on the Internet (e.g., for e-commerce or web browsing).

[0024] As is known, Transport Type A involves the delivery of triggers along with the audio/visual stream **18**. That is,

existing Transport Type A transmissions often transmit triggers on the Vertical Blanking Interval (VBI) Line **21** of the NTSC video signal. In contrast to Transport Type B transmissions, Transport Type A transmissions do not transmit a resource stream **20** or an announcement stream. Hence, Transport Type A systems usually use two-way Internet connections to fetch resources using http:.

[0025] An embodiment of the invention improves upon existing Transport Type A and Transport Type B systems by providing the system **10** with a trigger inserter unit **26** for the recorder **12**, and a stream simulator unit **28** (which can be likened to a Transport Type A stream simulator) and a proxy unit **30** for the player **14**. The end result is that one or more resources **32** may be provided to a receiver unit **34**, from the storage medium **24**, without having to unnecessarily retrieve the resources **32** from the Internet. Furthermore, using the trigger inserter unit **26** to insert triggers into the VBI of video signals of the audio/video stream **18** provides synchronization between the trigger stream **16** and the audio/video stream **18** that is not present in conventional Transport Type B systems.

[0026] Operation of an embodiment of the trigger inserter unit **26** of the recorder **12** is illustrated in a flow diagram in **FIG. 2**. The trigger inserter unit **26** can be embodied in software, hardware, or a combination of both, and uses data from the trigger stream **16** and data from the audio/video stream **18** as inputs. It is assumed that other supporting infrastructure of the system **10**, such as some of those shown in **FIG. 1** and various other software and viewer application components, is present to determine that programming and/or enhancements are to be recorded. Furthermore, it is assumed that if a Transport Type B transmission is taking place, the resource listener **22** is operating to store resource data from the resource stream **20** into the storage medium **24**. For the sake of clarity, operation of these components is not described in detail herein because they would be familiar to those skilled in the art based on the description herein.

[0027] At a block **36**, the trigger inserter unit **26** first checks if there is a trigger available in the received broadcast. If the received broadcast is a Transport Type A transmission, such triggers, if any, are in the VBI of the audio/video stream **18** and are extracted and evaluated for validity as part of the receiving process. If the triggers are valid, the trigger inserter unit **26** stores the data from the audio/video stream **18** (and its associated valid triggers) into the storage medium **24** at a block **40**. It is noted that some broadcasts simply may not include triggers, and so at the blocks **36** and **40**, the trigger inserter unit **26** directly stores data from the audio/video stream **18** into the storage medium **24**.

[0028] If a Transport Type B transmission is present, then the trigger inserter unit **26** detects the availability of valid triggers from the trigger stream **16** at the block **36**. At a block **38**, the trigger inserter unit **26** combines the trigger data with the audio/visual data. More specifically, according to an embodiment of the invention, the trigger inserter unit **26** inserts triggers into Line **21** of the VBI of the audio/visual stream **18**. In this manner, the Transport Type B stream is "transformed" into Transport Type A stream prior to storage into the storage medium **24** at the block **40**. Accordingly, by inserting the triggers into the VBI, as the trigger stream **16** and the audio/visual stream **18** are received, the triggers are

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kept synchronized in time with the audio/visual data by presenting the triggers along with their corresponding video frames.

[0029] It is noted that although the incoming broadcasts are described herein as analog-type signals, such as NTSC signals, it is understood that principles of embodiments of the invention may be implemented on non-analog input signals. For instance, while an embodiment of the invention inserts triggers into the VBI of an analog NTSC signal, it is possible to provide an embodiment that inserts triggers into a digital input signal. In such a case, the triggers can be inserted, for example, between blocks of data that define video frames.

[0030] At the block 40, the trigger inserter unit 26 stores the data into the storage medium 24 using a suitable type of audio/video streaming and storage format. Formats such as RealVideo™/RealAudio™, Flash™, QuickTime™, Audio Video Interleaved (AVI), Motion Pictures Experts Group (MPEG), DVD, etc. may be used.

[0031] As previously discussed above, the trigger information present in the VBI, whether inserted by the trigger inserter unit 26 or originally present from a Transport Type A transmission, includes URLs pointing to locations of resources. These URLs may be in the form of lid: URLs pointing to the storage medium 24 if the corresponding resources were extracted from the resource listener 22 and subsequently stored in the storage medium 24. The URLs in the trigger may also be http: URLs if the corresponding resource is available both from the storage medium 24 and from the Internet. Similarly, other URL schemes, such as ftp:, may be used by the triggers to denote the location of resources available from the storage unit 24 or from the Internet. In one embodiment, the resource listener 22 can extract all necessary resources from the resource stream 20, regardless of its specific URL, and then store these resources in the storage medium 24, so that requests for these resources from external web servers can be minimized. This avoids a large number of simultaneous hits on the web servers from multiple receivers requesting the resources. The manner of retrieving stored resources from the storage medium 24, rather than from an external Internet source, is described in further detail below with respect to the proxy unit 30.

[0032] FIG. 3 shows an embodiment of the stream simulator unit 28 that can be used by the player 14. The stream simulator unit 28 can be embodied in software, hardware, or a combination of both. In operation, the stream simulator unit 28 reads, from the storage medium 24, the stored audio/video stream 18 and the trigger stream 16 at a block 42. No additional formatting/transformation needs to be performed according to one embodiment of the stream simulator unit 28, if the format that the trigger inserter unit 26 had used to insert triggers into the VBI of the audio/video stream 18 and then to store the resulting stream (e.g., the simulated Transport Type A stream) is compatible with the eventual presentation application software. In another embodiment, the stream simulator unit 28 may perform additional formatting of the resulting stream at a block 44, in order to make the resulting stream compatible with the format used by the eventual presentation/display application software. For example, if Microsoft Window's Direct-Show™ is used as the presentation software, then the stream

simulator unit 28, at the block 44, can format the resulting stream into the DirectShow™ architecture using libraries in the Windows environment.

[0033] Next, the stream simulator unit 28 provides the simulated Transport Type A stream to the receiver unit 34. The receiver unit 34 can include any type of suitable real-time (or ATVEFF-enabled) viewer, application, or appliance that has the capability to receive Transport Type A broadcasts, or both Transport Type A or Transport Type B broadcasts, and to play them. As examples, the receiver unit 34 can comprise a personal computer (PC) having an enhanced television module 46 and a display unit 48. As another example, the receiver unit 34 can comprise a conventional television set as the display unit 48 and having the enhanced television module 46 as a separate unit coupled to the television set.

[0034] The enhanced television module 46 can be any type of suitable commercially available unit that has the capability to receive enhanced television broadcast data, display/announce the enhanced television features to the user, and then provide the user with interfaces to allow the user to input information (e.g., to interact) with the enhanced broadcast. In an embodiment of the invention, the features of the invention described herein may be provided to complement existing functionalities of the enhanced television module 46. In another embodiment, the enhanced television module 46 may be specifically programmed or designed to implement the inventive features described herein.

[0035] Operation of the player 14 using the receiver unit 34, the stream simulator unit 28, and the proxy unit 30 is shown in a flow diagram in FIG. 4. The proxy unit 30 may be thought of as an "http: proxy" in that it intervenes in the retrieval of resources 32 having http: URLs. The proxy unit 30 can also be made to intervene and retrieve resources 32 having lid: URLs or other protocol resources, such as a resource having an ftp: URL. That is, the proxy unit 30, in one embodiment, may comprise a thin/simple agent that can reroute a resource request and retrieve the requested resource from a local cache (e.g., from the storage medium 24) if available, but relinquishes or invokes a normal http: handler to perform the retrieval if the requested resource is not in the local cache (and assuming that an uplink or back channel to the Internet is available).

[0036] The proxy unit 30 can be embodied in software, hardware, or a combination of both. In an embodiment, the proxy unit 30 can comprise a set of software communication instructions or settings in a registry of an operating system of a PC, for example. In another embodiment or implementation, a specific and new http: handler may be used instead of the proxy unit 30 to replace the original http: handler. Similarly, ftp: handling can be embodied in a proxy or in a new implementation.

[0037] In various embodiments, a new lid: handler may be a separate (installable) component or is integral to the http: proxy (e.g., a functional unit within the http: proxy unit 30). An advantage of implementing a proxy, such as the proxy unit 30, is that because the role of such a proxy is specific, it can be easier and faster to implement than if one were to design and build the whole component from the beginning, especially if there is no sample source code to mimic.

[0038] In operation, when the receiver unit 34 receives an enhanced television broadcast, in a simulated Transport

Type A stream format having triggers inserted in the VBI, the user can request the resources **32** or the receiver unit **34** can automatically request the resources **32**. Because the receiver unit **34** is assumed to be Transport Type A-enabled, the receiver unit **34** assumes that the requested resources **32** needs to be retrieved externally from the Internet. Therefore, at a block **50** in **FIG. 4**, the receiver unit **34** sends a URL request for the resource **32** using http: protocols. It is noted that if the trigger included a lid: URL, rather than an http: URL, then the receiver unit **34** and/or proxy unit **30** can retrieve the resource **32** directly from the storage medium **24**, which can be a local cache.

[0039] At a block **52**, the proxy unit **30** intercepts the http: request from the receiver unit **34** and checks if the resource **32** is in the storage medium **24**. If it finds the resource **32** in the storage medium **24**, then the resource **32** is retrieved from the storage medium **24** at a block **54**, and is provided to the receiver unit **34** for display and/or other use by the receiver unit **34**. Again it is noted that at the block **52**, the proxy unit **30** may retrieve resources **32** having lid: URLs from the storage medium **24**, as well as resources **32** having http: or ftp: URLs from the storage medium **24**, if the resources **32** are stored there, or externally from the Internet.

[0040] If, at the block **52**, the proxy unit **30** does not find the requested resource **32** in the storage medium **24**, then at a block **56**, the proxy unit **34** tries to retrieve the resource **32** from the network (e.g., from the Internet). If the retrieval is unsuccessful at a block **58**, then a message is sent to the receiver unit **34**, notifying it of the unsuccessful retrieval. In response, the receiver unit **34** may cause the proxy unit **30** to try again, or the receiver unit **34** may display a message to the user on the display unit **48** to notify the user of the unavailability of the resource **32** or other appropriate response.

[0041] If, back at the block **58**, the resource **32** is successfully retrieved by the proxy unit **30**, then the retrieved resource **32** can be stored in the storage medium **24** at a block **60**, and then subsequently provided to the receiver unit **34**, thereby providing the user with enhanced television content and features.

[0042] In conclusion, embodiments of the invention transform Transport Type B streams into a simulated Transport Type A stream by inserting triggers into the VBI. The recorder **12** stores resources and the transformed stream in the storage medium **24**. During playback, the player **14** reads the triggers in the stored simulated Transport Type A stream from the storage medium **24** and uses the proxy unit **30** to retrieve requested resources from the storage medium **24** or externally from the Internet, if the resource is not already stored. As such, Transport Type B transmissions appear like and are treated like Transport Type A transmissions by the receiver unit **34**. This provides advantages in that embodiments of the invention may easily complement existing Transport Type A systems without any undue and expensive installation or redesign. Furthermore, by inserting triggers into the VBI, the incoming streams of trigger and audio/video data can be synchronized and stored in a storage medium **24**, in a manner unavailable to existing prior art systems.

[0043] The above description of illustrated embodiments of the invention is not intended to be exhaustive or to limit the invention to the precise forms disclosed. While specific embodiments of, and examples for, the invention are described herein for illustrative purposes, various equivalent modifications are possible within the scope of the invention, as those skilled in the relevant art will recognize.

[0044] For example, while the figures show separate components for the recorder **12**, player **14**, trigger inserter unit **26**, stream simulator unit **28**, proxy unit **30**, receiver unit **34**, etc., one or more of these components (and/or their associated features or functions) can be combined into a single component. For instance, elements of the trigger inserter unit **26** and the stream simulator unit **28** can be combined into a single component. Furthermore, any of the components shown in the figures can be combined into the enhanced television module **46**. That is, while the figures show separate and discrete components of the system **10** for the sake of clarity, an embodiment may combine several of these components into the enhanced television module **46** and/or into the receiver unit **34**. In an example of an implementation, the enhanced television module **46** can include, for instance, one or more processors and machine-readable media having instructions stored thereon, which when executed by the processor(s), effect the various functions and features of the recorder **12** and player **14** described herein.

[0045] These modifications can be made to the invention in light of the above detailed description. The terms used in the following claims should not be construed to limit the invention to the specific embodiments disclosed in the specification and the claims. Rather, the scope of the invention is to be determined entirely by the following claims, which are to be construed in accordance with established doctrines of claim interpretation.

What is claimed is:

1. An article of manufacture, comprising:

a machine-accessible medium having associated data, wherein the data, when accessed, results in a machine performing operations comprising:

receiving a Transport Type B stream, the Transport Type B stream having a trigger stream and an audio-visual stream, the trigger stream having trigger data corresponding to resource data, the audiovisual stream being received on at least two vertical blanking interval (VBI) lines including a VBI line **21**, the audiovisual stream having audiovisual data;

inserting the trigger data into the VBI line **21** of the Transport Type B stream along with the audiovisual stream;

storing the trigger data and audiovisual stream in a storage medium; and

based on the trigger data, retrieving corresponding resource data from the storage medium.

2. The article of manufacture of claim 1, wherein the machine-accessible medium further includes data, when accessed, that results in the machine performing operations comprising:

checking a trigger stream for the trigger data;

receiving a resource stream having resource data and storing the resource data in the storage medium;

inserting the trigger data from the trigger stream into a Transport Type B video stream; and

detecting the trigger data in the Transport Type B video stream and retrieving the corresponding resource data from the storage medium or from an external source, if the corresponding resource data is not stored in the storage medium.

3. The article of manufacture of claim 1, wherein the machine-accessible medium further includes data, when accessed, that results in the machine performing operations comprising:

receiving a resource stream having resource data corresponding to trigger data; and

storing the resource data in the storage medium.

4. The article of manufacture of claim 1, wherein the machine-accessible medium further includes data, when accessed, that results in the machine performing operations comprising:

reading the trigger data and Transport Type B stream from the storage medium; and

formatting the trigger data and Transport Type B stream into a simulated Transport Type A stream.

5. The article of manufacture of claim 1, wherein the machine-accessible medium further includes data, when accessed, that results in the machine performing operations comprising:

detecting a request for resource data;

checking the storage medium for the requested resource data and retrieving the requested resource data if it is present in the storage medium; and

retrieving the requested resource data from a network if the requested resource data is not present in the storage medium.

6. The article of manufacture of claim 5, wherein the machine-accessible medium further includes data, when accessed, that results in the machine performing operations comprising storing the requested resource data retrieved from the network in the storage medium.

7. An article of manufacture, comprising:

a machine-accessible medium having associated data, wherein the data, when accessed, results in a machine performing operations comprising:

receiving a Transport Type B having a trigger stream, a video stream, and a resource stream;

combining trigger data from the trigger stream with the video stream to obtain a simulated Transport Type A stream;

storing resource data from the resource stream in a storage medium; detecting trigger data in the resulting stream; and

responsively retrieving resource data associated with the detected trigger data from the storage medium if the resource data is stored in the storage medium.

8. The article of manufacture of claim 7, wherein the machine-accessible medium further includes data, when accessed, that results in the machine performing operations comprising, if the resource data is not stored in the storage medium, retrieving the resource data from an external network.

9. The article of manufacture of claim 8, wherein the machine-accessible medium further includes data, when accessed, that results in the machine performing operations comprising:

intercepting a request to retrieve the resource data from an external network; and

retrieving the requested resource data from the storage medium instead, if the requested resource data is stored in the storage medium.

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