



- (51) International Patent Classification:
G09B 7/02 (2006.01) *G09B 7/06* (2006.01)
- (21) International Application Number:
PCT/EP2012/071351
- (22) International Filing Date:
29 October 2012 (29.10.2012)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
1118687.1 28 October 2011 (28.10.2011) GB
- (71) Applicant (for all designated States except US): **PROMETHEAN LIMITED** [GB/GB]; Promethean House, Lower Philips Road, Blackburn Lancashire BB1 5TH (GB).
- (72) Inventor; and
- (71) Applicant (for US only): **BURGHGRAEVE, Pierre** [FR/GB]; Promethean Limited, Promethean House, Lower Philips Road, Blackburn Lancashire BB1 5TH (GB).

- (74) Agent: **DAVID JOHN WILLIAMS**; Page White & Far-
rer, Bedford House, John Street, London Greater London
WC1N 2BF (GB).
- (81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY,
BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM,
DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,
HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP,
KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD,
ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI,
NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU,
RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ,
TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA,
ZM, ZW.
- (84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ,
UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ,
TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK,
EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV,
MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM,
TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,
ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: NETWORKED INTERACTIVE DISPLAY SYSTEMS

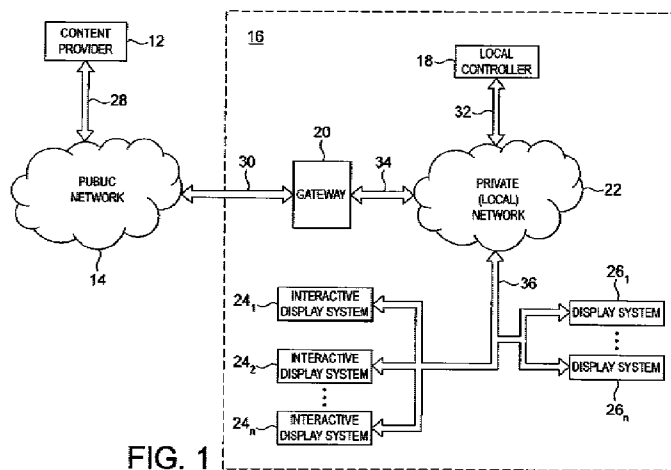


FIG. 1

(57) Abstract: The invention relates to an interactive display system architecture, comprising a controller (18) arranged to receive data representing content in a first data format and further arranged to convert the data in the first data format into data in a second data format; a plurality of interactive displays systems (26-1,... 26-n), each interactive display system comprising an interactive display surface adapted to display visual content and receive inputs associated with the displayed visual content at the surface thereof; a controller for the interactive display; and a plurality of remote devices connected to the controller, for providing inputs corresponding to the visual content displayed on the interactive display; a local network (36) arranged to distribute the data representing content in the second data format to the plurality of interactive display systems; and wherein each of the plurality of interactive display systems is arranged to simultaneously display content based on the data in the second data format as visual content on their respective interactive display surfaces; detect inputs at the interactive display surface and receive inputs from the associated plurality of remote devices; and provide the received interactive inputs in the second data format to the controller (18), the controller further being adapted to distribute the received data in the second format to each of the plurality of interactive display systems, such that results associated with the interactive display data from each of the plurality of systems may be displayed by each display system; convert the received inputs in the second data format into inputs in the first data format; and transmit the received interactive inputs in the first data format.



Published:

— with international search report (Art. 21(3))

— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

NETWORKED INTERACTIVE DISPLAY SYSTEMS

The present invention relates to an interactive display system, and more particularly to an environment in which multiple interactive display systems are provided.

5 Interactive display systems are well-known in the art, and for example are commonly provided in school classrooms. Content is displayed to students, and the teacher and or the students can provide interactive responses to the displayed content either by providing inputs at the surface of an
10 interactive display surface, or using peripheral devices connected to a computer controlling the display. Such peripheral devices may be dedicated handsets, such as voting devices, or graphics tablets, laptop computers, smart phones etc. associated with one or more users.

15 In a typical environment where interactive display systems are provided, such as a school, typically multiple systems are deployed in different locations around a building. Each system operates largely independently, with content being selected locally by a teacher, for example, for use in a
20 lesson. Interactive responses are received which are associated with the locally generated content in that lesson and relevant only to that lesson. Whilst the teacher may select the content, this may be a selection from pre-stored content.

25 Pre-arranged content is generally provided by the interactive display system providers, and limits the teacher to using such material.

It is an aim of the invention to provide an improved interactive display system architecture in arrangements where
30 multiple interactive display systems are provided, and/or in arrangements where content for an interactive display session is generated under the control of a third party.

The invention is described by way of example with reference to the accompanying drawings, in which:

Figure 1 illustrates an interactive display system architecture in which embodiments of the invention may be implemented;

Figure 2 illustrates an exemplary implementation of a content provider in accordance with the architecture of **Figure 1**;

Figure 3 illustrates a first exemplary implementation of a local controller in accordance with the architecture of **Figure 1**;

Figures 4(a) and **4(b)** illustrate a second exemplary implementation of a local controller in accordance with the architecture of **Figure 1**;

Figures 5(a) and **5(b)** illustrate a first exemplary implementation of an interactive display system in accordance with the architecture of **Figure 1**;

Figures 6(a) and **6(b)** illustrate a second exemplary implementation of an interactive display system in accordance with the architecture of **Figure 1**;

Figure 7 illustrates an exemplary operation of the architecture of **Figure 1**;

Figure 8 illustrates the exemplary flow process of the content provider of the architecture of **Figure 1**;

Figure 9 illustrates the exemplary flow process of the local controller of the architecture of **Figure 1**; and

Figure 10 illustrates the exemplary flow process of a controller of one of the interactive display systems of the architecture of **Figure 1**.

The invention is described by way of example with reference to particular embodiments. One skilled in the art

will appreciate that the invention is not limited to the specifics of any described embodiments, and that the details of individual embodiments may be combined with the details of other embodiments.

5 **Figure 1** illustrates an exemplary overall architecture in which embodiments of the invention may be provided.

A content provider 12 is connected via a network connection 28 to a public network 14.

10 An exemplary arrangement for the content provider 12 is discussed below, but it will be understood that the content provider 12 may comprise appropriate hardware and software functionality to allow the communication of content over a network, including as appropriate one or more computers, one or more servers, etc.

15 The invention is not limited to the content provider 12 being connected by a public network, and in alternative arrangement the content provider may be connected via a private network, or via either a public network or a private network. An exemplary public network is the Internet.

20 Reference numeral 16 denotes a private environment. The expression private environment is used herein to refer to a networked environment in which access is controlled or limited in some way. This contrasts to a public network. Such a network may similarly be referred to as a private network. In
25 the following description the private environment comprises a private network and a number of network elements which communicate via the private network. Sub-networks may also be provided.

30 In an exemplary arrangement of the present invention, as will be described in further detail hereinbelow, the private environment 16 includes a plurality of interactive display systems. Interactive display systems are well-known in the

art, and one or more exemplary interactive display systems are available from Promethean Limited, details of which systems can be found at www.prometheanworld.com. The invention and its embodiments are not, however, limited to any specific
5 interactive display system as will be apparent from the following description.

A typical private environment 16 in which interactive display systems may be provided is a school environment. In a school environment one or more interactive display systems may
10 be provided in one or more classrooms.

It is known also in the art for interactive display systems to be associated with learner response systems, or for learner response systems to be provided independent of an interactive display system. Learner response systems are well-
15 known in the art, and one or more exemplary learner response systems are available from Promethean Limited, details of which can be found at www.prometheanworld.com. The invention and its embodiments are not, however, limited to any specific learner response system as will be apparent from the following
20 description.

A typical private environment 16 in which learner response systems may be provided is a school environment. In a school environment one or more learner response systems may be provided in one or more classrooms, either in combination
25 with, in addition to, or independent of an interactive display system.

The invention and its embodiments are described in the following description in the context of the private environment comprising a school environment, because of the
30 well-known usefulness and widespread deployment of interactive display systems in school environments. However the invention and its embodiments are not limited to school environments, and may be implemented in any environment where interactive

display systems are provided, including other educational establishments such as colleges/universities, and commercial enterprises.

The provision of private networks connected to public networks is well-known in the art. In the exemplary arrangement of **Figure 1** the private environment 16 includes a gateway 20 for connecting a private network 22 to the public network 14. The purpose and implementation of such gateways is well known to one skilled in the art. The gateway 20 connects to the Internet 14 via a network connection 30, which is external to the private environment 16. The gateway 20 connects to the private network 22 via a network connection 34, which is internal to the private environment 16.

As further illustrated in **Figure 1** a local controller 18 is provided which connects to the private network 22 via a network connection 32; a plurality of interactive display systems 24₁ to 24_n are provided which connect to the private network 22 via a network connection 36; and a plurality of display systems 26₁ to 26_n are provided which connect to the private network 22 via the network connection 36.

Figure 2 illustrates an exemplary implementation of the content provider 12. The content provider does not form part of the present invention or embodiments thereof other than as a source and destination of data, and therefore the detail and scope of its implementation falls outside the scope of the present invention.

The exemplary content provider comprises a data source 40, a data store 42, a controller 44 and a network interface 46 all of which are interconnected via a content provider network connection 48. The network interface 46 additionally connects to the network connection 28 to provide external connection for the content provider 12 to the public network 14.

The content provider 12 provides data to the private environment 16, as will be discussed further hereinbelow. The data is provided in a first data format, which may be proprietary to the content provider 12. The data typically includes video content for display on displays in the private environment 16, such as on displays of the interactive displays systems 24 and the display systems 26. The data may also comprise web links to content, rather than the content itself. The data may also include playlists associated with the content.

The local controller 18 may be implemented in a number of ways, as one skilled in the art will appreciate, and **Figure 3** represents an exemplary implementation in one arrangement.

As illustrated in **Figure 3**, in an exemplary arrangement the local controller 18 includes a web server 56, an XMPP server 58, a data source content server 60, a data store 62, a processor 50, a first data converter 52, a second data converter 54, and an interface 70. All the elements are interconnected via a local controller network connection 32. The interface 70 connects to the network connection 32 to connect the local controller 18 to the private network 22. All the elements operate under the control of the processor 50.

The data source content server provides functionality to handle the content received from the content provider 12, including establishing communication with applications running on computers associated with the interactive display systems to allow functionality associated with the content from the content provider to be achieved.

The preferred embodiment of the invention follows a client-server model with servers as shown in **Figure 3** being deployed into private environments such as schools. The data source content server 60 acts as the client for the functionality, with controllers (or computer systems)

associated with individual interactive display systems (as described further hereinbelow) being clients for the server. The client-server model allows functionality to be achieved without the clients needing to access the internet. This is
5 done for security reasons, and also to ensure good bandwidth/connection speed over the private network.

As will be described hereinbelow, in appropriate embodiments the data source content server also provides functionality associated with interactive data received from
10 the interactive display systems, as will be described further hereinbelow.

The first data converter 52 converts data from the first data format (associated with the content provider 12) to a second data format, which second data format is compatible
15 with the interactive display systems of the private environment 16.

The second data converter 54 converts data from the second data format to the first data format.

In this way the local controller 18 operates as a data
20 translator, translating data between the public and private networks. The private environment thus does not have to be designed in accordance with the data format used by the content provider 12. The local controller 18 may also be adapted to include additional data converters, to allow data
25 received from additional content providers in additional data formats to be converted into the appropriate format for the interactive display systems, and vice versa.

The data converter 54 is provided to allow data generated by the interactive display systems to be transmitted back to
30 the content provider 12 as will be discussed further hereinbelow.

The web server 56 provides access to web services, and also allows access to content provided on the Internet that may be identified by the content provider 12. For example the local controller 18 may access web content from the Internet using an Internet address provided by the content provider 12.

The XMPP server provides the transport mechanism for data within the private network. In accordance with the exemplary arrangement data is transported in accordance with the XMPP protocol.

The data store 62 is used by the local controller to store data. For example the local controller may store in the data store 62 interactive data returned from the interactive display system, in arrangements discussed further hereafter.

The arrangement of **Figure 3** is an exemplary arrangement, in which network elements are provided to work in combination to provide the necessary functionality of the local controller 18. The functionality and operation of the local controller 18 in accordance with embodiments of the invention will be described further below.

An alternative arrangement of the local controller 18 is illustrated in **Figures 4(a)** and **4(b)**.

In **Figure 4(a)**, an arrangement is shown where the local controller 18 is a computer system comprising a computer hardware unit 80, a monitor 82 including a display area 84, a keyboard 86 and a computer mouse 88. The computer is provided with a connection 90 to connect with the private network.

In this exemplary arrangement the computer hardware 80 is adapted as shown in **Figure 4(b)**. The computer hardware includes a processor 112, a memory 116 including a data store portion 114, a network interface 18, and a plurality of applications 100, including a web server application 102, an XMPP server application 104, a data source server application

106, a first data conversion application 108, and a second data conversion application 110.

The applications 102, 104, 106, 108, and 110 provide the functionality in software running on the computer 80 equivalent to the functionality provided by the hardware elements 56, 58, 60, 52, and 54 respectively of **Figure 3**. The data store 114 corresponds to the data store 62 of **Figure 3**.

The arrangement of **Figures 4(a)** and **4(b)** is an exemplary arrangement, in which network elements are provided to work in combination to provide the necessary functionality of the local controller 18. The functionality and operation of the local controller 18 in accordance with embodiments of the invention will be described further below.

The data source content server 60 may include a functionality to handle tasks such as downloading content from the content provider and reporting back to the content provider, and scheduling when activities should be invoked (for live activities). Whilst the data source content server 60 may be adapted to provide this additional functionality, alternatively an additional server may be provided within the local controller to provide this specific functionality, which server is in part designed in accordance with compatibility with the content provider.

The local controller acts as a bridge between the data source content server 60 and the XMPP server 58. This bridge acts as an interface between the code base of the content provider and the code base of the private environment.

The XMPP server 58 is an example of a transport mechanism, and other transport mechanisms may be implemented within the private network.

Preferably all content, including video files, are served off the data source content server 60 using the HTTP protocol.

The web server 56 preferably supports static file downloading and basic video streaming, all using standard HTTP protocols.

The interactive display systems 24₁ to 24_n may comprise a variety of different architectures, as one skilled in the art will appreciate. The characteristic of an interactive display system is that it facilitates the capture of feedback associated with the display of content, but the mechanism by which content is displayed, and the mechanism by which feedback is captured, may vary.

One exemplary architecture is described with reference to **Figures 5(a)** and **5(b)**.

In **Figure 5(a)**, the interactive display system 24₁ is shown to comprise an interactive whiteboard (IWB) 130 having a display area 132, and a computer 146 having an associated monitor 148 with a display area 147, a keyboard 152 and a computer mouse 150. The IWB 130 and the computer 144 are connected via a connection 144. The computer additionally connects to the private network 22 via a connection 149.

As illustrated in **Figure 5(a)** the IWB is preferably adapted such that inputs may be detected at the interactive surface thereof which are provided by a pen 134 or a finger 136. Such a dual mode IWB in which both pen and touch inputs can be detected is available from Promethean Limited. The invention and its embodiments are not, however, limited to any specific arrangement of an IWB, or any specific IWB technology. Nor is the invention limited to an interactive whiteboard: the interactive display may be provided, for example, by projecting images onto a plain surface, and other techniques exist for detecting inputs at a displayed image in such an arrangement which do not require interactive surfaces.

As shown in **Figure 5(a)**, content is displayed on the IWB 130. In an arrangement, content is displayed in a window 138,

including a sub-window 140. Such content may, for example, be video content originating from the content provider 12. The content may be displayed in a portion of the display as shown in **Figure 5(a)**, or may fill the whole of the display.

5 Also displayed are icons 142₁ to 142₄. These icons are preferably associated with the content, and represent user choices. They may be possible multiple choice answer options, for example, to a question displayed in the sub-window 140 whilst content associated with the context of the question is
10 displayed in the window 138. A user may select ones of the options 142₁ to 142₄ to provide an interactive response to displayed content. The responses may be provided by any user proximate the IWB 130, which in a classroom environment may be a teacher or a student.

15 **Figure 5(b)** illustrates an exemplary adaptation of the computer 146 of **Figure 5(a)** in accordance with an exemplary arrangement.

The computer 146 comprises an IWB interface 164, a processor 166, a memory 168 including a data store 170, a
20 network interface 172, and applications including a data source content server application 162. All the identified computer elements are interconnected via a computer network connections 174.

The IWB interface receives data from the IWB 130 on
25 connection 144, which data is associated with inputs at the IWB surface. The network interface 172 interconnects the computer system 146 to the private network via network connection 36.

The processor 166 controls the computer. The data store
30 170 stores local data associated with the content to be displayed or the interactive responses received from the IWB 130.

The data source content server application 162 communicates and interacts with the data source content server 60 or data source content server application 106 of the local controller 18.

5 The arrangement of **Figures** 5(a) and 5(b) is an exemplary arrangement, in which functional elements are provided to work in combination to provide the necessary functionality of the interactive display system 24₁. The functionality and operation of the interactive display system 24₁ in accordance with
10 embodiments of the invention will be described further below.

Another exemplary architecture of an interactive display system is described with reference to **Figures** 6(a) and 6(b).

In **Figure** 6(a), the exemplary interactive display system 24₂ is shown to comprise a display device 180 having a display area 182, a computer system 184 having an associated monitor 186 including a display area 188, a keyboard 192, a computer mouse 190, and a wireless transceiver 194, and a plurality of wireless handsets 196₁ to 196_n.
15

Each wireless handset 196 includes a respective keypad 20
20 198, a respective display 200, and a respective wireless transceiver 202. Each wireless handset 196 is in communication with the computer 184, via the wireless transceiver 194.

The handsets 196₁ to 196_n comprise voting devices and are associated with a respective plurality of users. In a school
25 environment, each student in a classroom may be provided with a voting device, or groups of students may share voting devices.

The users may view content on the display device 180, with which content there may be displayed questions or
30 requests for user inputs. The users use the handsets 196 to provide such user inputs.

In a simple example, the questions may be displayed on the display 182 together with multiple choice answer options, and the user may select the appropriate multiple choice answer using the keypad 198. In such an arrangement the keypad may
5 have a small number of buttons corresponding to the number of available multiple choice options, and need have no display.

In more sophisticated systems the users may be able to make full text entries using the handsets 196, and the keypads 198 may be full alphanumeric keypads.

10 In some systems any questions associated with the content displayed on the display 182 may be provided on the screens 200 of the handsets rather than on the screen 182.

In some systems the handsets may comprise a variety of devices, including but not limited to graphic tablets,
15 computers including laptop computers, and smartphones, all adapted to run appropriate software applications.

Figure 6(b) illustrates an exemplary adaptation of the computer 184 of **Figure 6(a)** in accordance with an exemplary arrangement.

20 The computer 184 comprises a handset interface 216, a processor 218, a memory 220 including a data store 222, a network interface 226, and applications including a data source content server application 214 and a learner response system (LRS) application 212. All the identified computer
25 elements are interconnected via a computer network connection 224.

The handset interface 216 receives data from the handsets 196 and transmits data to the handsets 196 if appropriate. The network interface 226 interconnects the computer system 184 to
30 the private network via network connection 36.

The processor 218 controls the computer. The data store 222 stores local data associated with the content to be

displayed or the interactive responses received from the handsets 198.

The data source content server application 214 communicates and interacts with the data source content server 60 or data source content server application 106 of the local controller 18.

The learner response system application 212 also communicates and interacts with the data source content server 60 or data source content server application 106 of the local controller 18.

The arrangement of **Figures** 6(a) and 6(b) is an exemplary arrangement, in which functional elements are provided to work in combination to provide the necessary functionality of the interactive display system 24₂. The functionality and operation of the interactive display system 24₂ in accordance with embodiments of the invention will be described further below.

It should be noted that the display 180 of **Figure** 6(a) may be implemented as the IWB 130 of **Figure** 5(a), such that an interactive display system may receive interactive user feedback from the IWB surface and from remote devices. Various elements of the interactive display systems as described herein, and as well-known in the art, may be combined in different embodiments, and the invention is not limited to the specifics of any interactive display system.

The client-server model involves establishing a communication between the client (such as the data source content server 60 of **Figure** 3 or the data source content server application 106 of **Figure** 4(b)) and clients (such as the data source content server application 162 of **Figure** 5(b) or the data source content server application 214 of **Figure** 6(b)).

All commands between the clients and the server are preferably carried out using the XMPP protocol. Use of the XMPP protocol establishes a virtual "chatroom" between the server and clients. Bridge software associated with the data source content server 60 or the data source content server application 106 may log on to such a virtual chatroom. Each client listens to commands being posted to the "chatroom" from the bridging service associated with the local controller 18, and then responds accordingly. If any of the clients need to pass data back to the server, they may post to the "chatroom" which in turn results in a request for data to be transmitted being handled by the bridging servers within the local controller 18. Commands from the server can carry payloads such as the interactive playlist (described further below), and the client is adapted to handle any such payloads. The client sends commands back to the servers which include playback status of playlist, and the voting results.

All content associated with the applications is preferably stored at the local controller 18, in the data source content server 60 or under control of the data source content server application 106. When a client handles an interactive playlist, all videos and related files are streamed or downloaded to the client from the server, using the HTTP protocol and not XMPP.

The data source content server application 162 of **Figure 5(b)** or the data source content server application 214 of **Figure 6(b)** preferably roams in the background on a client computer, and opens a permanent connection to the server and the "chatroom". The application waits for commands from the server. If a playlist command is sent to the client from the server, then the application will be displayed in full screen mode and start to play the content that is past (which may be referred to as a live mode of operation). The user associated

with the computer may be able to start an access menu that will allow the user to view an active list of past playlists and related content (referred to as a user mode of operation).

As discussed above the playlist will come from the server
5 and the content is hosted on the server, but it is up to the client to handle the playlist and content. The playlist is made up of a number of interactive video segments which is defined as a video, and activities that are to be interactive activated at a given time index along the video's timeline.
10 Interactive activities include voting sessions, interactive HTML, and other applications. Activities can be grouped together into a set that the user will be able to play either individually or one or more collectively.

When the client actions a voting activity the user will
15 be able to vote at the interactive surface or through a voting device, as appropriate according to the system, with results being returned to the server (if the session is initiated by the server) and displayed on the screen of the local interactive display system. When applicable, as discussed
20 further hereinbelow, the client will also show the total set of results for the whole school.

There are a number of behavior options that activities can have, which include an activation period which allows a user to start a video after it has been paused, and a time out
25 period. Each playlist can have additional activities and content (such as flipcharts) which are accessible after the playlist has played.

The client will normally operate in a background mode, but can be in a live mode or a user mode as discussed above.
30 No matter what mode of operation the client is in, if the server commands it to play a playlist it will switch into live mode, and the user will not be able to switch modes until the playlist has finished. If the client is in background mode the

user will be able to switch it into user mode, which will display a set of menu pages (or hosted on the data source content server 60). The menu will list all past playlists which the user will be able to select, and preferably presents
5 a sub-menu which will allow the user to re-play it, play individual activities, and/or download/open flipcharts. The client preferably handles downloading of flipcharts and starts a copy of an appropriate software application to display the flipchart content.

10 Interactive activities preferably comprise voting sessions, either separate to or in synchronization with current video content being displayed. The interactive activities preferably comprise DHTML content which the client opens with an appropriate application and loads. Interactive
15 DHTML activities are preferably stand-alone, and do not interact with the data source content server application 162 or 214 of **Figures** 5(b) and 6(b).

Voting activities are handled natively by the client, and if allowed voting is preferably achieved via a wireless
20 connection between the computer system and remote handsets. Supported voting types would be in accordance with those known in the art, and will include for example multiple choice, yes/no, true/false, yes/no/do not know, and true/false/do not know.

25 With reference to **Figure** 7, there is illustrated the main communication between the content provider 12, the local controller 18, and the interactive display systems 24₁, 24₂, and 24_n (denoted also as IDS₁, IDS₂ and IDS_n) in an exemplary arrangement.

30 As denoted by communication 210, the content provider 12 transmits content in the first data format to the local controller 18.

The local controller converts the content into the second data format, and as denoted by communications 212₁, 212₂, 212_n transmits the received content to each of the interactive display systems 24₁, 24₂, and 24_n in the second data format. Although these communications are illustrated as individual communications in **Figure 7**, preferably they comprise a broadcast to all interactive display systems.

The relevant content is then displayed on each of the interactive display systems 24₁, 24₂, and 24_n as denoted by reference numeral 214.

Individual learner response sessions are then conducted on each of the interactive display systems 24₁, 24₂, and 24_n based on the displayed content, as denoted by reference numeral 216.

Each of the interactive display systems 24₁, 24₂, and 24_n then transmits a respective message 218₁, 218₂, 218_n in the second data format to the local control comprising the interactive responses received at the respective IDS.

The local controller 18 then collates the responses, and broadcasts the collated responses to the interactive display systems 24₁, 24₂, and 24_n as denoted by messages 220₁, 220₂, 220_n.

The collated responses are then displayed on each of the interactive display systems 24₁, 24₂, and 24_n as denoted by reference numeral 222.

The local controller 18 additionally converts the collated responses into the first data format, and transmits the collated response in the first data format to the content provider 12 as denoted by communication 224.

With reference to **Figure 8** there is illustrated as a process flow the steps performed by the content provider (or data source) in an exemplary arrangement. The content provider

may be a third party content provider, independent of any the private environment 16 and independent of the interactive display systems and other content provided to the interactive display systems.

5 In a step 230, there is transmitted content and playlist information to the local controller in a first data format.

In a step 232, there is received collated voting results/interactive responses associated with the display of the content and playlist in the first data format.

10 With reference to **Figure 9** there is illustrated as a process flow the steps performed by the local controller in an exemplary arrangement. The local controller may be a local network computer. The local network computer may be a dedicated computer provided for the purposes of control, or
15 may be a computer associated with an interactive display system and additionally adapted to control the private network in accordance with embodiments of the invention.

The local controller receives content and playlists from the content source in a first data format, as denoted by step
20 240.

The local controller converts the content and playlist from the first data format to the second data format, as denoted by step 242.

25 The local controller broadcasts a playback command in the second data format to the interactive display systems in accordance with triggers in the playlist, as denoted by step 244.

The local controller receives voting results from the individual interactive display systems in the second data
30 format as denoted by step 246.

The local controller collates the voting results in step 248.

The local controller broadcasts the collated voting results to the interactive display systems in the second data format as denoted by step 250.

The local controller converts the collated voting results into the first data format as denoted by step 252.

The local controller broadcasts the collated voting results in the first data format to the content source as denoted by step 254.

With reference to **Figure 10** there is illustrated as a process flow the steps performed by the interactive display system controller in an exemplary arrangement. The interactive display system controller may be a local computer, such as a teacher computer in a classroom.

The interactive display system controller receives the playlist from the local controller (location of videos and interactive activities on content server associated with local controller), as denoted by step 260.

The interactive display system controller receives the broadcast playback command from the local controller, as denoted by step 262.

The interactive display system controller accesses content based on playlist information, as denoted by step 264.

The interactive display system controller displays content associated with playlist, as denoted by step 266.

The interactive display system controller initiates a voting session associated with interactive activities as denoted by step 268.

The interactive display system controller transmits the voting results to the local controller as denoted by step 270.

The interactive display system controller receives the voting results of all the interactive display systems as denoted by step 272.

5 The interactive display system controller displays the voting results of all interactive display systems as denoted by step 274.

The software running on the computer associated with any interactive display system preferably constantly runs in the background. The software preferably plays video and time-
10 triggered activities, interactive or not, involving a learner response system or not. The software application takes over the desktop when activated, with any content being displayed in full screen mode always on top of any other windows. For this to happen, the computer must preferably be logged in and
15 unlocked. If not logged in, preferably nothing happens. If logged in and locked, the video will play but cannot be viewed until the desktop is unlocked.

The software application on the computer system associated with an interactive display system receives from
20 the server, via XMPP protocol, a school-wide playback command; a playlist (for example in XML format), including locations of videos and interactive activities on the media server; vote results from interactive display systems in the whole school; and a button library for the user interface.

25 The software application running on the computer system associated with the interactive display system sends to the server, preferably using the XMPP protocol, its current status (e.g. play, stop, pause, error etc.), and vote results for the classroom with which it is associated.

30 The software application running on the computer system associated with the interactive display system is preferably activated by the server for school-wide playback or by an icon on a desktop of the teacher's computer to access archive

material. The school-one trigger is sent by the content server by a bridge associated with the private network controller.

The playlist is preferably sent to the client as XML data. The playlist preferably contains the list of video files to play, and any activity data associated with the video. The activity data is a separate activity playlist. The activity data contains a list of activities, any associated time triggers with the activities, the type of the activities and the description of the activities.

At the end of a playback, an HTML page is accessible from the content server, showing daily additional material (such as flipcharts, web links, links to activities in the playlist, linked to the video to play it back). This is preferably created daily, and made available in the playlist as an HTTP link.

If the teacher wants to make modifications, the flipcharts can be downloaded locally onto the teacher's computer. If the teacher only wants to read the flipchart, then they can use a copy stored on the media server. The player will keep track of which flipcharts have been saved, so that if a teacher tries to open it from the additional content page, it will open the modified copy (or give a choice of which to open).

Activities are time-triggered. The type, trigger and all other information is preferably defined in the activity playlist, consisting of XML data sent from the server. The activities can be triggered automatically, with some exceptions. The activities can be triggered by pressing a button on the screen (e.g. on the screen of an interactive display surface). Activities can also be triggered to appear automatically at the end of a video. Once an activity starts, internal timers preferably handle the timing out of the activity if a timer has been defined, which is recommended

when an activity starts automatically, otherwise the video playback may stop. A final additional content page may be provided, which appears at the end of the video and will display an overview in shortcuts to each activity.

5 Activities may be any of the following type, as well as additional activities. One activity is an in-line LRS question. As the video plays, a player starts an LRS session. If an LRS system is present, then users may vote by clicking on buttons, with the responses slotting in alongside the
10 video. This is done automatically and preferably requires no involvement from the teacher. The result would be logged and sent to the server, and subsequently to all classrooms, for school-wide display in a preferable embodiment.

 Automatic or button-triggered interactivity may be
15 provided. A time-trigger may activate a web based activity located on the server or externally. This may occur either automatically, or if the user presses a button, the video may pause and the activity starts. The activity is freeform, and the results (if any) will not be logged or shared between
20 classrooms in a preferred embodiment. Activities include (but are not limited to): dragging pictures (for instance on a map); reveal of type activity (clicking on a picture to play a sound or revealing a picture); and an LRS question.

 The activities may be written in any appropriate format,
25 but preferably in a format which allows the activities to be as rich as possible, for example including sound when they start, and/or advanced animations. The timing and sequencing of the activities is preferably handled by the player software, not directly by the activity. This will be done
30 using timers independent of the video playback. To start with, the activities may be presented as templates that can be customized by the content provider. Customization may include, for example, changing the background of an activity.

Activities can be grouped together. For instance an activity may be to drag items to a correct location, and the next activity may be a static picture of the answer. This is created as two activities but automatically presented on the screen one after the other, so that when the answer is entered and the application continues, the answer appears on the screen.

Several groups of activities may be triggered at the same point in time. Buttons on the side of a video displayed on an interactive display surface may allow a teacher to choose which activity to run.

In the case of several groups of activities, the first activity may be triggered automatically (or not). The others may only be started manually. Also, for inline LRS questions and button activities, these cannot be triggered at the same time, because the inline answer buttons and the choice buttons cannot co-exist on the screen. This can be solved by creating an LRS question as a button-triggered activity, in which case it appears over the video rather than slotting on the side of the screen.

In the case of the presence of an LRS system, the results are preferably sent to the server via XMPP. The bridge software then sends the results to the content provider, for storing and further processing in accordance with the content provider's requirements. Preferably the XMPP server sends a copy of an individual classroom's answers to all other classrooms, which may be termed listening classrooms.

The player in a classroom will report the results of both the room and the school for a set period of time, defined in the activity. Preferably activities are not integrated with the video. In the case of an inline question, buttons appear on the side of the video, but not on it. In the case of interactive content, a window will appear on top of the video,

hiding it. It will not be possible, preferably, to click on the video or write or drag on it.

The activities are preferably web-based, and so as not to rely upon a particular application being installed in order to play them back. This makes operation easier, as there is no requirement to keep track of whether a particular application is running, nor is there a requirement to save data.

The invention has been described herein with reference to exemplary arrangements and preferred embodiments. One skilled in the art will appreciate that the invention is not limited to such arrangements, and further modifications to the described arrangements is possible without departing from the scope of the invention as defined by the appended claims.

The claims are representative of the embodiments of the invention as described herein, and additional features as described herein may constitute an invention either alone or in combination with other features as described herein.

20

25

30

Claims

1. An interactive display system architecture, comprising:

5 a controller arranged to receive data representing content in a first data format and further arranged to convert the data in the first data format into data in a second data format;

a plurality of interactive displays systems, each interactive display system comprising:

10 an interactive display surface adapted to display visual content and receive inputs associated with the displayed visual content at the surface thereof;

a controller for the interactive display; and

15 a plurality of remote devices connected to the controller, for providing inputs corresponding to the visual content displayed on the interactive display;

a local network arranged to distribute the data representing content in the second data format to the plurality of interactive display systems; and

20 wherein each of the plurality of interactive display systems is arranged to:

simultaneously display content based on the data in the second data format as visual content on their respective interactive display surfaces;

25 detect inputs at the interactive display surface and receive inputs from the associated plurality of remote devices; and

provide the received interactive inputs in the second data format to the controller,

30 the controller further being adapted to:

distribute the received data in the second format to each of the plurality of interactive display systems, such that results associated with the interactive display data from

each of the plurality of systems may be displayed by each display system;

convert the received inputs in the second data format into inputs in the first data format; and

5 transmit the received interactive inputs in the first data format.

2. The interactive display system architecture of claim 1 wherein the data representing data in the first data format is received from, and the received interactive input in the first data format is transmitted to, a content provider.

3. The interactive display system of claim 1 or claim 2 wherein the controller of the architecture comprises a server and the controller of each interactive display system comprises a client.

4. The interactive display system of claim 3 wherein a communication session is established between the server and each client for delivering received content to each interactive display system.

5. The interactive display system of claim 3 or claim 4 wherein a communication session is established between one of the clients and the server for delivery of interactive responses to the architecture controller.

6. An interactive display system architecture, comprising:
a data source arranged to provide content in a first data format;

an interface arranged to convert the content in the first data format into content in a second data format;

a plurality of interactive displays systems; and

a local network arranged to distribute the content in the second data format to the plurality of interactive display systems,

wherein the plurality of interactive display systems are
5 arranged to display the content and to receive inputs from one or more users, and each of the plurality of interactive display systems is arranged to provide the received inputs in the second data format to the interface, the interface further being adapted to convert the received inputs in the second
10 data format into inputs in the first data format, and provide the inputs in the first data format to the data source.

7. An interactive display system architecture, comprising:

a plurality of interactive displays systems;

15 a controller connected to each of the plurality of interactive display systems; and

a local network arranged to distribute data between the plurality of interactive display systems and the controller,

wherein the plurality of interactive display systems are
20 arranged to display a common content under control of the controller, and to receive inputs from one or more users, each of the plurality of interactive display systems being arranged to provide the received input to the controller, the controller further being adapted to distribute received data
25 to each of the plurality of interactive display systems, such that results associated with the interactive display data from each of the plurality of systems may be displayed by each displays system.

30 8. A method of operating the interactive display system architecture of any one of claims 1 to 7.

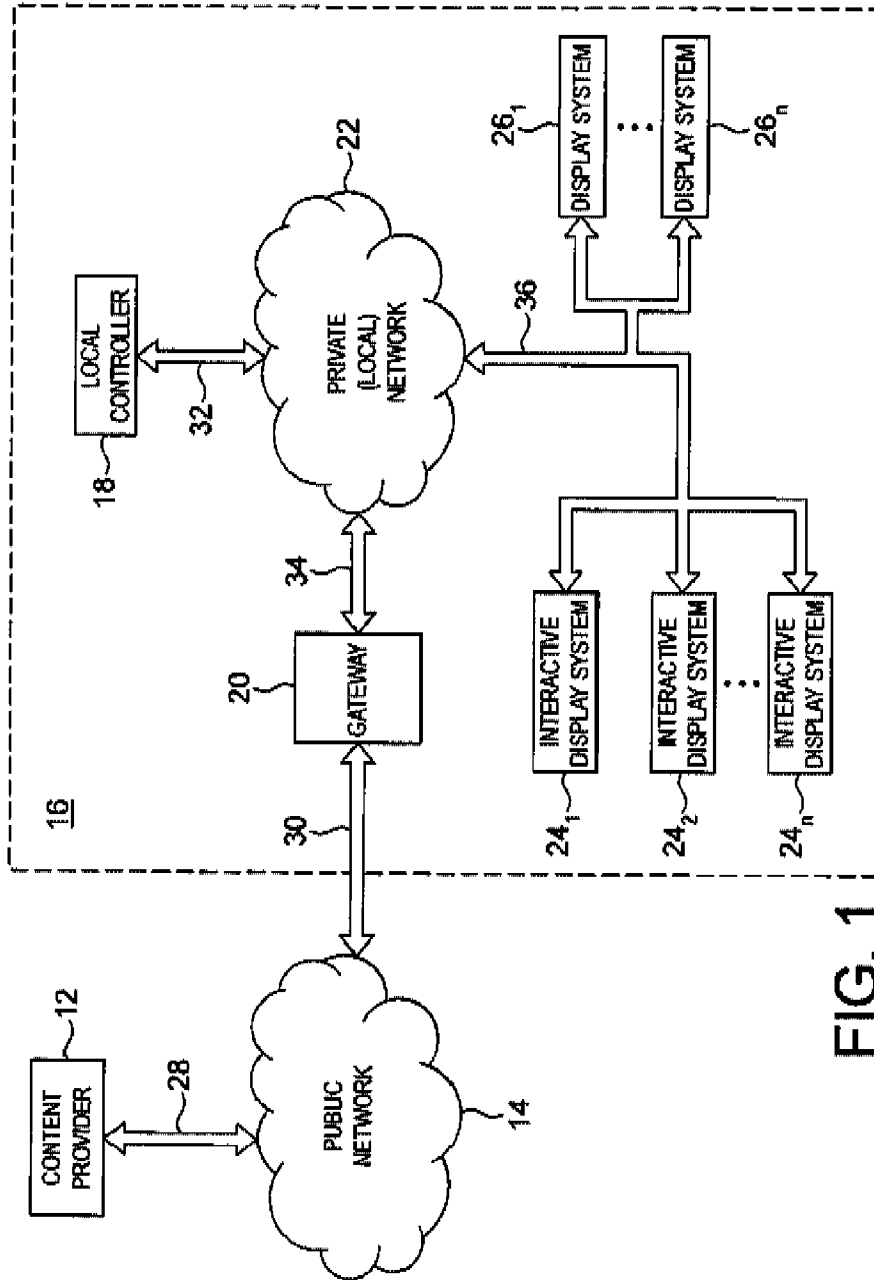


FIG. 1

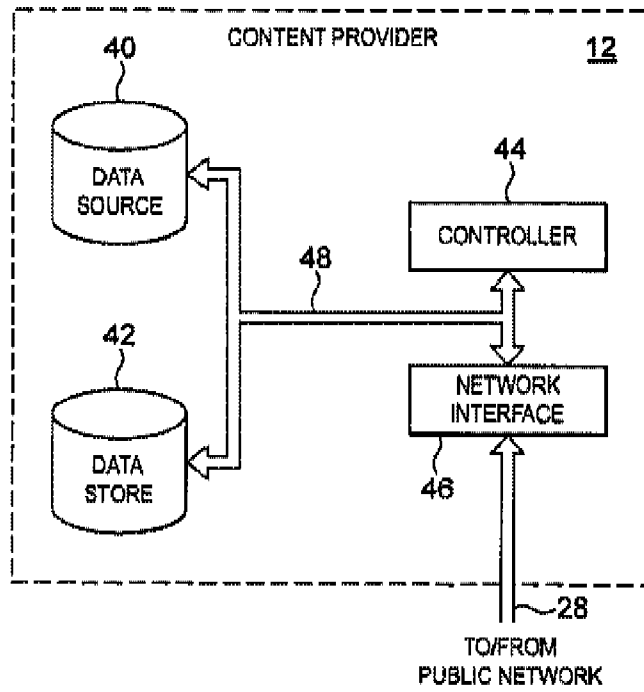


FIG. 2

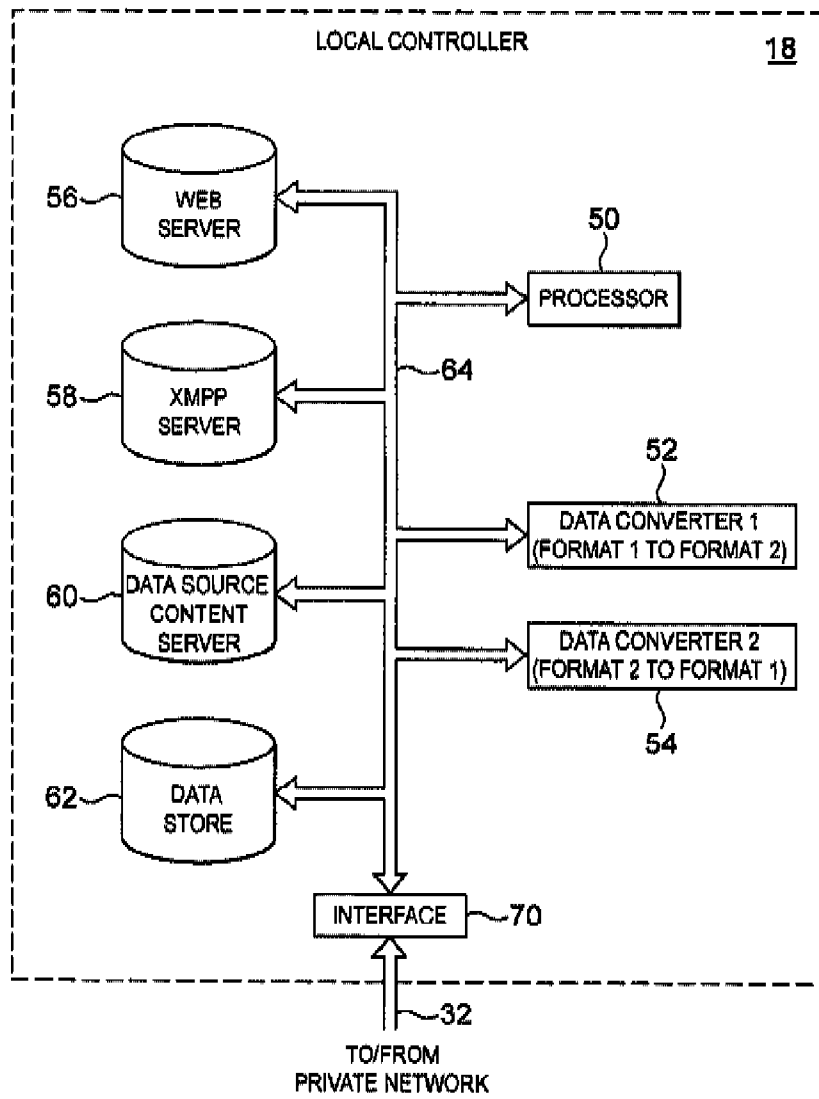


FIG. 3

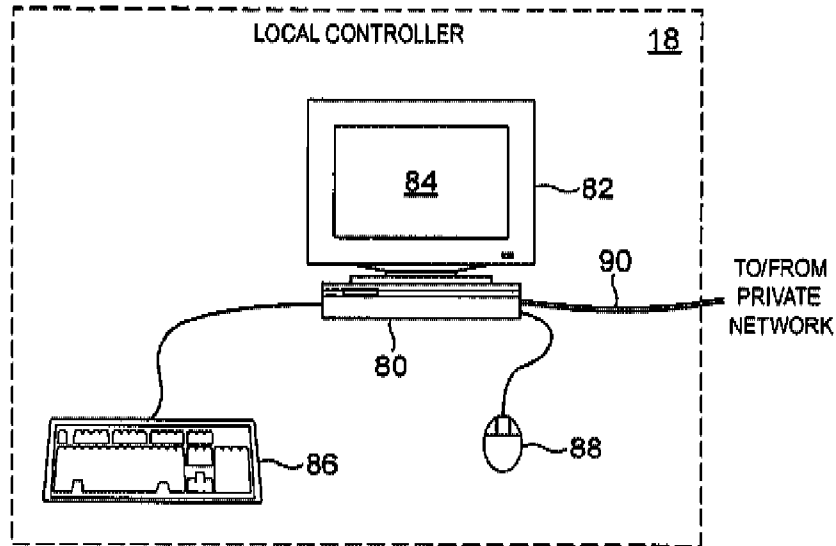


FIG. 4(a)

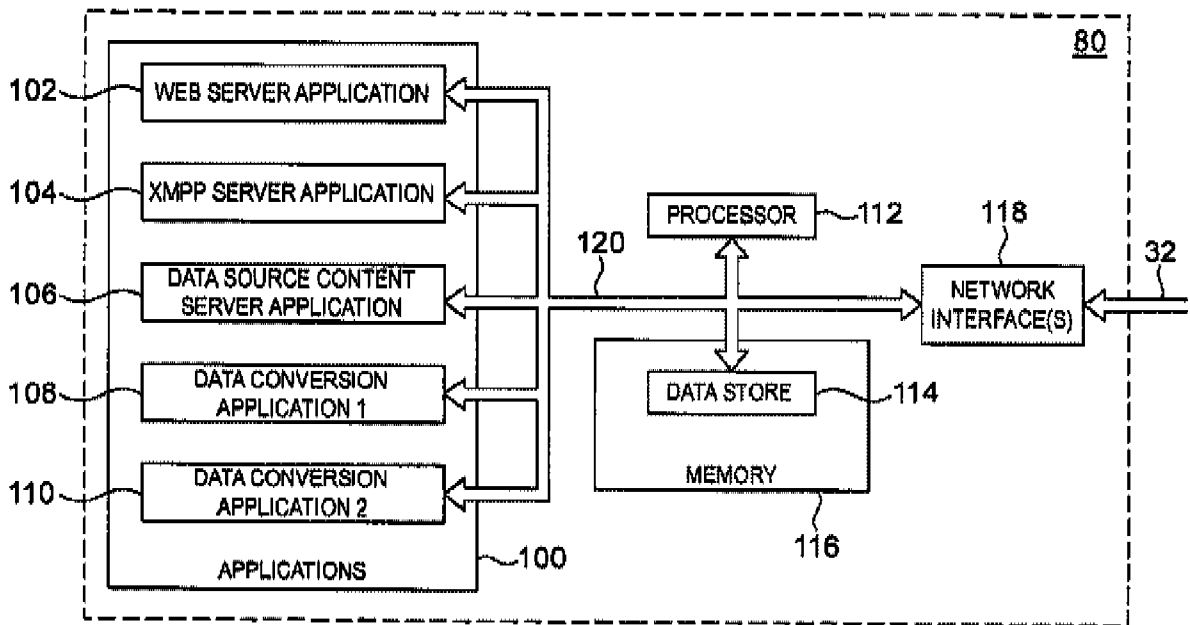


FIG. 4(b)

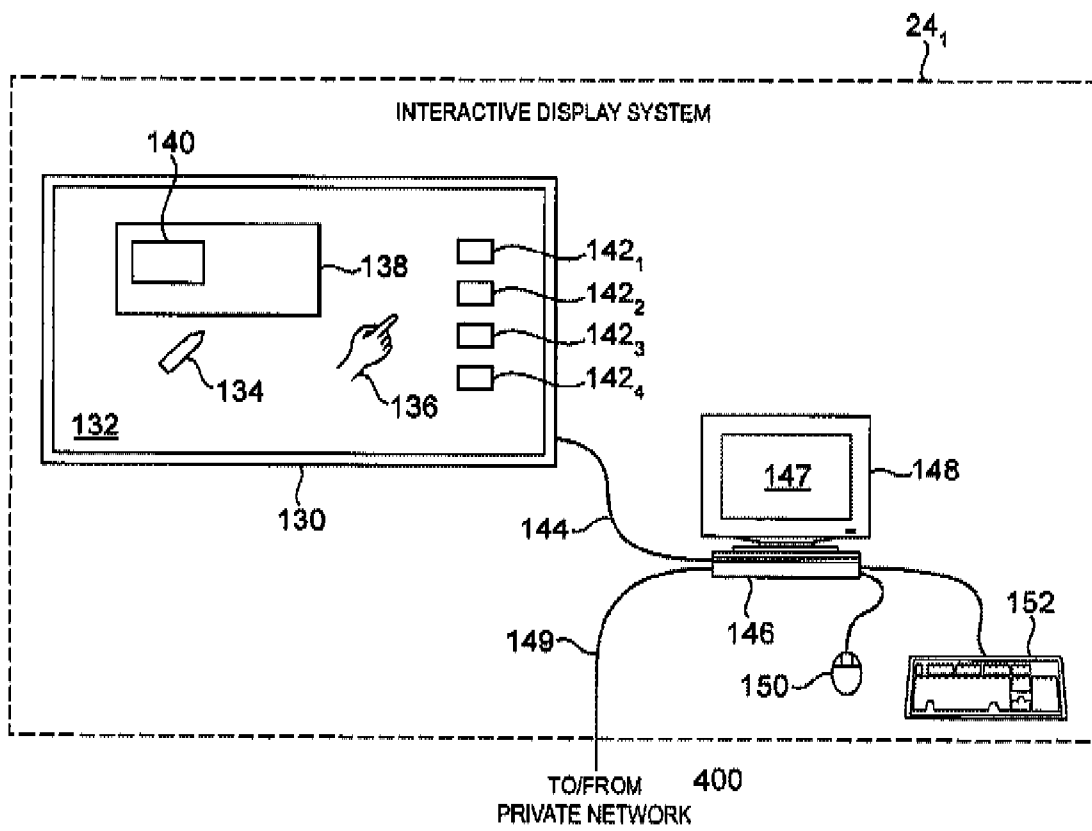


FIG. 5(a)

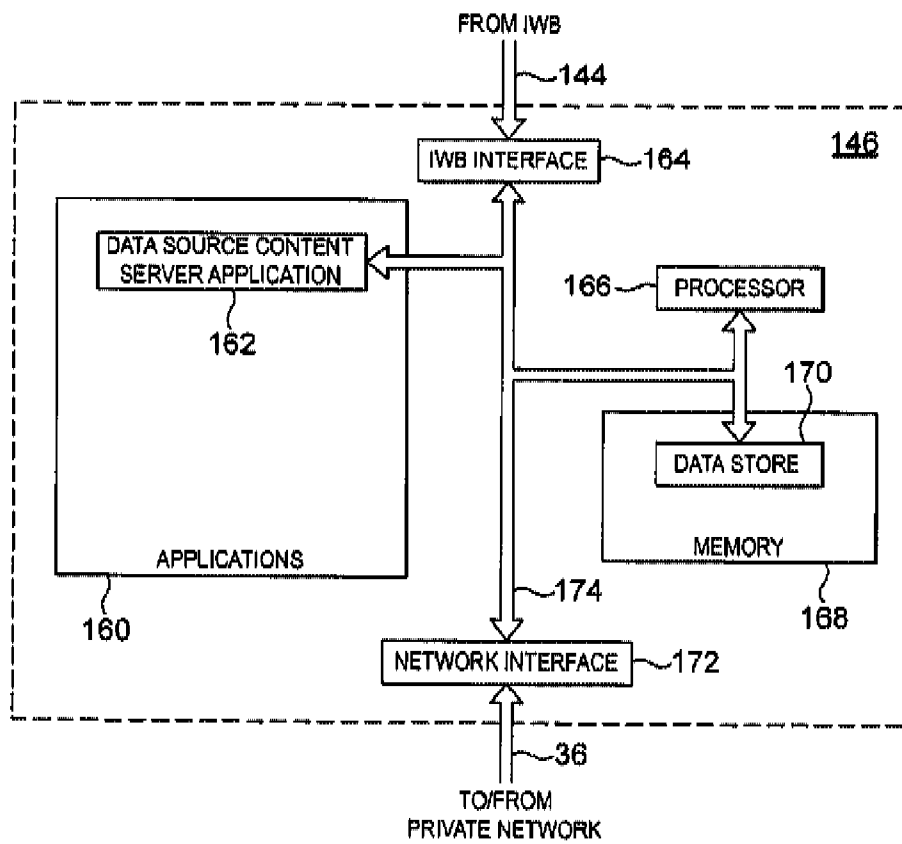


FIG. 5(b)

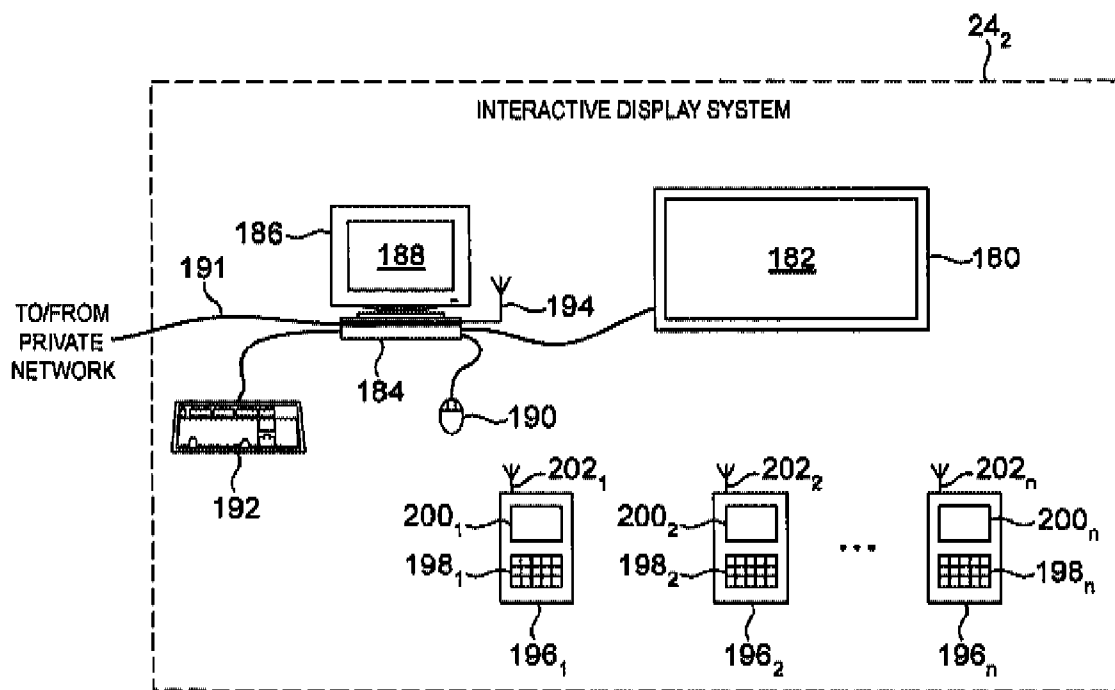


FIG. 6(a)

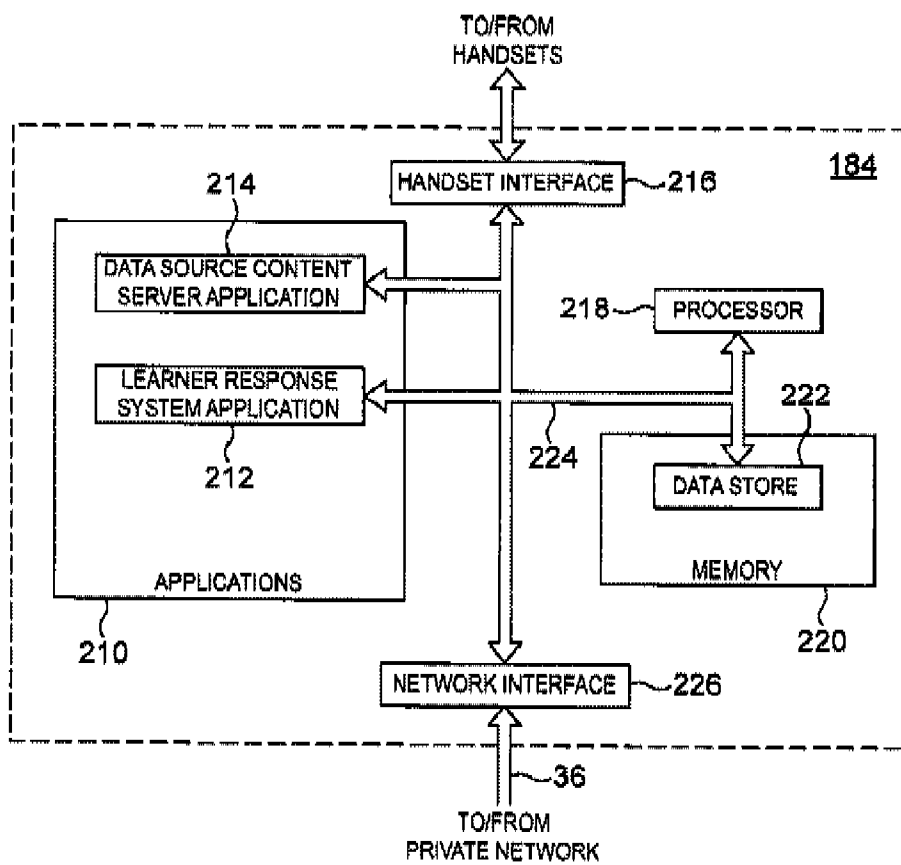


FIG. 6(b)

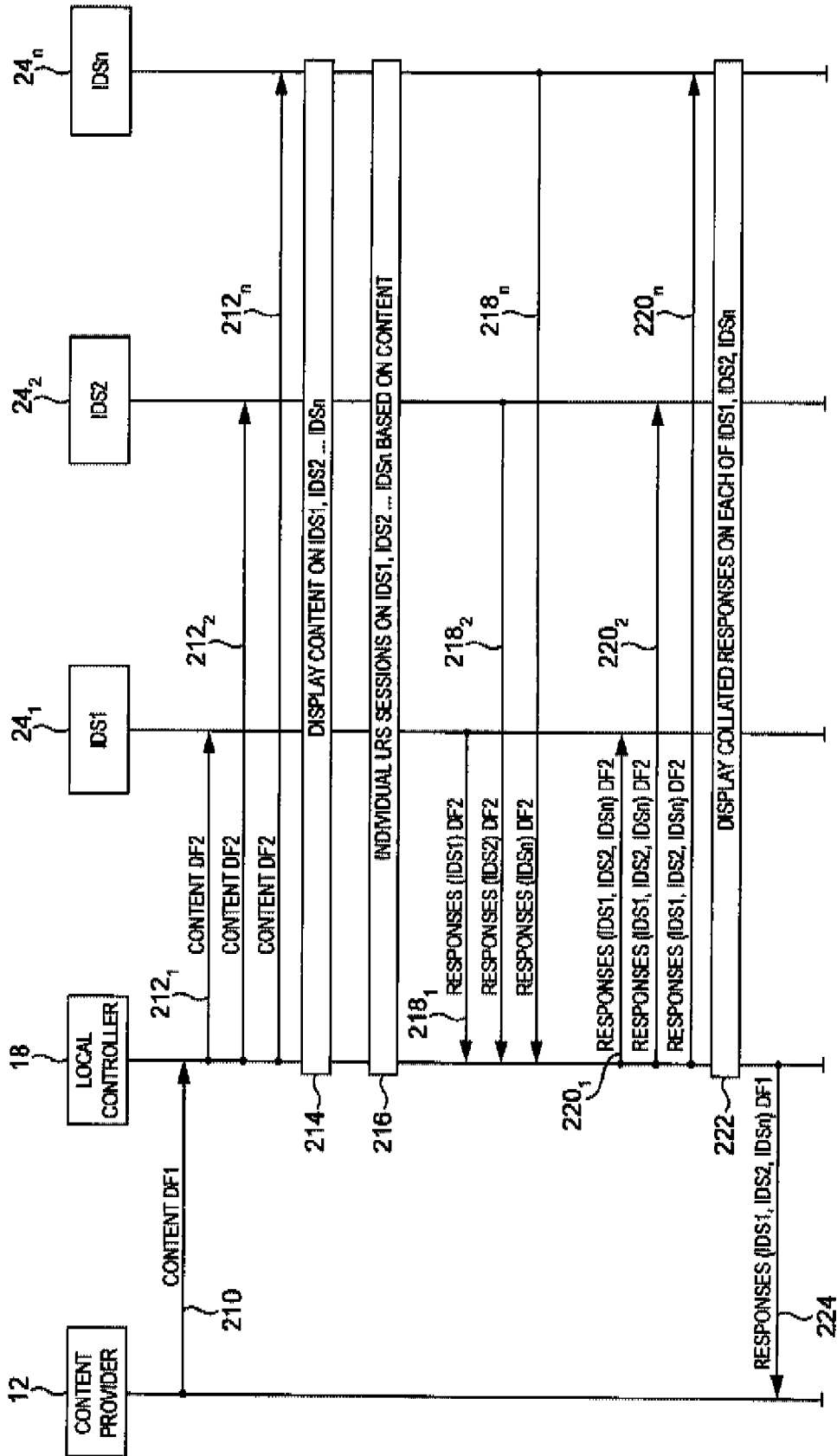


FIG. 7

10 / 11

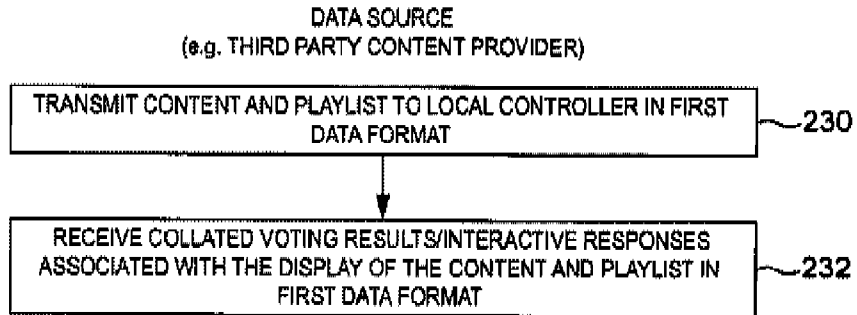


FIG. 8

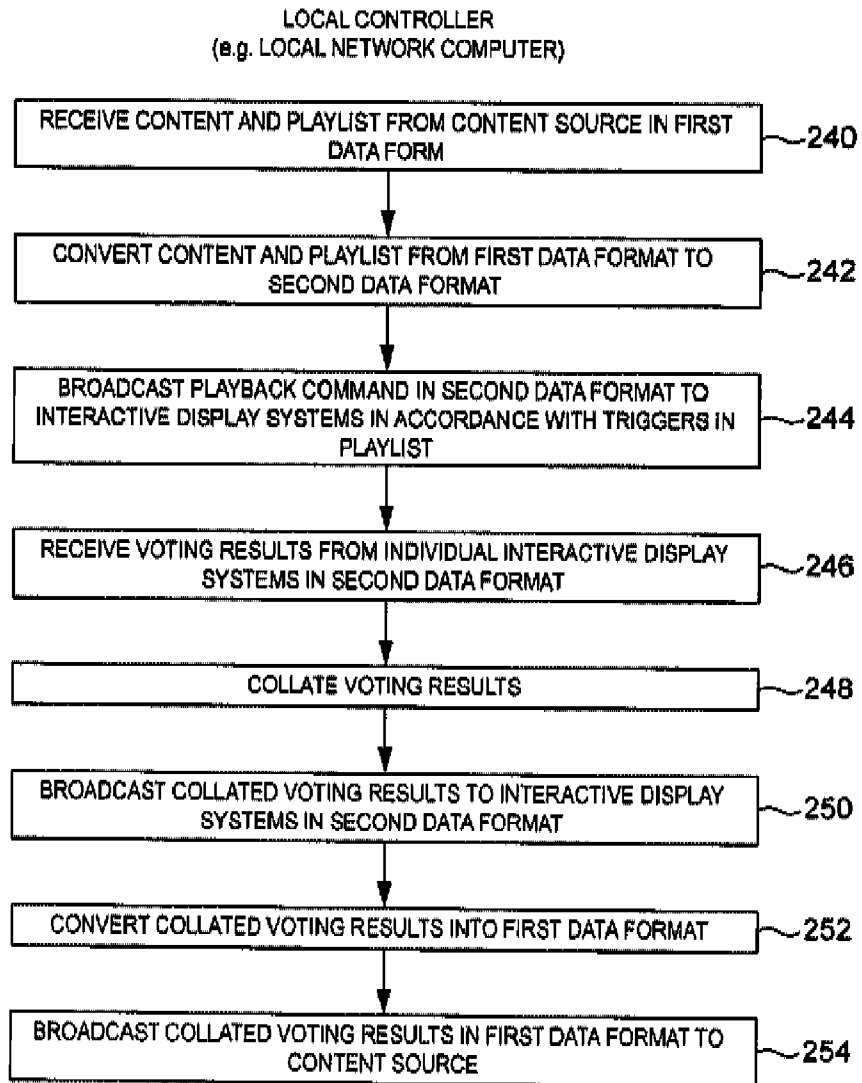


FIG. 9

11 / 11

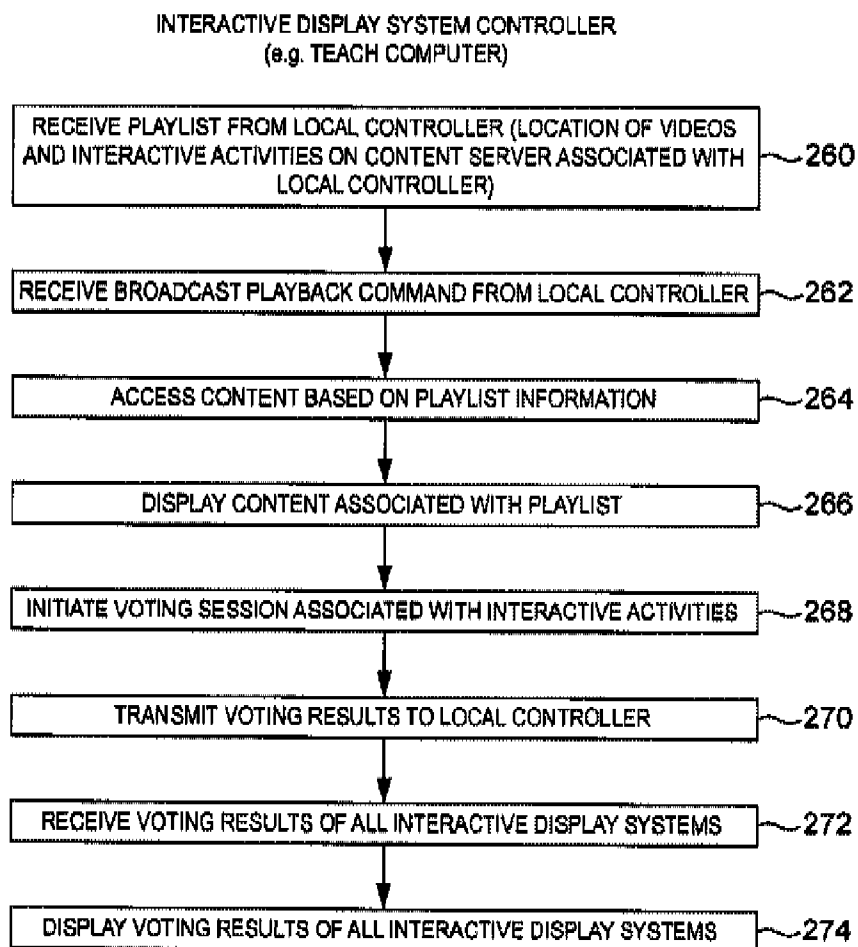


FIG. 10

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2012/071351

A. CLASSIFICATION OF SUBJECT MATTER
INV. G09B7/02 G09B7/06
ADD.
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
Minimum documentation searched (classification system followed by classification symbols)
G09B G06F

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2002/115050 A1 (ROSCHELLE JEREMY [US] ET AL) 22 August 2002 (2002-08-22) abstract; figures 1,2,5 paragraphs [0021] - [0035], [0038], [0049], [0052], [0077], [0081] -----	1-8
X	US 6 471 521 B1 (DORNBUSH CHARLES F [US] ET AL) 29 October 2002 (2002-10-29) abstract; figures 1, 2a, 2c, 8, 9 column 22, lines 34,35 column 24, lines 43-60 -----	1-8
X	WO 2009/120921 A1 (KNOWLEDGE ATHLETES INC [US]; MILLER DAVID E [US]) 1 October 2009 (2009-10-01) abstract; figures 1,5 paragraphs [0055], [0057] - [0058], [0060] -----	1-8

Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

Date of the actual completion of the international search 26 March 2013	Date of mailing of the international search report 04/04/2013
---	---

Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Amian, Dirk
--	--

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2012/071351

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2002115050	A1	22-08-2002	NONE

US 6471521	B1	29-10-2002	US 6471521 B1 29-10-2002
			US 6773266 B1 10-08-2004

WO 2009120921	A1	01-10-2009	US 2010151431 A1 17-06-2010
			WO 2009120921 A1 01-10-2009
