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- (71) Applicant and
(72) Inventor: **DUNCAN, Kelvin, Scott** [NZ/NZ]; 1 Allister Avenue, Merivale, Christchurch (NZ).
- (74) Agents: **FERANCE, Stephen, J.** et al.; Fetherstonhaugh & Co., Box 11560, Vancouver Centre, 650 W. Georgia Street, Suite 2200, Vancouver, British Columbia V6B 4N8 (CA).
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(54) Title: DATA MANAGEMENT AND DISTRIBUTION

(57) Abstract: In a data management and distribution system an index data file is generated and made available for receipt by a recipient of a record, the index data file identifying aspects of segments of the record. In a preferred application the record is a record of sports game and the record is obtained from a television broadcast. Index data, including general match and team information, and details regarding particular occurrences or sub-sections of the game, are generated and made available for receipt by recipients of the television broadcast. Preferably the index data is made available by internet download or email. Recipients of both the record and the index data may then define criteria for selection of sub-sections of the record, e.g. all sub-sections showing successful tackles by a named player. The index data is used to identify sub-sections meeting the criteria and to identify the location of particular sub-sections within the record. The selected sub-sections may then be output with their associated index data or displayed, with full control of playback.

DATA MANAGEMENT AND DISTRIBUTION

FIELD OF THE INVENTION

5 This invention relates to the management and distribution of data and particularly, but not exclusively, to the distribution of an index data file that may be used to interactively access, edit and control the playback of a record, for example of a sports event.

10 In one application of the invention a record of an event, for example a sports game, is broadcast as a television signal and video data derived from the received television broadcast is stored by a recipient. An index data file is generated, the index data file including identification of segments of the broadcast television signal. The identification relates to the subject matter portrayed generally by the television signal and particularly by the individual segments, and includes indexing points (e.g. the
15 start and stop points) of the segments. The index data file is made available for receipt by recipients of the television broadcast. A recipient, having stored both the video data derived from the broadcast television signal and the index data file, is able to interactively use the index data file to identify selected segments of the video data and manipulate the stored video data, for example by editing and playing back
20 selected segments.

The invention has application in interactive television, sports analysis and training, management of digital assets or records, distance education, or medical and industrial
25 monitoring and training, for example.

BACKGROUND OF THE INVENTION

30 Analysis systems based on video records have been used for some time, for example in sports analysis and training. An index of the video record is compiled as a computer data file and integrated with the video record which is preferably compressed by being digitally encoded. The integrated index data file and video record are handled conjointly during storage and transmission of the video

information. The index data file may be used to provide interactive access to the video record.

5 Even in digitally compressed form, video information results in huge files which can require large bandwidth or long timeframes for transmission from one place to another. Hence, it is often expensive to distribute video data along with the associated index data file via electronic highways such as the internet.

10 Broadcast television provides cheap and effective mass distribution of video data and can include a small amount of metadata embedded with the television signal, e.g. during hidden lines or flyback periods. The 'Teletext' system is one example where a limited amount of information is embedded within the broadcast signal. Nevertheless, the capacity of embedded data systems is not sufficient to provide for the detailed indexing and description of a large number of short scenes or clips forming the
15 content of the associated television broadcast.

Video analysis systems used by professional sports teams may involve thousands of computer database records which allow coaches and players to get interactive access to any selected subset of actions or events recorded during the course of a game.
20 Detailed analyses can be made by providing playback facilities which allow any section of the video record to be played forwards or backwards at any speed and/or repeated.

25 SUMMARY OF THE INVENTION

It is an object of the present invention to make an index data file available for receipt by a recipient who is also able to receive a record signal, where the index data file includes identifications of aspects of the record signal, or at least to provide the public with a useful choice.

30 Accordingly in a first aspect the invention may broadly be said to consist in a data management method comprising the steps of generating an index data file and making the index data file available for receipt by at least one recipient, the index data file

containing segment descriptors corresponding to respective segments of a source signal available for receipt by the at least one recipient.

5 Preferably the segment descriptors include identifiers indicative of the start and finish of respective segments of the source signal, and the segment descriptors include identifiers indicative of the subject content of respective segments of the source signal.

10 In a second aspect the invention may broadly be said to consist in a data management method for management of data relating to a source signal, wherein the source signal is available for receipt by at least one recipient, and the source signal comprises a series of segments, each segment portraying subject matter when converted to a humanly perceptible format, the data management method comprising the steps of:

15 generating an index data file of codes corresponding to descriptors of respective segments of the source signal, the descriptors including limit identifiers identifying start and finish points of the respective segments, and the descriptors including subject identifiers identifying aspects of the subject matter of the respective segments, and

20 making the index data file available for receipt by the at least one recipient.

Preferably the data management method includes the additional steps of receiving the source signal, converting the source signal to the humanly perceptible format, and presenting the source signal in the humanly perceptible format to a human operator controlling the generation of the index data file.

25 Preferably the index data file is made available on an internet web site for download by the at least one recipient.

Preferably the index data file is e-mailed for receipt by the at least one recipient.

30 Preferably the index data file is stored on a portable signal storage medium which is made physically available for receipt by the at least one recipient.

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Preferably the source signal is stored along with the index data file on the portable signal storage medium.

5 Preferably the index data file is combined with a broadcast signal, and the combination is broadcast for receipt by the at least one recipient.

Preferably the index data file is embedded in a television signal which is broadcast for receipt by the at least one recipient.

10 Preferably the source signal is a broadcast signal.

Preferably the index data file received by the at least one recipient is stored on a digital data storage medium.

15 Preferably the at least one recipient receives the source signal stored as digital data on a digital data storage medium.

In a third aspect the invention may be broadly said to consist in a data coding apparatus for generating an index data file for interactive use with a digital signal file derived from a source signal, the digital signal file and the source signal each comprising a series of segments respectively portraying subject matter when converted to a humanly perceptible format, the data coding apparatus comprising:

20 a coding device which selectively generates an index data file of codes corresponding to descriptors of respective segments of the source signal, the descriptors including limit identifiers identifying start and finish points of the respective segments, and the descriptors including subject identifiers identifying aspects of the subject matter of the respective segments, and

25 a data file delivery means which makes the descriptor code data file available for receipt by at least one recipient.

30 Preferably the data coding apparatus includes a source signal receiver which receives the source signal, and a source signal presentation device which converts the received source signal to the humanly perceptible format.

In a fourth aspect the invention may be broadly said to consist in a data formatting apparatus for interactively formatting a digital signal file derived from a source signal comprising a series of segments respectively portraying subject matter when converted to a humanly perceptible format, the data formatting apparatus comprising:

- 5 a first input which receives the source signal,
a second input which receives an index data file containing codes corresponding to descriptors of respective segments of the source signal, the descriptors including limit identifiers identifying start and finish points of the respective segments, and the descriptors including subject identifiers identifying
10 aspects of the subject matter of the respective segments,
a data storage device in which the received index data file and the received source signal are stored as respective data files, and
a formatting device which has access to the respective stored data files and has a format definition input which receives an indication of a format definition, the
15 formatting device generating a list identifying a subset of the source signal segments identified by codes corresponding to descriptors which match the format definition, and the formatting device outputting data comprising those parts of the source signal data file corresponding to the subset of segments identified by the list.

- 20 Preferably the data formatting apparatus includes an encoder which converts the received source signal into an encoded digital source signal data file.

- Preferably the format definition includes a subject matter definition, the formatting device generating a list identifying a subset of the source signal segments identified
25 by codes corresponding to descriptors which match the subject matter definition.

BRIEF DESCRIPTION OF THE DRAWINGS

Preferred embodiments of the invention will be described, by way of example only, with reference to the accompanying drawings in which:

- 30 Figure 1 shows, in flow chart form, a broad overview of a data management system,
Figure 2 shows, in flow chart form, a detailed overview of a data management system,

Figure 3 shows a process for the generation and compilation of an index data file,

Figure 4 shows a process for exporting index data,

Figure 5 shows a process for importing index data,

5 Figure 6 shows a synchronisation process,

Figure 7 shows a process for editing and displaying a stored record, and

Figure 8 shows an apparatus for performing some of the processes shown in Figures 1-7.

10 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the figures it will be appreciated that the invention can be implemented in many forms for a wide variety of users without departing from the scope of the claims. Preferred forms are given here by way of example only.

15

Descriptions of features given in respect of one Figure are to be understood as applying, where not inappropriate, to like features with like labels appearing in other Figures.

20

Figure 1 shows a broad over view of system in which a broadcaster 101 televises an event and broadcasts a signal derived from that event. The broadcast event signal is received 102 by an indexing author 103 who generates an index 104 based on the received event signal. The index includes details relating to the event and details relating to segments or sub-events of the event.

25

It is to be understood, unless the context requires otherwise, that references herein to index or index data are to include general or synoptic event details in addition to details regarding the nature of individual sub-sections of the event and the location of those sub-sections within the record of the event.

30

The broadcast event signal is also received 105 by at least one end user 106. The end user digitally encodes 107 the event signal and stores 108 the encoded signal.

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The indexing author 103 makes the index data available 109 for receipt by end users including the end user 106.

5 The end user 106 receives 110 and stores 111 the index data and uses the stored index data to access the encoded and stored event signal. The index data is used to identify and locate segments or sub-events meeting defined criteria. The index data can be used to edit 112 and re-compile the event signal into an edited version, and to control the play back 113 of the event signal.

10 In addition to the television broadcaster, the system is implemented by two distinct components: the indexing system, and the end user or player system.

15 The indexing system is used by an 'authoring' organisation and has two major functions: to encode and record a video signal, for example as a file in MPEG format, and to create a database of index data which codes and identifies segments of the video. The video signal is obtained from a television broadcast, video camera or video recording.

20 A copy of the video signal is made available to the end user, preferably by television broadcast. Alternatively, the video signal is made available to the end user by way of a video recording, e.g. from a video cassette hire outlet. Alternatively, the video may be encoded, e.g. by the authoring organisation, and then made available to the end user, e.g. in the form of a CDROM or DVD, or by internet download.

25 The end user or player system is used by an end user to access the video signal by means of the database of index data acquired from the authoring organisation. The video file will usually be provided on the end user's system by receiving a television broadcast, and encoding a video signal derived from the broadcast by using an MPEG encoding device connected to the end user's computer. Alternatively, an MPEG file
30 may be copied to the end user computer from the 'authoring' organisation system by means of a computer network, e.g. Local Area Network (LAN), Wide Area Network (WAN), or the Internet.

Figure 2 shows a detailed overview of a system by which a signal 201 captured or derived from an event 202, e.g. a sports game, and an index data file 203 corresponding to the derived event signal are delivered 204, 205 to a recipient end user 206 where they are respectively stored as a stored event signal 207 and a stored index data file 208 for subsequent interactive editing 209 of the stored event signal using the stored index data file.

Figure 2 shows various functions enclosed by broken lines to represent the functions which in one preferred arrangement may be performed by three parties: the event signal author and distributor 210, the indexing author 211 and the end user or recipient 206. In practice, the functions do not necessarily have to be performed in the groupings shown in Figure 2. For example, the capture of the event signal and the delivery or distribution of the event signal to the indexing author and the recipient may be performed by distinct parties. In another example, the indexing function is performed by the distributor of the event signal.

There are many possible options, some of which are included in the general overview shown in Figure 2. One embodiment of the system, depicted by the boxes joined by bold lines in Figure 2, will be particularly described.

In Figure 2 an event signal author and distributor 210 captures 212 a record or signal 201 of an event 202, for example a game of rugby football or other field sports game. The event is captured by television cameras which generate a real time event signal 201 in the form of a video signal. This video signal is delivered 204 as a broadcast television signal 213.

As is common in such circumstances, the real time event signal may be recorded 214. This record may be subsequently played back 215, e.g. when a relatively small portion of the event signal is played back as a so-called 'action replay' or when an event is recorded for subsequent play back as a delayed broadcast of the event.

The broadcast television signal of the event is received 220 by an indexing author 211. The indexing author digitally encodes 221 the received televised event signal into a compressed digital format, e.g. MPEG1. The encoded event signal is stored

222 preferably on a hard disk of a computer of the indexing author. The stored encoded event signal is played back 223 and displayed 224 for viewing 225 of the event signal, as broadcast, by the indexing author.

5 The received broadcast event signal may be recorded 230 for subsequent play back 231, e.g. by a video cassette recorder (VCR) or by a digital video disk (DVD) recorder. After playback 231 the signal may be displayed 224 directly or digitally encoded 221, if not already, and stored 222 as an encoded signal for later playback 223.

10

The signal may be received by the indexing author 211 already in a digitally encoded format in which case the encoding step 221 may be omitted and the received digital signal routed 232 directly to be stored 222 as an encoded signal.

15

If the indexing author 211 attends the event 202 and views the live event 233, then the steps of receiving, recording and playing back the event signal 220, 230, 231; encoding, storing and playing back the encoded signal 221, 222, 223; and displaying the event signal 224, may be omitted.

20

In summary of the modes discussed above, the author can view the event live 202, 233, 225, or view the event directly from a live broadcast 202, 212, 201, 204, 213, 220, 224, 225, or view the event directly from a delayed broadcast 202, 212, 201, 214, 215, 204, 213, 220, 224, 225, or from a subsequent playback 223, 231 of a stored record 222, 230 of the television broadcast.

25

The functions of the event signal author and the indexing author can be combined and performed by the same provider, i.e. the event signal author also generates and compiles the indexing data file. In this case, the delivery of the event signal from event signal author to indexing author is simplified and the captured event signal 201 can be routed directly 234 to the indexing author, e.g. for digital encoding 221 and/or display 224 and viewing 225.

30

Upon viewing the event 225, the indexing author 211 generates index data as representative codes and compiles an index data file 203. The index data file is made

available 205 (i.e. exported) for receipt 240 (i.e. import) by a recipient end user 206. Examples of export/import methods include e-mailing the index data file to the recipient, and posting the index data file on an internet web site for download by the recipient.

5

In the example where the event is a game of rugby football, the index data can include general details, e.g. the date, time and venue of the game, the names of the teams playing, the names of the players and substitutes in each team, the names of the officials such as referee and linesmen, and may include other background information such as the weather or other playing conditions and the crowd size. These details can be input before or after the event is displayed to the indexing author.

10

Other index details relate to particular segments of the televised event signal as broadcast 213. These details include the segment subject content and the segment location within the event record. These segment index details may be input while watching a display of the event record. The index details are input by the indexing author 211 by keystrokes on a computer keyboard, the keys having been specially assigned to represent particular game parameters. Other methods of inputting the index data are discussed below.

15

20

The generation and compilation of the index data file 203 will be discussed in more detail below with reference to Figure 3.

25

The broadcast television signal 213 of the event is received 241 by the recipient end user 206. The recipient user digitally encodes 242 the received television signal into a compressed digital format, e.g. MPEG1. The encoded event signal is stored 207, preferably on the hard disk of a computer of the recipient 206.

30

The received broadcast event signal may be recorded 243, e.g. by a video cassette recorder (VCR) or by a digital video disk (DVD) recorder, for subsequent play back 244. After playback 244, the signal may be encoded 242, if not already, and stored 207 as an encoded signal for later use.

If the signal received by the recipient end user 206 is already in a digitally encoded format the encoding step 242 may be omitted and the received digital signal routed 245 directly to be stored 207 as an encoded signal.

5 Thus, the recipient end user has a digitally encoded record 207 derived from the television broadcast 213 of the event 202 and a corresponding stored index data file 208 which contains index information on the event and on aspects of particular segments of the record of the event. The recipient end user can then compile an edited version of the event record by inputting criteria to identify selected segments of the event record which meet those criteria and thus interactively edit the event record. 10 For example, the end user may generate a list of segments showing try scoring sequences involving a particular named player. The selected segments can be viewed or recorded as a new event record.

15 The process of segment selection and editing 209 from the stored event record 207 using the stored index data file 208 will be discussed in more detail below with reference to Figure 7.

20 The event signal as recorded by the indexing author, either as received or after encoding, may be delivered to, or at least made available for receipt by, the recipient end user. For example, the event signal as received and recorded 230 by the indexing author, may be made available 246 for receipt by the recipient end user in the form of a video cassette or DVD.

25 Alternatively, the encoded and stored event signal 222, may be made available 247 for receipt by the recipient end user. In this case, the recipient end user would not need to receive the television broadcast of the event and would not need to have a digital encoder. For example, the event signal, in the form of an encoded digital data file, could be provided on CDROM or DVD, by email, or by posting on an internet web 30 site for download by the end user recipient.

The functions of the indexing author and the recipient are performed using computers programmed with similar computer software. The indexing author computer is loaded with an indexing, or coding, version of the software which provides for encoding,

storing and displaying the event record, creating the index data file and exporting the index data as a courier file. The recipient computer is loaded with a player version of the software and performs the functions of importing the courier file and using the index data therein for controlling the editing and playback of a corresponding event signal received and stored on the hard disk of the recipient's computer.

5

Figure 3 shows further detail of the index data file generation process 300 (seen at step 104 of Figure 1 and step 203 of Figure 2). The index data file is a database which includes details identifying the event and sub-events within the event.

10

Before an end user can access an event record received independently of the index data, the two must be synchronised so that segment locations referred to in the index data correctly identify the corresponding portions of the event record. To facilitate this a synchronisation point on the event record is identified in the index data file. This is done by the indexing author who identifies and designates a particular point in the event as a start point 301, enters a description of the start point 302 and zeros an event signal counter 303. For example, where the signal is a video signal, the author identifies a particular start frame, enters details describing the scene or content of the start frame, and then zeros the video frame counter at that frame. The start frame description is included in the index data file.

15

20

The indexing author inputs basic details 304 for the event about to be viewed. Such details typically include the location or venue, and the date and time of the event, the type of the event, the subject or the participants, e.g. the teams and players in the case of the event being a team sports game, in which case the names of officials, such as referees or linesmen, may be added.

25

The basic event details can be input 304 to the index data file by the indexing author either before or after the identification of the start frame 301-303.

30

Indexing data can be input when the event signal is first encoded and stored, or at a later stage, e.g. upon playback. Additional index data can be added during subsequent viewings of the event record.

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As noted above, the event may be viewed by the indexing author in many ways. For example, as a live performance, a real-time broadcast, a delayed broadcast, or a playback of a recording of a broadcast. Although a restricted amount of indexing may be done in real time, e.g. while watching the live event or during reception of a broadcast of the event, more extensive segmentation and indexing of the event may be achieved by recording or storing a signal derived from the event and playing back the stored or recorded signal.

Preferably the indexing is performed upon playback of a video signal of the event after an event signal has been digitally encoded and saved to the hard disk of the indexing author's computer. In this mode, segments of the video signal may be replayed at a slowed speed, or reversed and repeated for multiple review, thereby allowing greater detail to be analysed and indexed for addition to the index data file. Further index data can be added, to previously input data, on successive replays of the stored event signal.

Special functions are assigned to various keys 305 of the indexing author's computer keyboard. These keys are used to initiate the generation of codes representing selected sub-events or segments of the event which are identified by the indexing author as he or she views a display 306 derived from the event signal. Special functions assigned to specific keys are used to define or describe the segments or video clips being indexed (e.g. tackle, kick, pass) and to control display of the recorded event signal stream (e.g. jump forward 2 seconds, jump backward 2 seconds). The display control functions are assigned to specific keys for use by the indexing author to control the display of the record of the event being indexed, e.g. to go back and review an action to add more indexing detail.

The indexing author identifies a particular action or occurrence 307 in the game (e.g. tackle, ruck or try). This identification may be performed by pressing a 'sub-event' key. The system records a code identifying the action assigned to that key and the current frame number 308 of the event signal when the key press occurred.

In an alternative indexing arrangement, particular actions or occurrences in the game and other index data can be input by voice, e.g. using voice a recognition system on

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the computer used by the indexing author. The recognised voice input determines the identifying code indexed for the particular segment of the event record. The system records a code identifying the action determined from the recognised voice input and the current frame number of the event signal when the voice input occurred.

5

The system calculates nominal beginning and end points 309 for the segment or video clip by subtracting a 'lead time' and adding a 'lag time' to the current time of the 'sub-event' key press as identified by the frame number. The calculated frame numbers identifying the nominal beginning and end of the segment are added 310 to the basic event details already input to the index data file being generated for that event.

10

When the indexing author is indexing an event by viewing the event live (e.g. 233 in Figure 2), or by viewing a record not including a frame or other counter having sufficient resolution (e.g. from a video cassette recorder, 231 in Figure 2), an independent clock is run and the clock time of index actions recorded and used in place of the frame count available with MPEG data, for example. Of course there is only a limited opportunity to add detailed index data to a live event because it cannot be slowed or reversed and reviewed. Similarly, there is limited opportunity to add detailed index data to a record without an integral clock because the record cannot easily be reversed and reviewed while maintaining synchronism between the record and the separate clock. Preferably, a record including an integral clock signal or frame count is created from the unlocked record before detailed indexing is performed.

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An individual player may be identified by pressing a 'player' key. Similarly, 'qualifier' keys may be pressed to identify an occurrence or action as 'excellent' or 'poor', or as creating a 'possession gain' or a possession loss' for one particular team, for example.

30

The descriptive index data input for that sub-event is added 311 to the index data file being generated for that event. The basic event details, including the start frame description, and the index data relating to the individual segments identified, are then

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compiled into an index data file 312 which is then ready to export 313, i.e. ready to be made available for receipt by a recipient end user of the event signal.

5 Figure 4 shows further detail of the data export process 400 (seen as step 109 of Figure 1 and step 205 of Figure 2). By this process index data is exported by the indexing author as a courier file using the indexing, or coding, version of the system software. The computer of the index author creates the courier file for the selected event by first displaying two dialog boxes requesting the indexing author to select the event to be exported 401 and to enter a new name for the courier file 402.

10 The computer system then copies a template held as a 'base' or master courier file 403 to create the initial content of the new courier database file 404 and names the new file 405 with a new file name entered by the indexing author. The base file contains basic database template information not unique to a particular event, e.g. database definitions and formats for requests, forms, tables, etc.

15 Tables of information unique to the selected event are copied 406 from the index data file generated for that event database to the courier database file. These data tables include, for example, tables identifying the event, players in the game, game sub-event data, etc. The system then provides notification 407 that the courier or export index data file has been successfully created.

20 The index data courier file can then be made available 408 for receipt by a remote end user. The exported index data file may be sent to the recipient user as an email attachment, copied across a LAN or WAN to the recipient user, or, in a preferred option, uploaded to a web server for download by end users.

25 When the export of the index data is complete 409, the recipient end user may use an import function of the player version of the system software to import the index data file.

30 Figure 5 shows further detail of the import process 500 (seen as step 110 in Figure 1 and step 240 in Figure 2) by which the recipient system uses a player version of software to receive the courier file from a remote indexing author. The index data

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courier file is received 501 by the recipient end user e.g. as an email attachment; as a file copied across a LAN or WAN; or by file download from a Web site.

5 The recipient end user then imports the index data file and creates a new project database on the local recipient computer. A dialog box is displayed requesting the recipient to select the courier file to import 502. From the selected index data courier file, the system extracts the filenames 503 originally used for the associated event when the index file was first created by the remote indexing author. These filenames include, for example, the name of the file of the encoded event record and the name
10 given to the corresponding index database.

The system then copies 504 a 'base' database file, already installed as part of the player version of the system software on the recipient computer, to create a new project database file 505. This base file includes template information and includes
15 all database queries and reports, and lookup tables which remain constant between projects. This basic common data is included as part of the player system software initially loaded on the recipient computer. The size of the courier files can therefore be reduced because the courier files do not have to include this basic information.

20 The new project file is renamed 506 using the original name of the event database previously extracted 503 from the courier file. The unique index data from the courier file is then added 507 to the newly renamed project file.

25 A dialog box is displayed requesting the recipient end user to select 508 the particular encoded event file which is to be associated with the newly-imported project file. This event file, which in the embodiment described in relation to Figure 2 is usually a digitally encoded video file, has been previously received and recorded onto the recipient system, as described above in relation to Figures 1 and 2.

30 The system then renames the encoded file 509 using the name of the associated encoded video file, which name was previously extracted 503 from the courier file. The import process is then complete 510 and the imported project is then accessible on the recipient end user computer.

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Figures 6 and 7 show processes by which the recipient end user accesses the imported project file using the player version of the system software.

5 Figure 6 shows a synchronisation process 600 by which the start of the video event signal is synchronised to the index data. The recipient end user accesses an imported project 601 to be synchronised by opening the encoded event video file and the associated index data file.

10 The start frame is a uniquely distinctive frame described by a few short sentences which are input by the indexing author and stored as part of the index data conveyed in the courier file. For example, in a rugby game the 'start frame' could be described as "Referee has his hand up directly on the half way line, about to blow the whistle for start of game." The start frame description is retrieved from the index data file, and displayed and read by the end user.

15 A 'play' function is used to provide a display 602 of the video event file on the screen of the recipient computer. The display shows a single, i.e. still, frame. A 'move' function 603 is used to adjust the current single frame display to the specific frame described by the indexing author as the 'start frame' for the project.

20 The 'move' function is used to shift the single frame video display forward and backward to locate the identified start frame. E.g. the move function can provide fast forward and backward functions to initially find the approximate location of the start frame, and then slower or single frame movements to find the exact or nearest frame. 25 Having located the distinctive single start frame, the recipient end user clicks a 'Set Event Start' button which 'zeros' the frame counter and synchronises 604 the selected video frame to the zero frame recorded in the equivalent index database record. Segment locations included in the index data can then be recalculated to be relative to the identified start frame. The recipient end user system is now ready to use other 30 functions provided by the player system software, e.g. editing and displaying the recorded or stored event signal under control of the index data.

Figure 7 shows further detail of a select and edit process 700 (seen at step 112 of Figure 1 and 209 of Figure 2) by which the recipient end user makes a selection from,

-18-

and edits, an open video file of an event signal using the player version of the system software. This is done after the imported project has been synchronised with the index data, as described above in relation to Figure 6.

5 The available index criteria relating to the open event file and to any indexed segments, are displayed 701 as a list from which individual entries may be selected 702, e.g. by clicking listed criteria with a mouse. The criteria list may be displayed in the form of a single drop down list, or preferably as nested drop down lists. For example, where the event is a rugby game, a primary criteria list could include player names, action, quality of play, and possession changes as selectable criteria, in which 10 case the secondary criteria lists could include actual player names; line-out, scrum, ruck, maul, try, tackle, etc; good, mediocre, bad; and gain and loss (for a specified team), respectively.

15 Alternatively, criteria selection may be made by mouse clicking on displayed 'buttons' or cells in a spreadsheet-like display, or by pressing keys assigned to specific criteria.

The system then selects 703 event segments having index data meeting the input 20 criteria. The end user may thus obtain a subset of selected actions. For example, by nominating 'John Martin', 'tackle', 'good' and 'gain' as selection criteria, the system would select all segments showing good successful tackles by player John Martin.

25 Alternatively, a list of all indexed segments can be displayed 704 and segments selected 705 from the list. The list identifies each indexed segment by descriptors including the index information input by the indexing author for that segment; e.g. tackle, good, John Martin. Further segments may be added by repeating 706 either of the above-described segment selection processes 701-703, 704-705.

30 Thus a segment play list is created, defining the selection of segments identified directly or meeting selected criteria. This newly created play list, may be played back 720 or output 730, without storing 710, or may be confirmed, e.g. by a double click, and named 714 and stored 711 for later recall. Newly created play lists to be output 730 are confirmed and named 715 if not already confirmed and named.

Previously-stored play lists may be recalled 712 and substituted for, or added to, an existing list 713 derived from the above described selection process. Multiple recalled lists may be combined.

5

The edited video, being the segments defined by the play list, may be played back on the end user computer using the player version of the system software. Upon play back 720, the end user has full control over play back modes. For example, the user can select the play back speed 721 and direction 722, and can play single segments or clips 723 from the play list, a subset of the play list (by inputting further selection criteria), or can play back all segments or clips of the event.

10

The edited video defined by the play list may also be output 730, e.g. for loading to a CDROM or DVD authoring program. The video and play list are output as two files; the encoded video and the corresponding index data. The latter includes the general data for the events from which the segments have been derived and the specific index data for each selected segment. In this process an 'edit decision list' (EDL) is created 731 for an in-built MPEG video editor which in turn creates a new file or data stream of composite MPEG video and audio data 732. At the same time, the system creates a new database 733 with full index details of the selected subset of video segments or clips, corresponding to the video EDL. Both these files are output 734 in a format ready for copying to a CDROM or DVD.

15

20

The system can also make statistical reports available to the end user, via the courier file or generated from templates already resident on the end user's computer. To generate a statistical report, a stored project is opened and the index data applied to database tables and queries. Criteria may include analyses of sequences of segments. After statistical analysis, the reports are presented on the user's computer screen and may be saved.

25

30

Figure 8 shows apparatus for performing some of the processes described above. The apparatus of the indexing author 801, includes a television tuner 802 for receiving a broadcast television signal 803. The video signal output from the tuner is digitally encoded and compressed in a video encoder 804. The encoder outputs a file in a

digitally encoded format, e.g. MPEG1. The encoded file is stored on the hard disk of the indexing author's computer 805. The index authoring or coding software is loaded on to the computer hard disk. The computer is connected to a network, e.g. the internet 807.

5

The recipient end user 807 has a similar apparatus 802a, 804a, 805a receiving the same signal 803a as broadcast to the indexing author. The end user 807 has a computer 805a loaded with the player version of the system software and a MPEG1 digital encoder and compressor 804a.

10

The digitally encoded signal data can be received other than by broadcast. For example, the encoded data may be loaded onto the end user computer 805a by download from a network 806, or from a CDROM or DVD. The source of these encoded data transfers may be the indexing author or a third party. The end user does not require the broadcast television tuner 802a and the digital video encoder-compressor 804a if the event signals are only received in encoded form.

15

While one preferred application of the processes described is the management of video data, it can also be applied to other similar sequential or 'linear' records, e.g. audio recordings. It can also be applied to a series of single elements or segments. One example of the latter is a series of individual video frames, each single frame being an indexed segment. This application can be likened to an album of still photographs or 'clip art', each video frame providing a fully indexed, and therefore searchable and retrievable, record of a respective photograph or image.

20

In one preferred application, a central organisation, such as a sports franchise holder or a technical production company, receives a broadcast signal of a sports game (or other event), digitally encodes the video signal derived from the broadcast, and produces a separate index database file containing all information necessary to allow detailed, interactive access to the video signal. This index data file is then stored and made available to subscribers or to the public, e.g. via some repository such as an internet web site.

25

30

If the game or event signal is accessible to the indexing organisation before general broadcast, all or part of the index database file could be embedded and broadcast with the television signal, e.g. transmitted in the vertical blanking interval.

5 A home user with a television receiver, a computer and a digital video encoding device captures and stores an encoded version of the television broadcast of the game on their computer. The video encoding device preferably compresses the digital data to minimise the size of the video files. Suitable digital video encoding devices are relatively cheap and readily available.

10

The home user can then access the web site of the central organisation and download the index data file. With both the game video file and the corresponding index file stored on the home user's computer, the home user can then interactively edit and select items of interest from the game and display or store or output the selection. For
15 example, home users can obtain increased enjoyment or functionality from the event video by easily reviewing specified game highlights, such as try scoring moves, or actions involving their favourite players.

20

Another application is educational television broadcasts used by distance learning organisations, where televised material can be augmented by with a widely available index for easy selection and retrieval of required portions of the broadcast signal. Because the indexing data allows any part of the essentially linear video record to be readily accessed, and in any order, the video material can be incorporated into an interactive teaching strategy which can be made reactive to a student's responses. In
25 this application the index data preferably includes annotations in the form of written text to be associated with each video segment. The annotations provide a commentary followed by questions for eliciting student responses to be used in determining the next video segment to be displayed.

30

Unlike other video analysis systems which output only a selected subset of video clips, the invention creates a full subset of database index data in addition to the video clips, so that the resulting subset is, in all aspects, as functional as the original from which it came. That is, it can be edited further and displayed with full interactive control over playback. In the sports game example given above the edited subset

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created by the end user could be a series of game highlights. Similarly, in the distance learning example, the edited subset could be a series of topics requiring further study or review.

5 By recording the video signal directly from a mass media transmission and making the corresponding index database data widely available independently, for example via a web site, the entertainment and/or educational value of material broadcast by television is considerably increased for the many people having access to a television set and a computer by the simple addition of a video encoder.

10

Where in the foregoing description reference has been made to integers or components having known equivalents then such equivalents are herein incorporated as if individually set forth.

15

Although the invention has been described by way of example and with reference to particular embodiments thereof it is to be appreciated that improvements and/or modifications may be made thereto without departing from the scope and spirit of the invention as set out in the claims.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A data management method for providing an index to a source signal, the source signal being available for receipt by at least one recipient, the comprising the steps of generating an index data file and making the index data file available for receipt by the at least one recipient, the index data file including segment descriptors corresponding to respective segments of the source signal.
2. The data management method of claim 1, wherein the segment descriptors include identifiers indicative of the start and finish of respective segments of the source signal, and the segment descriptors include identifiers indicative of subject matter of respective segments of the source signal.
3. A data management method for management of data relating to a source signal, wherein the source signal is available for receipt by at least one recipient, and the source signal includes a series of segments, the data management method comprising the steps of:
 - generating an index data file of descriptors of respective segments of the source signal, the identifiers including limit identifiers identifying start and finish points of the respective segments, and the descriptors including subject identifiers identifying aspects of the subject matter of the respective segments, and
 - making the index data file available for receipt by the at least one recipient.
4. The data management method as claimed in claim 3, including the additional steps of receiving the source signal, and presenting the source signal to an operator controlling the generation of the index data file.
5. The data management method as claimed in any one of claims 1 to 4, wherein the index data file is made available on an Internet web site for download by the at least one recipient.
6. The data management method as claimed in any one of claims 1 to 4, wherein the index data file is e-mailed for receipt by the at least one recipient.

7. The data management method as claimed in any one of claims 1 to 4, wherein the index data file is stored on a portable signal storage medium which is made physically available for receipt by the at least one recipient.

5 8. The data management method as claimed in claim 7, wherein the source signal is stored along with the index data file on the portable signal storage medium.

10 9. The data management method as claimed in any one of claims 1 to 4, wherein the index data file is combined with a broadcast signal, and the combination is broadcast for receipt by the at least one recipient.

15 10. The data management method as claimed in claim 9, wherein the index data file is embedded in a television signal which is broadcast for receipt by the at least one recipient.

20 11. The data management method as claimed in any one of the preceding claims, wherein the index data file received by the at least one recipient is stored on a digital data storage medium.

25 12. The data management method as claimed in any one of the preceding claims, wherein the at least one recipient receives the source signal stored as digital data on a digital data storage medium.

30 13. The data management method as claimed in any one of claims 1 to 11, wherein the source signal is a broadcast signal.

14. A coding apparatus for generating an index data file for interactive use with a digital signal file derived from a source signal, the digital signal file and the source signal each comprising a series of segments, the coding apparatus comprising:

30 a coding device which selectively generates an index data file of codes corresponding to descriptors of respective segments of the source signal, the descriptors including limit identifiers identifying start and finish points of the respective segments, and the descriptors including subject identifiers identifying aspects of subject matter of the respective segments, and

a data file delivery means which makes the index data file available for receipt by at least one recipient.

15. The coding apparatus as claimed in claim 14 including:

5 a source signal receiver which receives the source signal, and
a source signal presentation device for presentation of the received source signal.

10 16. A data management method for making an interactive selection from a digital signal file derived from a source signal comprising a series of segments, the data management method comprising the steps of:

receiving the source signal,

storing the source signal as a data file,

15 receiving an index data file containing codes corresponding to descriptors of respective segments of the source signal, the descriptors including limit identifiers identifying start and finish points of the respective segments, and the descriptors including subject identifiers identifying aspects of the subject matter of the respective segments,

storing the index data file,

20 inputting a selection definition which includes one or more segment descriptors,

identifying a subset of segments of the source signal, the subset containing source signal segments that are identified by codes corresponding to descriptors matching the descriptors included in the selection definition, and

25 generating a list of the segments identified as being within the subset.

17. A data management method as claimed in claim 16, wherein the selection definition includes a subject matter definition, and the generated list is a list of the segments identified by codes corresponding to descriptors which match the subject matter definition.
30

18. A data management method as claimed in claim 16 or 17, wherein the received source signal is converted to an encoded digital source signal data file, and the stored source signal data file is the encoded digital source signal data file.

19. A data management method as claimed in any one of claims 16 to 18, wherein the subset of segments identified by the list is stored as a data file.

5 20. A data management method as claimed in any one of claims 16 to 19, wherein the subset of segments identified by the list is presented to a user.

10 21. A data management apparatus for making an interactive selection from a digital signal file derived from a source signal comprising a series of segments, the data management apparatus comprising:

a first input which receives the source signal,

15 a second input which receives an index data file containing codes corresponding to descriptors of respective segments of the source signal, the descriptors including limit identifiers identifying start and finish points of the respective segments, and the descriptors including subject identifiers identifying aspects of subject matter of the respective segments,

a data storage device in which the received index data file and the received source signal are stored as respective data files, and

20 a formatting device which has access to the respective stored data files and has a selection definition input which receives an indication of a selection definition, the formatting device generating a list identifying a subset of the source signal segments identified by codes corresponding to descriptors which match the selection definition, and the formatting device outputting data comprising those parts of the source signal data file that correspond to the subset of segments identified by the list.

25 22. A data management apparatus as claimed in claim 21, including an encoder which converts the received source signal into an encoded digital source signal data file.

30 23. A data management apparatus as claimed in claim 21 or 22, wherein the selection definition includes a subject matter definition, the formatting device generating a list identifying a subset of the source signal segments identified by codes corresponding to descriptors which match the subject matter definition.

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24. A data management method for providing an index data file, substantially as herein described with reference to the accompanying drawings.

5 25. A data management method for management of data relating to a source signal, substantially as herein described with reference to the accompanying drawings.

26. A coding apparatus for generating an index data file, substantially as herein described with reference to the accompanying drawings.

10 27. A data management method for making an interactive selection, substantially as herein described with reference to the accompanying drawings.

28. A data management apparatus for making an interactive selection, substantially as herein described with reference to the accompanying drawings.

15

29. Each and every invention herein described.

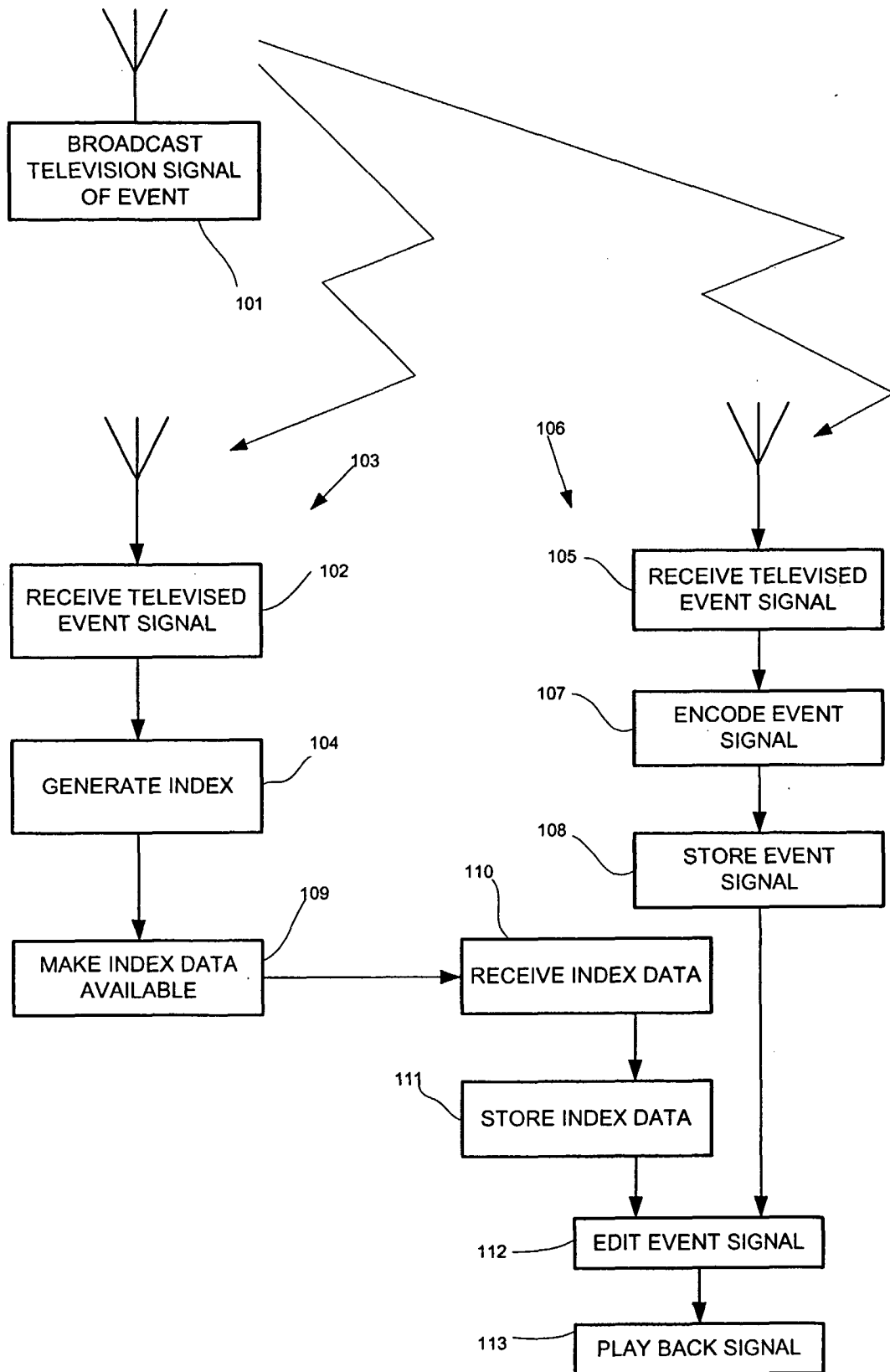


Figure 1

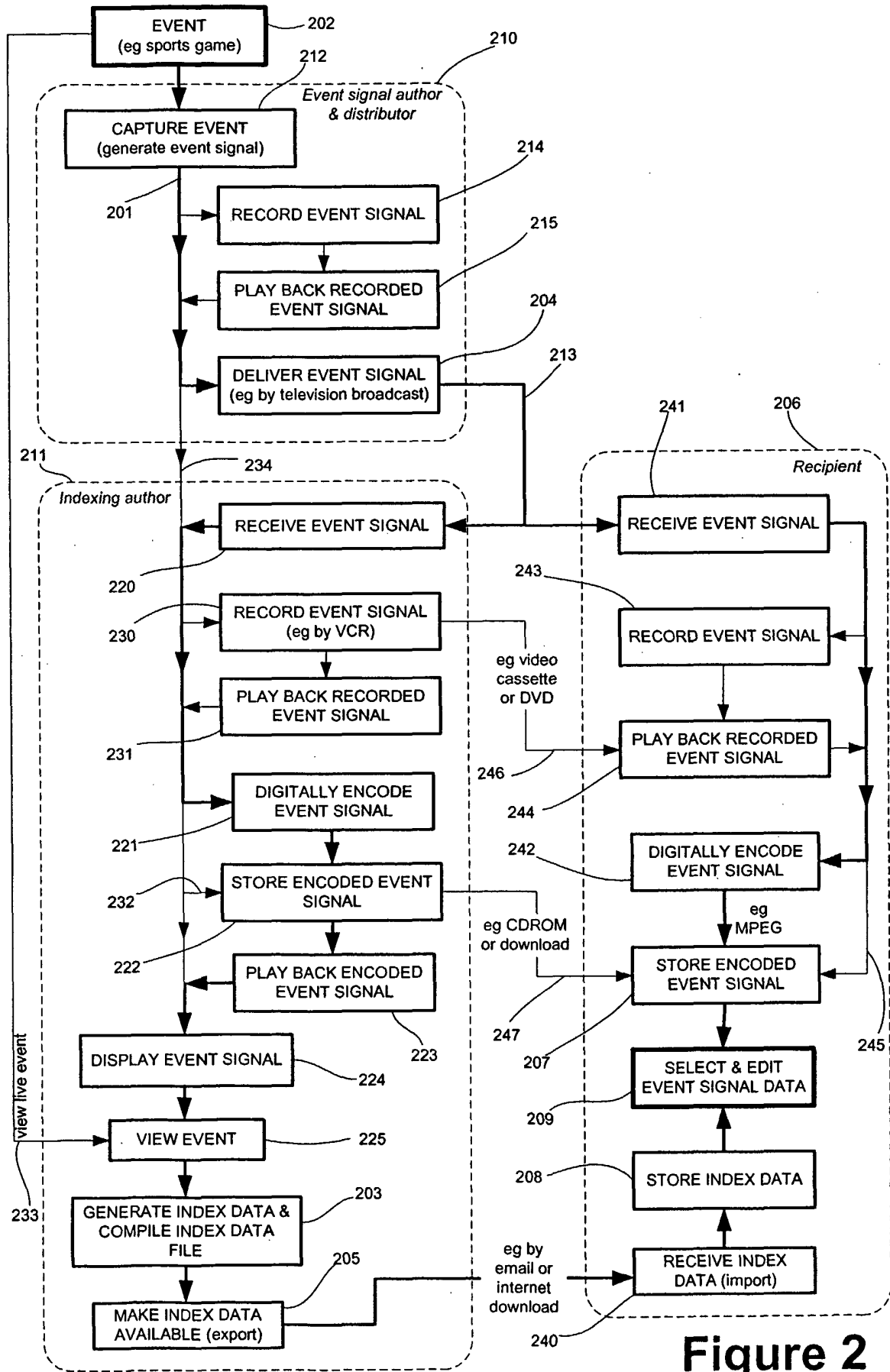


Figure 2

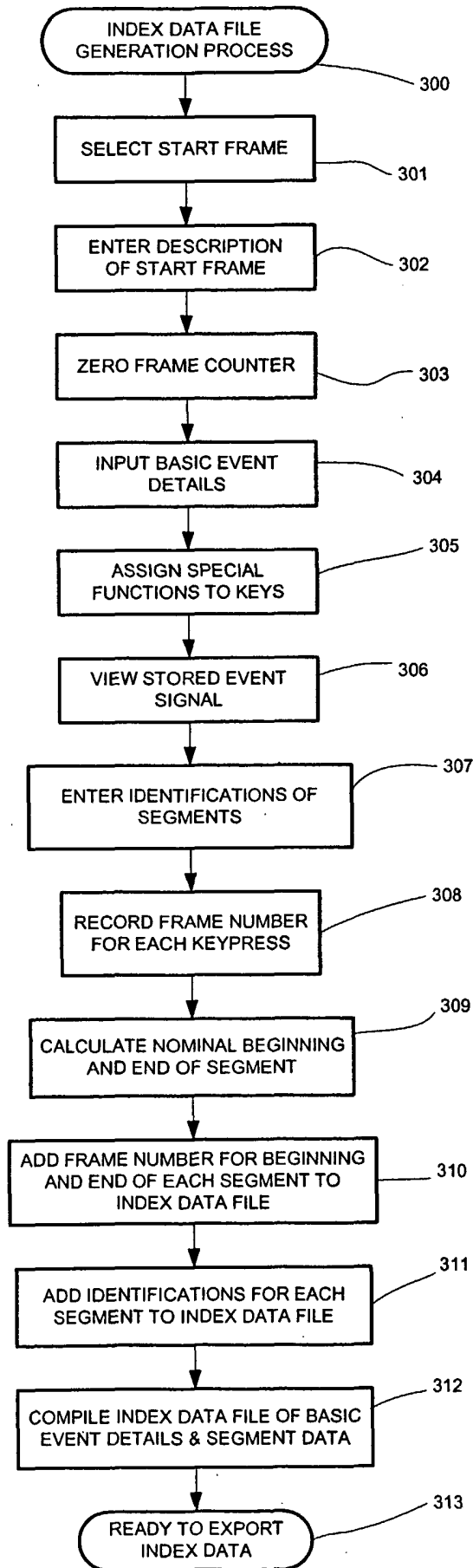


Figure 3

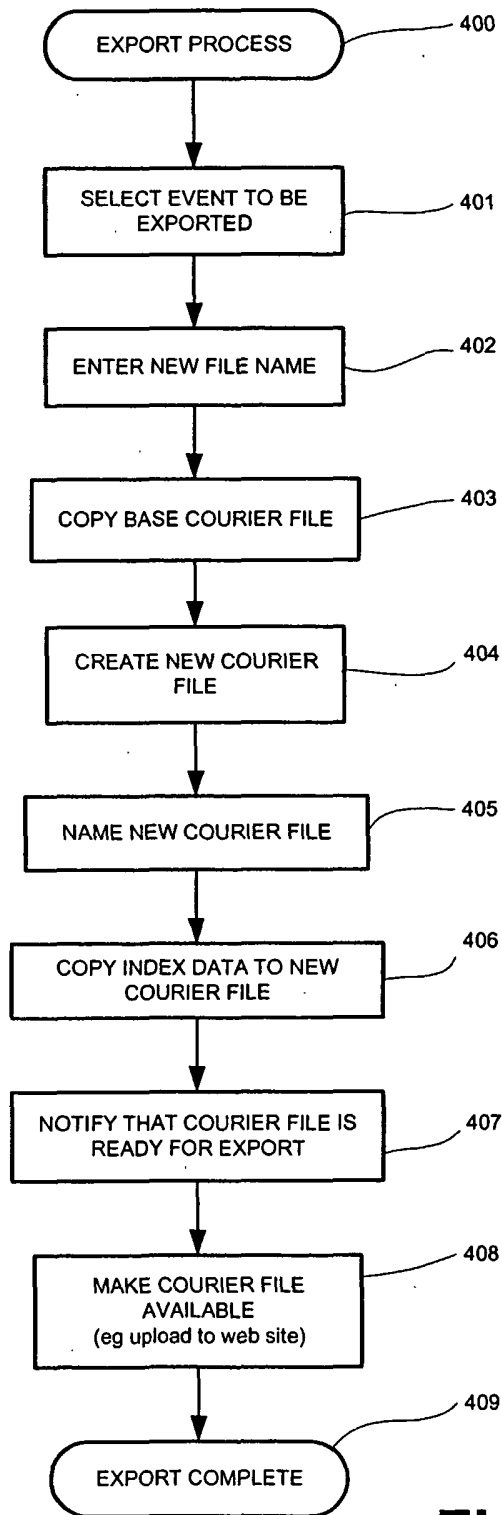


Figure 4

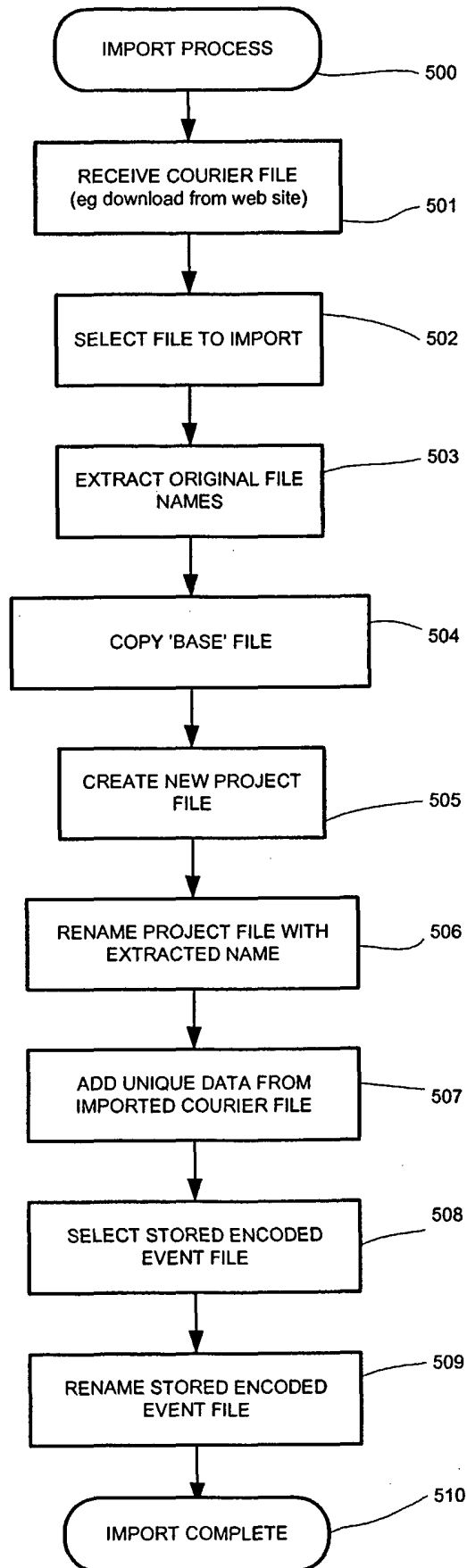


Figure 5

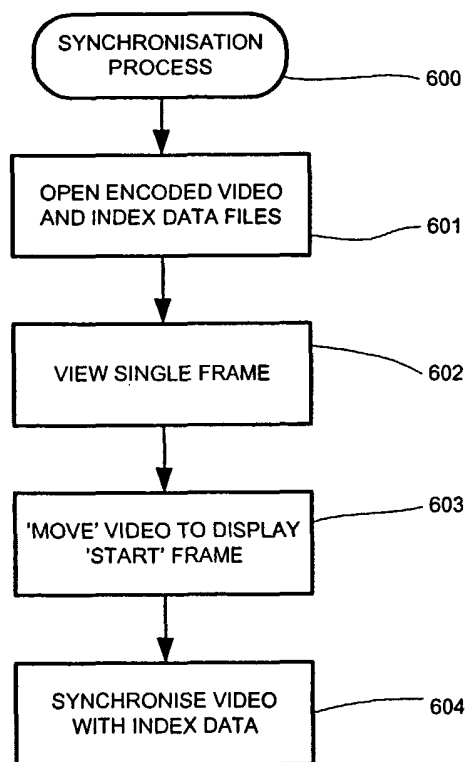


Figure 6

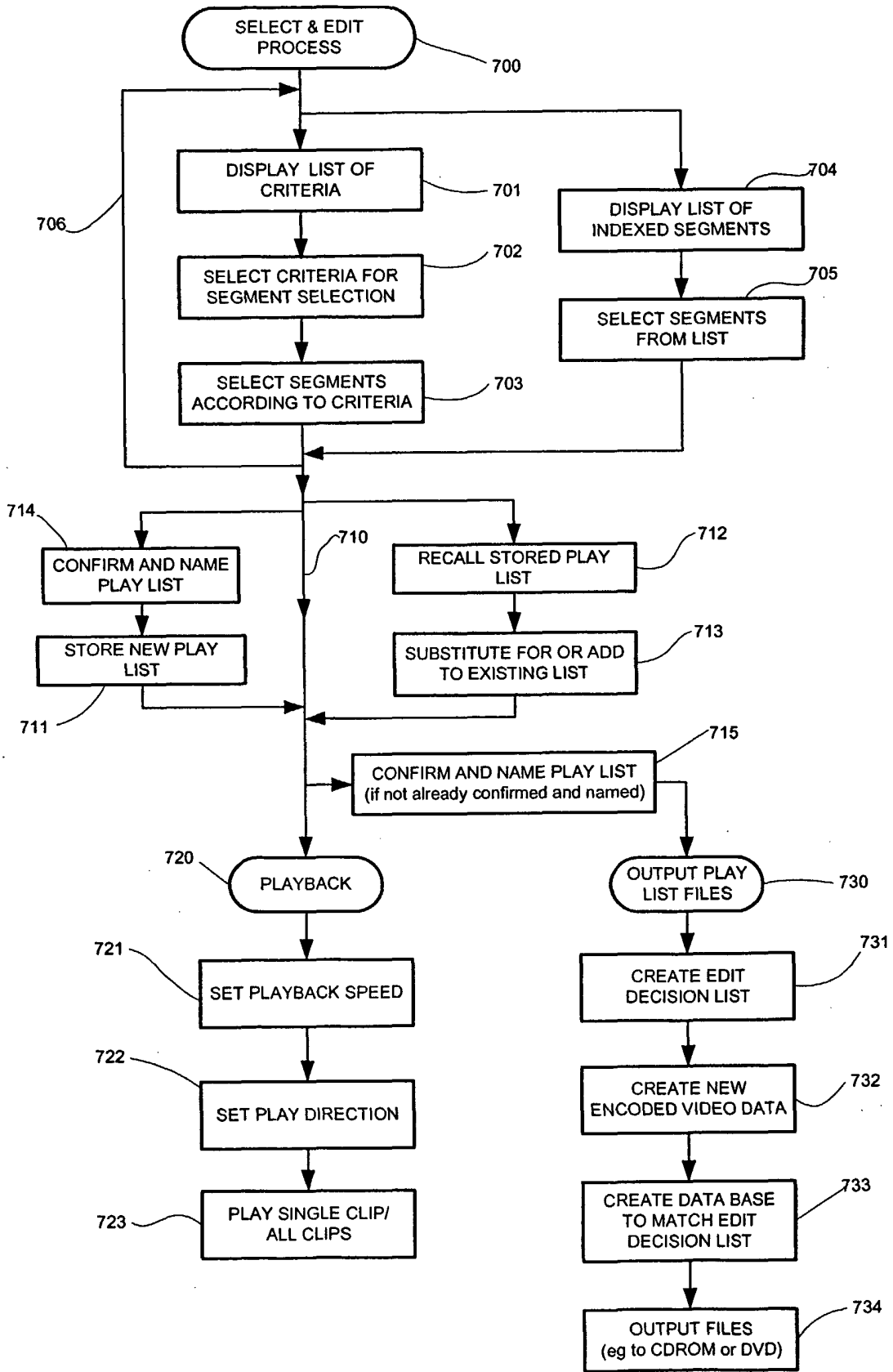


Figure 7

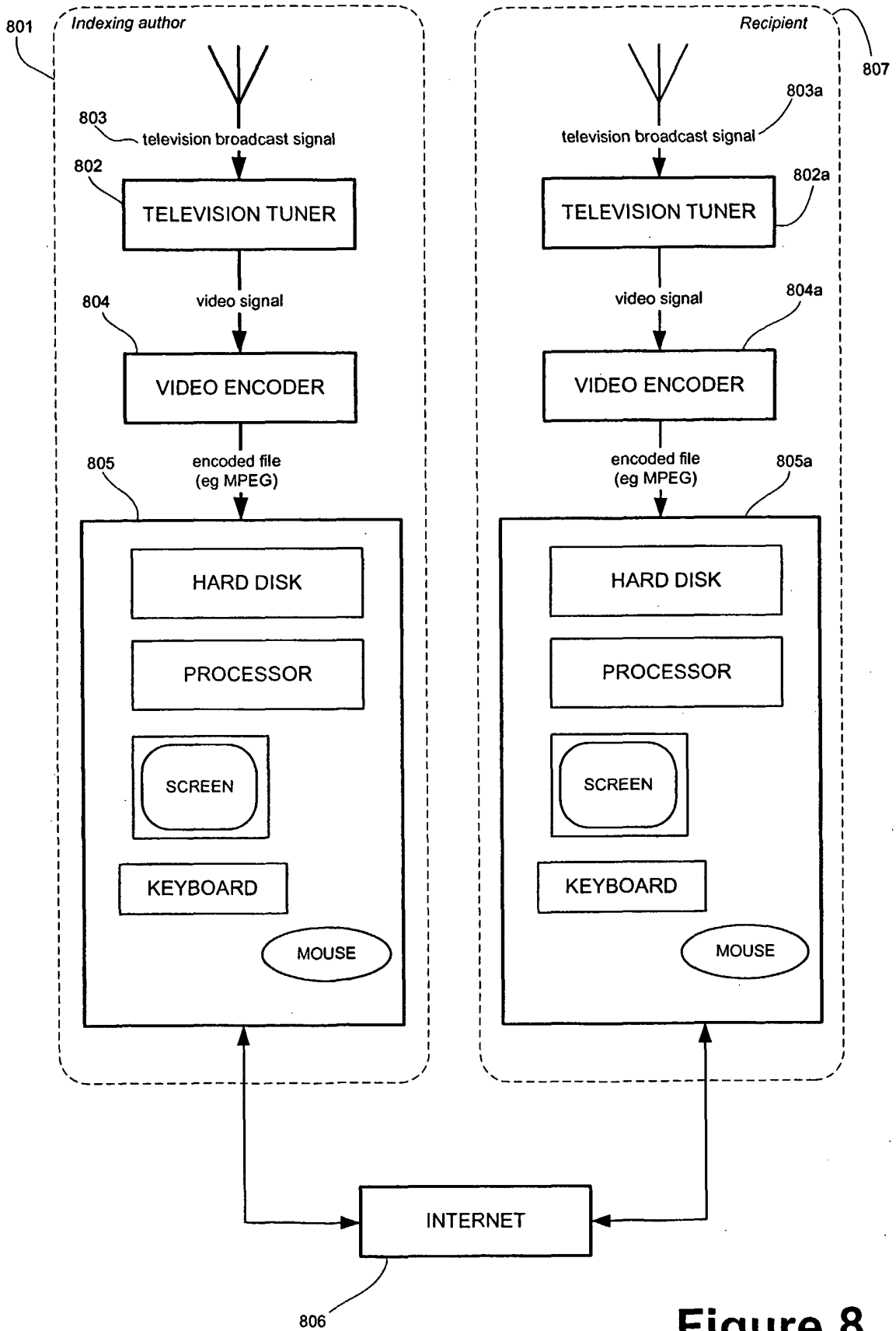


Figure 8