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(54) Title:  SIMULTANEOUS SUBTITLE CLOSED CAPTION SYSTEM

(57) Abstract:  Methods and apparatus for a system providing simultaneous closed captioning information display to various users by way of personalized receiving devices are described. The system demultiplexes closed captioning information from packetized stream content into various elementary streams. The system then repackages the streams into a format suitable for wireless transmission. The streams are then wirelessly transmitted to receiving devices that have been paired to the corresponding streams, where the closed captioning content of the streams is displayed. In one exemplary embodiment, the system operates on video program streams containing elementary streams of closed captioning information in various languages. The elementary streams are demultiplexed from the video content. Each stream can be paired to a particular receiving device of users that have requested closed captioning information in the particular language contained in that stream. The streams are repackaged into a format suitable for wireless transmission, then transmitted to that user’s receiving device that displays the closed captioning content. One exemplary type of receiving device is a pair of smart glasses that the user is wearing while watching the program. Additional information, such as caller id information from a phone or text messages, can also be sent to the receiving devices for display.
SIMULTANEOUS SUBTITLE CLOSED CAPTION SYSTEM

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of U.S. Provisional Application Serial No. 61/949,501, filed March 7, 2014, which is incorporated by reference herein in its entirety.

TECHNICAL FIELD

The present principles relate to apparatus and methods for providing individual-specific closed captioning information to people on personal devices without disturbing an ongoing audio/video presentation.

BACKGROUND OF THE INVENTION

Closed captioning information was first broadcast in the United States in 1973, although open captioning was used in 1972. In 1976, the Federal Communications Commission (FCC) set aside line 21 of NTSC broadcast signals for closed captioning information. The first regularly scheduled uses of closed captioning information came in 1980. By 1990, Congress passed legislation requiring all television sets larger than 13 inches to have the capability to decode closed captioning information.

With the advent of digital television, ATSC broadcasters encode television programs with two streams of data that are backward compatible with traditional caption information included in line 21 NTSC broadcasts, and a third stream comprising up to 63 EIA-708 format caption streams.

When a multimedia user sets up the closed caption or subtitle information to be displayed on a screen, several problems may exist. First, some users may not wish to have the subtitles on the screen at all because of a belief that it detracts from the overall viewing experience. Another problem arises if a group of viewers requires the captioning information in a first language, but a particular user needs the captioning information displayed in a second language that none of the other users can understand.
A need exists for individual multimedia viewers to be able to receive closed captioning information, or other information, specific to their needs without requiring the broadcast to be altered for the remaining viewers.
SUMMARY OF THE INVENTION

These and other drawbacks and disadvantages of the prior art are addressed by the present principles, which are directed to apparatus and methods for providing individual-specific closed captioning information to people on personal devices without disturbing an ongoing audio/video presentation.

According to an aspect of the present principles, there are provided several methods and several apparatus for enabling simultaneous closed captioning.

A first method for transmitting closed captioning information to be displayed by at least one receiving device is comprised of steps for demultiplexing a video program stream into separate elementary streams and repacking at least one elementary stream into a wireless transmission format. The method further comprises pairing at least one receiving device to at least one repacked elementary stream, wirelessly transmitting at least one repacked elementary stream to a paired receiving device and displaying the closed captioning contents of the repacked elementary stream on the paired receiving device display.

According to another aspect of the present principles, there is provided a system for transmitting closed captioning information to be displayed by at least one receiving device. The system is comprised of a demultiplexer that separates a video program stream into separate elementary streams, a circuit to repack at least one elementary stream into a wireless transmission format, and a communication device that pairs at least one receiving device to at least one repacked elementary stream. The system further comprises a wireless transmitter that transmits at least one repacked elementary stream to a paired receiving device and a display to show the closed captioning contents of the repacked elementary stream on the paired receiving device.

According to another aspect of the present principles, a second method is directed to additionally displaying auxiliary information on the display of a receiving device. The method comprises the aforementioned method steps and further comprises receiving auxiliary information, repacking said auxiliary information into a
wireless transmission format, and pairing at least one receiving device to the repacked auxiliary information. The method further comprises wirelessly transmitting the repacked auxiliary information to a paired receiving device and displaying the contents of the repacked auxiliary information on the paired receiving device display.

According to another aspect of the present principles, an apparatus is directed to additionally displaying auxiliary information on the display of a receiving device. The apparatus comprises the aforementioned system elements and further comprises a receiver to accept auxiliary information, a second circuit that repacks the auxiliary information into a wireless transmission format and a second communication device that pairs at least one receiving device to the repacked auxiliary information. The apparatus further comprises a second wireless transmitter that wirelessly transmits the repacked auxiliary information to the paired receiving device, wherein the paired receiving device displays the contents of the repacked auxiliary information.

These and other aspects, features and advantages of the present principles will become apparent from the following detailed description of exemplary embodiments, which are to be read in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows one embodiment of a system for enabling simultaneous closed captioning under the present principles.

Figure 2 shows one embodiment of a simultaneous closed captioning system incorporated into a movie theater environment under the present principles.

Figure 3 shows one embodiment of a method for providing closed captioning on demand under the present principles.

Figure 4 shows one embodiment of a method for pairing a receiving device to a particular repackaged stream of data under the present principles.

Figure 5 shows one embodiment of a method for enabling auxiliary information display on a system under the present principles.
Figure 6 shows one embodiment of an apparatus for enabling auxiliary information display on a system under the present principles.

**DETAILED DESCRIPTION OF THE INVENTION**

The present principles are directed to a method and apparatus for providing individual-specific closed captioning information to people using personal devices without disturbing an ongoing audio/video presentation.

For example, a large group of multimedia users may view a program in a large public place, such as a restaurant or lounge. Some users may not be able to hear the audio portion of the program, so closed captioning is typically turned on to allow viewers to read caption information related to the program.

But, supposed there are viewers in the group whose best language is not the same as the language of the current caption information? Or, suppose that a particular user needs closed captioning information, but other viewers don't want the captioning information on the screen to impact their viewing experience.

Digital video systems, such as ATSC, DSS, DVB and MPEG, for example, are packet stream based. Stream based systems are comprised of a number of elementary streams, which can include several different languages of audio streams.

One embodiment of the present principles is shown in Figure 1 which shows a system 100 for enabling simultaneous closed captioning. The system comprises a multimedia player 110. The multimedia player 110 can be a television receiver, a set-top box, a computer, or other such device, for example. Multimedia player 110 can be connected to a standard monitor 120 either through a dedicated cable or some other connection means, including wirelessly. Additionally, multimedia player 110 is configured to provide at least one additional stream of information wirelessly. The additional stream, or streams, of information can be received by at least one receiving device 130. The receiving device 130 can be a pair of smart eyeglasses, a tablet, a personal computer, laptop, or smartphone, for example.

As multimedia player 110 plays video content, the content is typically viewed on monitor 120. Monitor 120 also, optionally, displays closed captioning information in a particular language, for example English, from multimedia player 110. However, for
viewers of other languages, multimedia player 110 can wirelessly send information, such as closed captioning, in alternate languages. This other information is contained in additional elementary streams as part of the current program content. Multimedia player 110 contains a demultiplexer that can separate a program into separate elementary streams. The elementary streams are then repackaged by appropriate communication circuitry into a wireless transmission format. The communication circuitry can be part of multimedia player 110 or can be part of an auxiliary unit. The communication device pairs a receiving device 130 with at least one of the repackaged streams. The communication device can communicate with one or more receiving devices wirelessly or with a hardwired connection, or by some combination. The communication device sends and receives information between itself and one or more receiving devices. The repackaged streams are wirelessly sent by a wireless transmitter to one of the receiving devices 130, which has selected the particular language of their choosing for the captioning information to be displayed. The wireless transmitter can also either be incorporated into multimedia player 110 or can be an auxiliary unit. The pairing of a receiving device to one or more particular streams as performed by the communication circuitry is described below in an exemplary embodiment in Figure 4. The wireless transmitter wirelessly transmits the repackaged streams to a receiving device in a format that is either the same format, or an alternate format, as the format that the multimedia player 100 received the stream, as long as the particular receiving device can interpret that format.

Each receiving device 130 selects a language that corresponds to a stream containing captioning information in that language. The captioning information appears on their device so that they can follow the program. In a preferred embodiment, the captioning information appears on their "smart" glasses, so that the user can read the captioning information on the glasses while watching the program content on the monitor 120. Glasses such as these can have an active LCD/LED matrix capable of displaying the text that should have been on the video screen. The captioning information is synchronized with the video content and can be delivered in real time.

The aforementioned embodiment allows an end user to see captioning information in his choice of language simultaneously with other uses choosing different
languages. A system such as this is also capable of transmitting any visual information, such as a phone's caller id number or personal alerts, without impacting the continuous play of the video content. The system can display a user interface for each user in the language of his choosing and can select which information to see on their receiving device, such as the glasses. The receiving device can be configured to receive information from multiple sources, such as phones and computers for example, to display. The system can be configured to allow a user to compose or receive a text message on his phone without taking his eyes away from the video content.

In another embodiment of the system under the present principles, an auxiliary unit is attached to the multimedia player that synchronously transmits wireless information to each receiving device. The auxiliary unit can either demultiplex the closed captioning elementary stream, received as part of the program content to the multimedia player 110, or the multimedia player can demultiplex the streams and send to the auxiliary unit for transmission to the addressed receiving devices.

The auxiliary device or the multimedia player can contain communication circuitry that pairs a receiving device to a user service, such as a particular language of closed captioning, for example. The auxiliary device or the multimedia player shall also be able to perform multiple instances of the remotely running closed captioning services to a plurality of users' receiving devices as well.

In another embodiment of the system, the simultaneous closed captioning system can be employed in a movie theater environment using glasses as receiving devices to provide captioning to a multitude of users in different languages. Selection of a particular language for a user of a specific pair of glasses can be made using a user interface on the glasses prior to, or during, the movie.

The wireless protocol that can be used in repacking the elementary stream data from either a multimedia player or an auxiliary unit to the received devices can be Bluetooth, Wi-Fi (based on the Institute of Electrical and Electronics Engineers' (IEEE) 802.11 standards), RF4CE, or another similar protocol, for example.

An embodiment of the present principles is shown in Figure 2. Figure 2 comprises a simultaneous closed captioning system 200 incorporated into a movie theater environment. The system comprises a movie screen 201 that displays content.
from a multimedia player 210. The multimedia player 210 can be a digital cinema device or another such digital content player for example. The multimedia player 210 demultiplexes its digital content into several streams, which can comprise various languages of closed captioning information and other information streams. The multimedia player 210 is connected to an auxiliary device 220 that parses the elementary streams received from the multimedia player 210 and repackages these streams into a format suitable for transmission using a wireless protocol. The auxiliary device can, alternatively, perform the demultiplexing of streams itself before repackaging, and can also be incorporated into multimedia player 210 or they can be implemented in separate units. Auxiliary unit 220 sends wireless transmissions to receiving devices 230, which in this embodiment are smart glasses. Each pair of glasses is paired with at least one particular stream to receive captioning information, for example, in a particular language. This enables each user to view the movie on the theater screen, while reading the captioning information in his choice of language, without needing to include multiple versions of captioning information in various languages on the screen, and without interfering with the video portion on the screen, which can also be shown without any captioning, for example.

One embodiment of a method 300 for providing closed captioning on demand is shown in Figure 3. The method comprises a start block 301 which proceeds to block 310 for demultiplexing streams from digital program content to extract information, for example, closed captioning streams in alternate languages. Following block 310, control proceeds to block 320 for repackaging the extracted streams into a protocol suitable for wireless transmission. Examples of such wireless protocols are Bluetooth or Wi-Fi. Control proceeds from block 320 to block 330 for pairing a receiving device to a particular repackaged stream of data. Following block 330, control proceeds to block 340 for transmitting a repackaged stream of data to a paired receiving device. Control proceeds from block 340 to block 350 for displaying the contents of the repackaged elementary stream on the paired receiving device display.

One embodiment of a method 400 for implementing block 330 is shown in further detail in Figure 4. The method comprises a start block 401 which proceeds to block 410 for determining the available streams in demultiplexed data from the video program.
From block 410, control proceeds to block 420 for transmitting a user interface to a receiving device comprising choices regarding the selection of streams. For example, if there are elementary streams containing captioning information in French, Spanish, and Italian in the video program, the user interface can include a menu to select the user’s language of choice for viewing captioning information. The user interface can also include a selection to view text messages or caller id on the user’s receiving device, for example on their smart glasses. Control proceeds from block 420 to block 430 for receiving a user's selection regarding a choice of stream to be received by the receiving device.

One embodiment of a method 500 that also sends additional information, such as call id information, to one or more receiving devices is shown in Figure 5. The method comprises a start block 501 and proceeds to block 510 for receiving additional information from an auxiliary device, for example a telephone. The receiving can be performed by a receiver that can be a standalone unit or incorporated into a multimedia device, such as multimedia device 110. From block 510, control proceeds to block 520 for repacking the information into a format suitable for wireless transmission. The repacking circuit that performs this operation can be a standalone unit or incorporated into a multimedia device, such as multimedia device 110. From block 520, control proceeds to block 530 for pairing at least one receiving device to the repacked additional information. Following block 530, control proceeds to block 540 for wirelessly transmitting the repacked additional information to one or more receiving devices. Following block 540, control proceeds to block 550 for displaying the contents of the additional information on a receiving device’s display.

One embodiment of an apparatus 600 that also sends additional information, such as call id information, to one or more receiving devices is shown in Figure 6. The additional information is received from an auxiliary device, for example a telephone, by receiver 610 that can be a standalone unit or incorporated into a multimedia device, such as multimedia device 110. The output of receiver 610 is in signal communication with the input of repacking circuit 620, which can be a standalone unit or incorporated into a multimedia device. Repacking circuit 620 can be the same or separate from the repacking circuit operating on closed captioning information. Repacking circuit 620
repacks the information into a format suitable for wireless transmission. Communication circuitry 630 pairs at least one receiving device to the repacked additional information at the output of repacking circuit 620. A wireless transmitter 640 that can be a standalone unit or incorporated into multimedia device 110 transmits the repacked additional information to one or more receiving devices 130. Receiving device 650 displays the contents of the additional information on its display.

One or more implementations having particular features and aspects of the presently preferred embodiments of the principles have been provided. However, features and aspects of described implementations can also be adapted for other implementations. For example, these implementations and features can be used in the context of other video devices or systems. The implementations and features need not be used in a standard.

Reference in the specification to "one embodiment" or "an embodiment" or "one implementation" or "an implementation" of the present principles, as well as other variations thereof, means that a particular feature, structure, characteristic, and so forth described in connection with the embodiment is included in at least one embodiment of the present principles. Thus, the appearances of the phrase "in one embodiment" or "in an embodiment" or "in one implementation" or "in an implementation", as well any other variations, appearing in various places throughout the specification are not necessarily all referring to the same embodiment.

The implementations described herein can be implemented in, for example, a method or a process, an apparatus, a software program, a data stream, or a signal. Even if only discussed in the context of a single form of implementation (for example, discussed only as a method), the implementation of features discussed can also be implemented in other forms (for example, an apparatus or computer software program). An apparatus can be implemented in, for example, appropriate hardware, software, and firmware. The methods can be implemented in, for example, an apparatus such as, for example, a processor, which refers to processing devices in general, including, for example, a computer, a microprocessor, an integrated circuit, or a programmable logic device. Processors also include communication devices, such as, for example, computers, cell phones, portable/personal digital assistants ("PDAs"), and other devices.
that facilitate communication of information between end-users.

Implementations of the various processes and features described herein can be embodied in a variety of different equipment or applications. Examples of such equipment include a web server, a laptop, a personal computer, a cell phone, a PDA, and other communication devices. As should be clear, the equipment can be mobile and even installed in a mobile vehicle.

Additionally, the methods can be implemented by instructions being performed by a processor, and such instructions (and/or data values produced by an implementation) can be stored on a processor-readable medium such as, for example, an integrated circuit, a software carrier or other storage device such as, for example, a hard disk, a compact disc, a random access memory ("RAM"), or a read-only memory ("ROM"). The instructions can form an application program tangibly embodied on a processor-readable medium. Instructions can be, for example, in hardware, firmware, software, or a combination. Instructions can be found in, for example, an operating system, a separate application, or a combination of the two. A processor can be characterized, therefore, as, for example, both a device configured to carry out a process and a device that includes a processor-readable medium (such as a storage device) having instructions for carrying out a process. Further, a processor-readable medium can store, in addition to or in lieu of instructions, data values produced by an implementation.

As will be evident to one of skill in the art, implementations can use all or part of the approaches described herein. The implementations can include, for example, instructions for performing a method, or data produced by one of the described embodiments.

A number of implementations have been described. Nevertheless, it will be understood that various modifications can be made. For example, elements of different implementations can be combined, supplemented, modified, or removed to produce other implementations. Additionally, one of ordinary skill will understand that other structures and processes can be substituted for those disclosed and the resulting implementations will perform at least substantially the same function(s), in at least substantially the same way(s), to achieve at least substantially the same result(s) as the
implementations disclosed. Accordingly, these and other implementations are contemplated by this disclosure and are within the scope of these principles.
CLAIMS

1. A method for transmitting closed captioning information to be displayed by at least one receiving device, comprising:
   demultiplexing a video program stream into separate elementary streams comprising captioning information;
   repacking at least one elementary stream into a wireless transmission format;
   pairing at least one receiving device to at least one repacked elementary stream;
   wirelessly transmitting the at least one repacked elementary stream to a paired receiving device;
   displaying the closed captioning information from at least one repacked elementary stream on the paired receiving device display.

2. The method of Claim 1, wherein the receiving device is a pair of smart glasses.

3. The method of Claim 1, further comprising:
   receiving auxiliary information;
   repacking said auxiliary information into a wireless transmission format;
   pairing at least one receiving device to said repacked auxiliary information;
   wirelessly transmitting said repacked auxiliary information to a paired receiving device;
   displaying the contents of the repacked auxiliary information on the paired receiving device display.

4. The method of Claim 3, wherein the auxiliary information is caller id information.
5. A system for transmitting closed captioning information to be displayed by at least one receiving device, comprising:
   a demultiplexer that separates a video program stream into separate elementary streams comprising captioning information;
   a circuit to repack at least one elementary stream into a wireless transmission format;
   a communication device that pairs at least one receiving device to at least one repacked elementary stream;
   a wireless transmitter that transmits the at least one repacked elementary stream to a paired receiving device;
   a display to show the closed captioning information from at least one repacked elementary stream on the paired receiving device.

6. The system of Claim 5, wherein the receiving device is a pair of smart glasses.

7. The system of Claim 5, further comprising:
   a receiver to accept auxiliary information;
   a second circuit that repacks said auxiliary information into a wireless transmission format;
   a second communication device that pairs at least one receiving device to said repacked auxiliary information;
   a second wireless transmitter that wirelessly transmits said repacked auxiliary information to said paired receiving device, wherein said paired receiving device displays the contents of the repacked auxiliary information.

8. The system of Claim 7, wherein the auxiliary information is caller id information.
Figure 1
Figure 2
START

300

Demux streams

310

Repackage streams for wireless transmission

320

Pair receiving device with a repackaged stream

330

Transmit a repackaged stream to paired receiving device

340

Display contents of repacked stream on paired receiving device display

350

Figure 3
START

401

Determine available streams in demultiplexed data

410

Transmit U/I to a receiving device comprising available selection of streams

420

Receive a selection from the receiving device regarding choice of stream

430

Figure 4
START

Receive additional info from auxiliary device

Repack info into format suitable for wireless xmit

Pair at least one receiving device to repacked info

Wirelessly transmit repacked info to paired receiving device(s)

Display contents of info on paired receiving device's display

Figure 5
INTERNATIONAL SEARCH REPORT

International application No
PCT/US2015/019189

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04N5/445 H04N21/41 H04N21/488 H04N21/434

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)
H04N

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 database and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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X Special documents are listed in the continuation of Box C.

X See patent family annex.

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Date of the actual completion of the international search
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Date of mailing of the international search report
18/05/2015

Name and mailing address of the ISA/
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Authorized officer
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