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(54) **DISPLAYING MULTIPLE MULTIMEDIA SEGMENTS IN A DISPLAY DEVICE**

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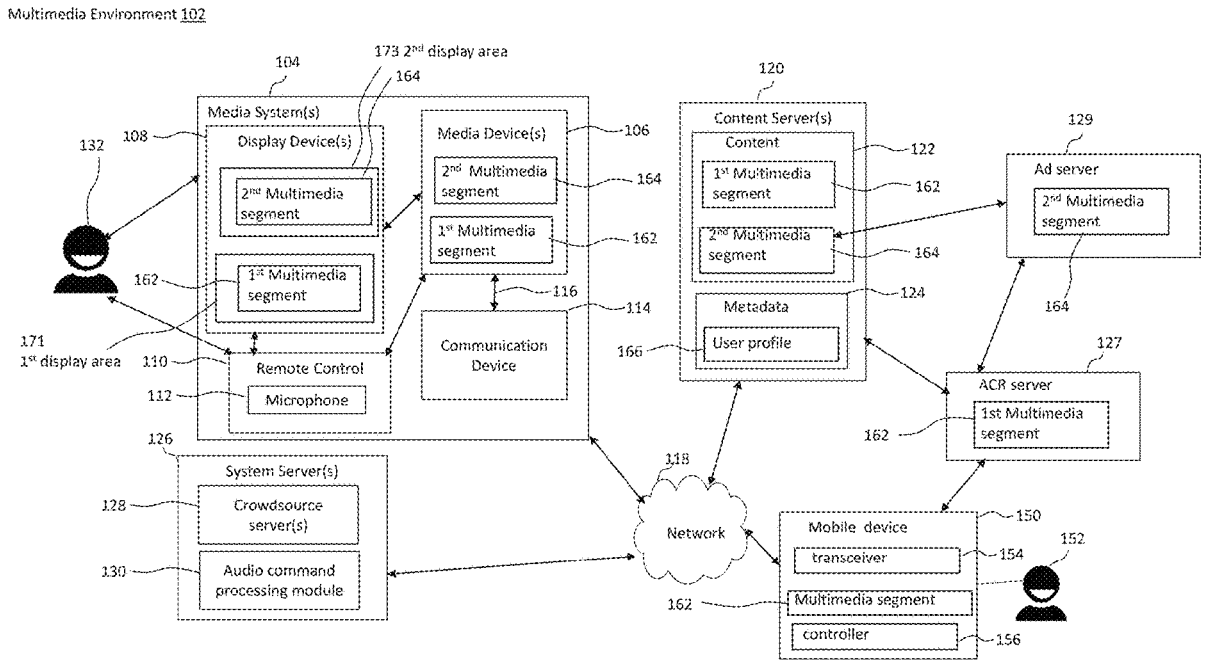
CPC ***H04N 21/4316*** (2013.01); ***H04N 5/45*** (2013.01); ***H04N 21/44029*** (2013.01); ***H04N 21/812*** (2013.01)

(57) **ABSTRACT**

Disclosed herein are system, apparatus, method and/or computer program product embodiments for a multimedia environment that includes a computing device to display multiple multimedia segments within multiple display areas of a display device. The computing device may determine a first multimedia segment including a plurality of frames, and display the first multimedia segment within a first display area of the display device. The computing device may further determine, based on a user profile or content of the first multimedia segment, a second multimedia segment related to the first multimedia segment to be displayed within a second display area of the display device within the predetermined time interval.



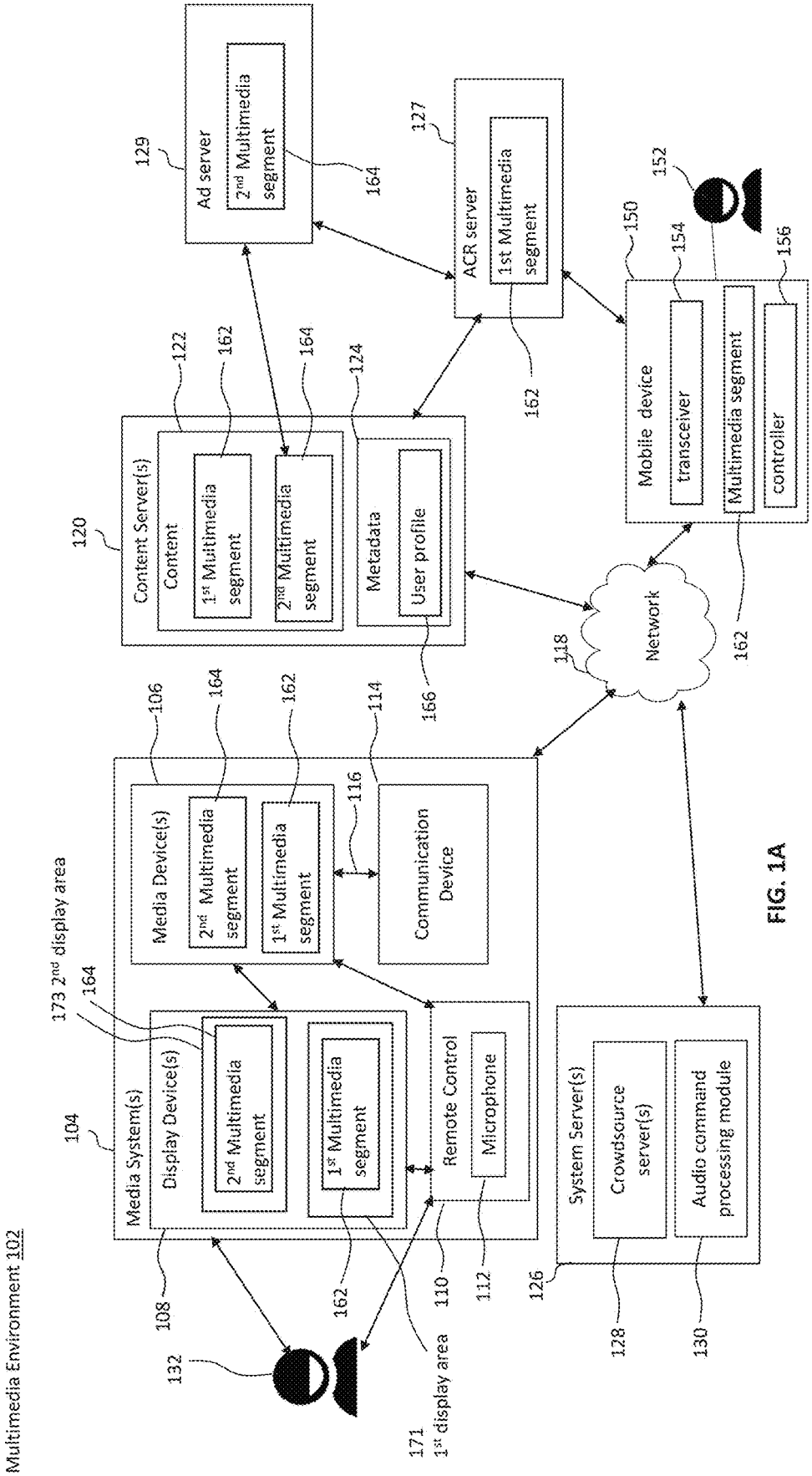

Multimedia Environment 102
Media System(s) 104
Display Device(s) 108
2nd Multimedia segment 173 2nd display area 164
1st Multimedia segment 162
Remote Control 110
Microphone 112
132
171 1st display area
Media Device(s) 106
2nd Multimedia segment 164
1st Multimedia segment 162
Communication Device 116 114
Content Server(s) 120
Content 122
1st Multimedia segment 162
2nd Multimedia segment 164
Metadata 124
User profile 166
Ad server 129
2nd Multimedia segment 164
ACR server 127
1st Multimedia segment 162
Network 118
System Server(s) 126
Crowdsource server(s) 128
Audio command processing module 130
Mobile device 150
transceiver 154
Multimedia segment 162
controller 156
152

FIG. 1A

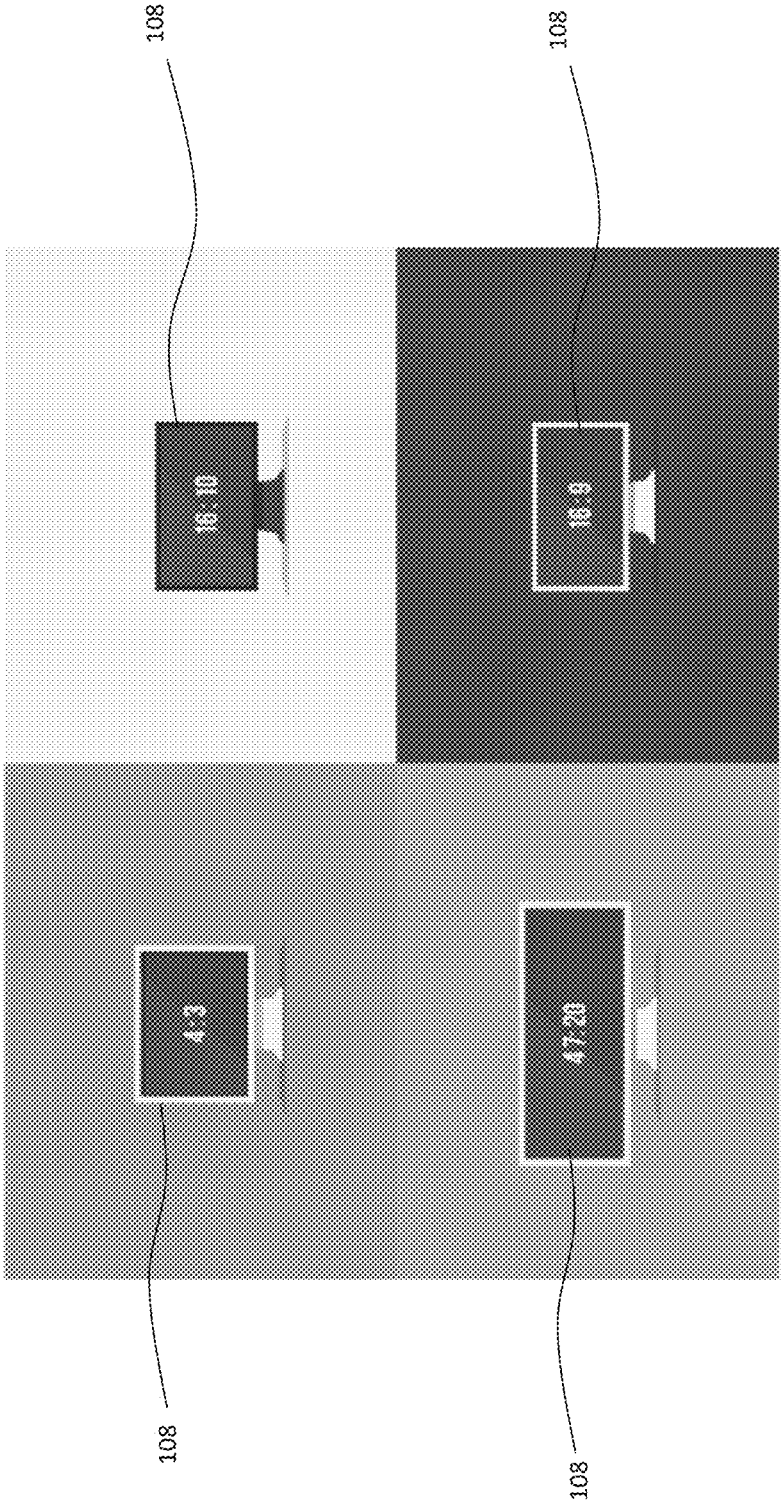


FIG. 1B

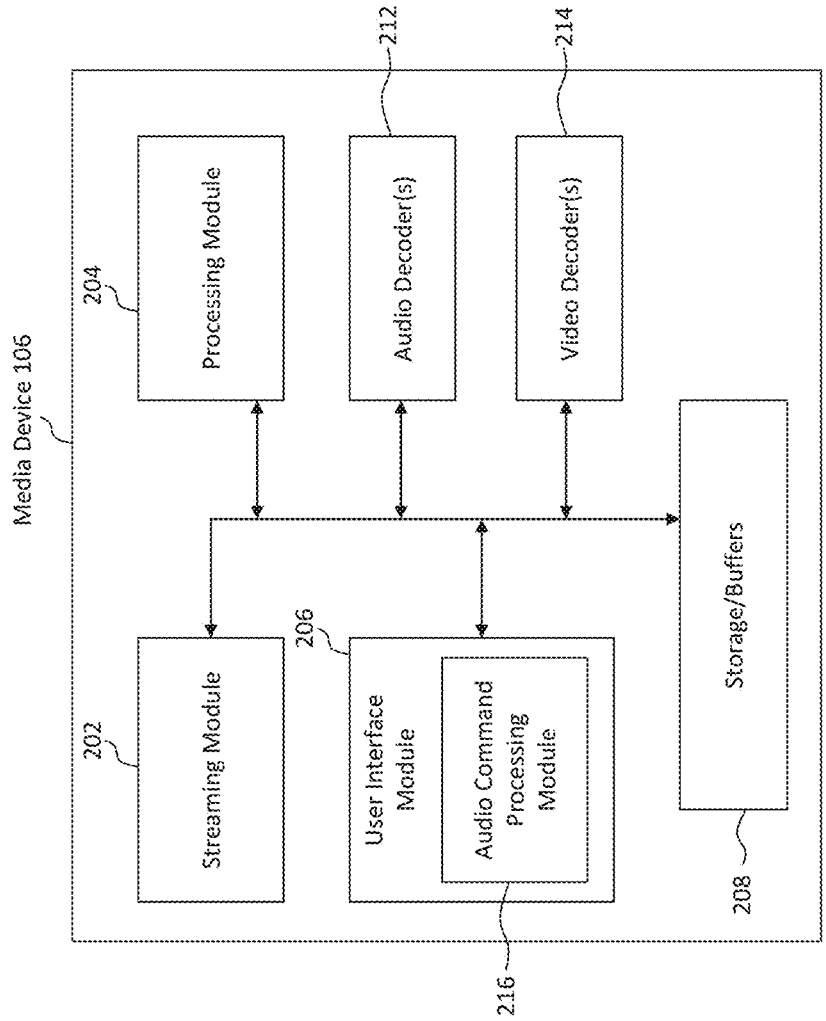

Media Device 106
204
Processing Module
212
Audio Decoder(s)
214
Video Decoder(s)
202
Streaming Module
206
User Interface Module
Audio Command Processing Module
Storage/Buffers
208
216

FIG. 2

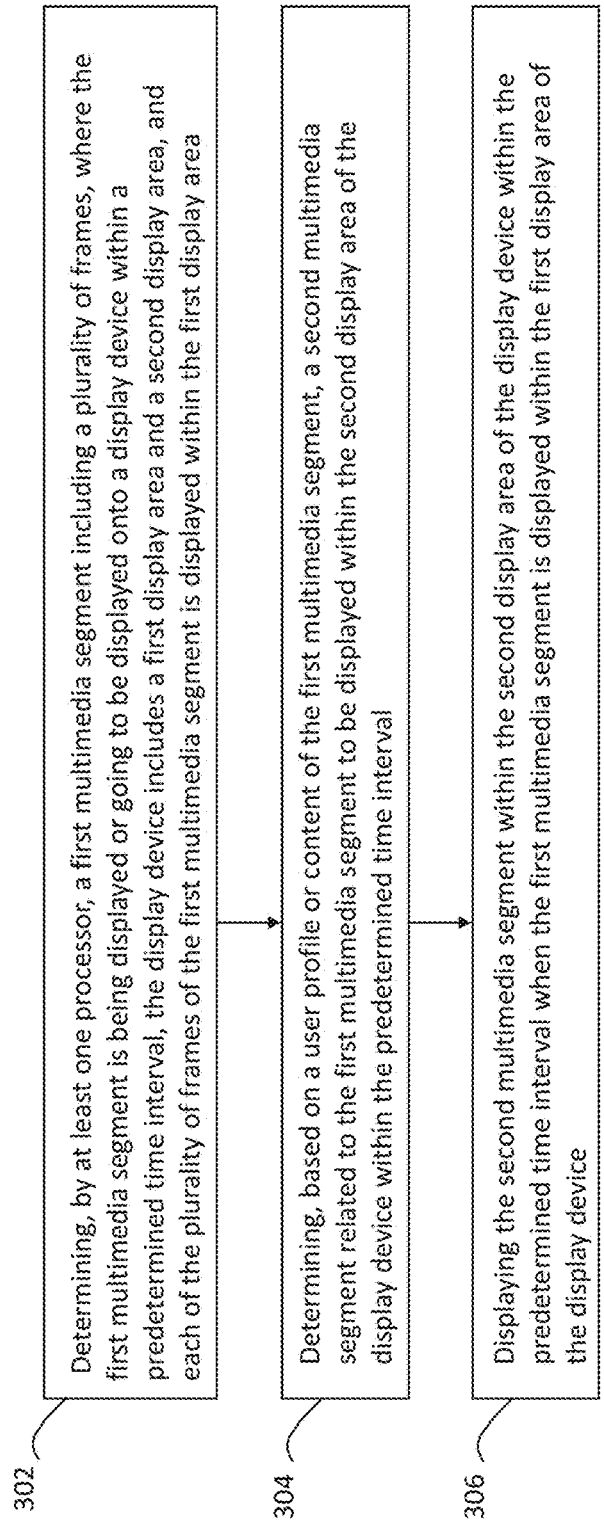

300
302
Determining, by at least one processor, a first multimedia segment including a plurality of frames, where the first multimedia segment is being displayed or going to be displayed onto a display device within a predetermined time interval, the display device includes a first display area and a second display area, and each of the plurality of frames of the first multimedia segment is displayed within the first display area
304
Determining, based on a user profile or content of the first multimedia segment, a second multimedia segment related to the first multimedia segment to be displayed within the second display area of the display device within the predetermined time interval
306
Displaying the second multimedia segment within the second display area of the display device within the predetermined time interval when the first multimedia segment is displayed within the first display area of the display device

FIG. 3

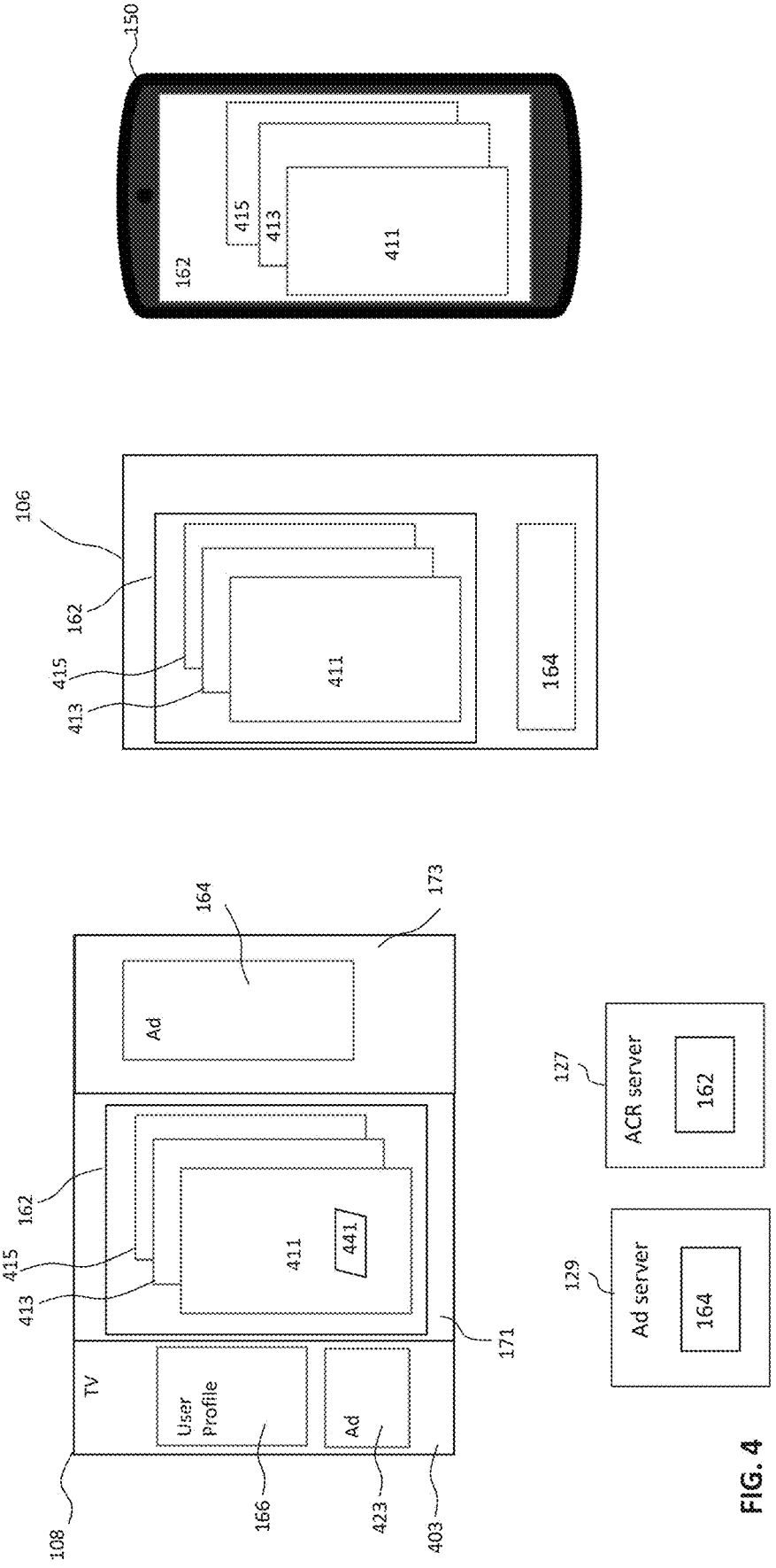

150
162
415
413
411
106
162
415
413
411
164
108
166
423
403
TV
User Profile
Ad
162
415
413
411
441
171
164
Ad
173
127
ACR server
162
129
Ad server
164

FIG. 4

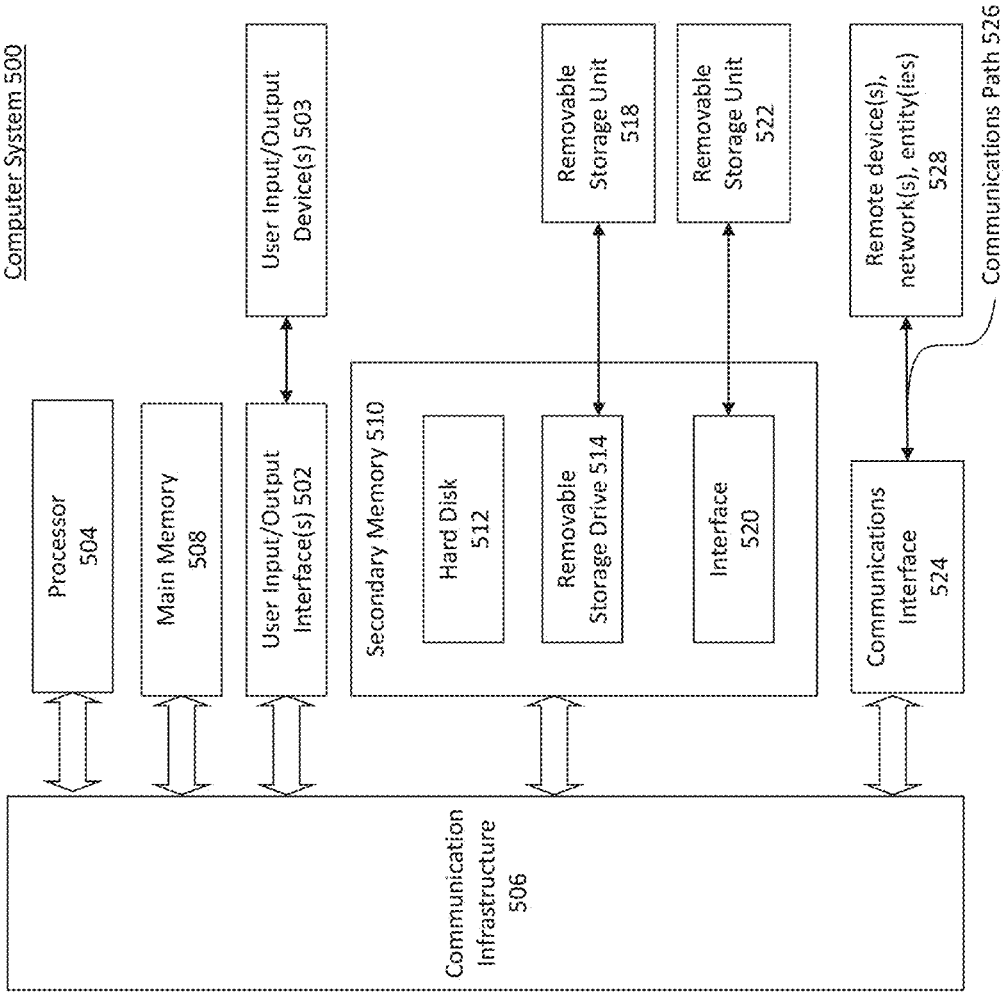

Computer System 500
Processor 504
Main Memory 508
User Input/Output Interface(s) 502
User Input/Output Device(s) 503
Secondary Memory 510
Hard Disk 512
Removable Storage Drive 514
Interface 520
Removable Storage Unit 518
Removable Storage Unit 522
Communication Infrastructure 506
Communications Interface 524
Remote device(s), network(s), entity(ies) 528
Communications Path 526

FIG. 5

DISPLAYING MULTIPLE MULTIMEDIA SEGMENTS IN A DISPLAY DEVICE

BACKGROUND

Field

[0001] This disclosure is generally directed to displaying multimedia segments or content in a display device.

Background

[0002] Television, sometimes shortened to TV, is a communication medium for displaying multimedia content including video and audio. Generally, the term can refer to a television set, or a medium of television transmission. Television is a mass medium for entertainment, news, and sports, and advertising. Digital television (DTV) generally refers to transmission and display of audio and video by digitally processed and multiplexed signals, in contrast to analog signals used by traditional analog television. A TV can be generally viewed as a display device to display images and sounds, e.g., multimedia segments or content. However, there are still challenges on how to display various multimedia segments or content in a display device, such as a TV.

SUMMARY

[0003] Provided herein are system, apparatus, article of manufacture, method and/or computer program product embodiments, and/or combinations and sub-combinations thereof, for displaying multiple multimedia segments within multiple display areas of a display device. An example of a display device can be a television (TV) or a TV set, although this disclosure is not limited to that embodiment.

[0004] An example embodiment of a multimedia environment includes a display device and a computing device which can serve as a media device. The media device may perform a method including various operations. In some embodiments, the media device may determine a first multimedia segment including a plurality of frames, where the first multimedia segment is being displayed or going to be displayed onto a display device within a predetermined time interval. The display device may include a first display area and a second display area, and each of the plurality of frames of the first multimedia segment is displayed within the first display area. The media device may further determine, based on a user profile or content of the first multimedia segment, a second multimedia segment related to the first multimedia segment to be displayed within the second display area of the display device within the predetermined time interval. In some embodiments, the user profile can be identified based on an identification of the display device. In addition, the media device may display the second multimedia segment within the second display area of the display device within the predetermined time interval when the first multimedia segment is displayed within the first display area of the display device.

[0005] In some embodiments, the second display area can be disjoint from the first display area. The first display area and the second display area can be of a rectangular shape of a substantially same height. In some embodiments, the second display area can overlay with the first display area, and the second multimedia segment can be an on-screen display (OSD) of the first multimedia segment.

[0006] In some embodiments, the second multimedia segment can include an advertisement related to the first multimedia segment or the user profile of the first multimedia segment. The content of the first multimedia segment can include audio content, and the second multimedia segment can be related to the audio content of the first multimedia segment. In some embodiments, the content of the first multimedia segment can include at least one object included in a frame of the first multimedia segment, and the second multimedia segment can be related to the at least one object included in the frame of the first multimedia segment. The at least one object included in the frame of the first multimedia segment can be identified by performing image recognition analysis of the frame. In some embodiments, the content of the first multimedia segment can include automatic content recognition (ACR) content recognized by an ACR server, and the second multimedia segment can be related to the ACR content of the first multimedia segment. In some embodiments, the first multimedia segment can be in a first format, and the first display area and the second display area together can have a capability to display the first multimedia segment in a second format different from the first format. The first format can include a first video aspect ratio, and the second format can include a second video aspect ratio different from the first video aspect ratio.

BRIEF DESCRIPTION OF THE FIGURES

[0007] The accompanying drawings are incorporated herein and form a part of the specification.

[0008] FIGS. **1A-1B** illustrate a block diagram of a multimedia environment, according to some embodiments.

[0009] FIG. **2** illustrates a block diagram of a streaming media device, according to some embodiments.

[0010] FIG. **3** illustrates an example process for displaying multiple multimedia segments within multiple display areas of a display device, according to some embodiments.

[0011] FIG. **4** illustrates an example multimedia environment to display multiple multimedia segments within multiple display areas of a display device, according to some embodiments.

[0012] FIG. **5** illustrates an example computer system useful for implementing various embodiments.

[0013] In the drawings, like reference numbers generally indicate identical or similar elements. Additionally, generally, the left-most digit(s) of a reference number identifies the drawing in which the reference number first appears.

DETAILED DESCRIPTION

[0014] Television, sometimes shortened to TV or TV set, can display multimedia segments or content including video and audio. Digital television (DTV) is the transmission of audio and video by digitally processed and multiplexed signals, in contrast to the analog signals used by analog television. TV can be generally viewed as a display device to display multimedia segments or content. The content being displayed onto a display device together with the display device itself have been evolving. In some ways, a traditional movie, such as a film being displayed onto a film screen, can be viewed as first generation multimedia content, while traditional broadcast TV content displayed onto a TV can be viewed as second generation multimedia content. In addition, computer monitor based video content, such as YouTube® multimedia content, can be viewed as third

generation multimedia content. Moreover, smart phone based multimedia content, such as short duration video, e.g., TikTok® video or Instagram® video, can be viewed as fourth generation multimedia content. Accordingly, the display device may include a movie screen, a TV set, a computer monitor, or a smart phone or other handheld devices. Various multimedia contents displayed on a display device can have its advantages and useful features. For example, a movie displayed onto a film screen can last 90 to 180 minutes normally so that viewers can watch in a theater. TV series are suitable for people to watch in front of a TV set at night. In addition, YouTube® videos are suitable for people to browse using an internet browser. Furthermore, everyone with a smart phone can create and post short duration videos on TikTok® instantly. Generally, viewing on the big screen, such as a film screen or a TV display, have seen significant growth and its popularity has led to the success of YouTube® on the TV set. Accordingly, there can also be great opportunities to bring short duration video taken by smart devices to be displayed on the TV set.

[0015] Since many short duration videos are generated with the portrait format or vertical format by a mobile device, it may be better to show the short duration video as the same vertical format on a wide screen TV that normally displays multimedia content in the landscape or horizontal format. Some other examples may include on Roku® TV. As a result, the wide screen TV display can have a blank space on the left and/or right sides of the area where the video being displayed in the portrait format. Hence, some embodiments may utilize the blank spaces that may exist on the left and right sides of the area where the video being displayed. In some embodiments, the area where the video being displayed in the portrait format may be referred to be a first display area, while the blank spaces on the left and right sides of the first display area may be referred to as a second display area or a third display area. Accordingly, the display device may include multiple display areas, such as two or more display areas.

[0016] Embodiments herein may present mechanisms for operations performed by a media device to display multiple multimedia segments within multiple display areas of a display device. A media device may be coupled to a display device to perform the various operations described herein. In some embodiments, the media device and the display device may be integrated into one device.

[0017] In some embodiments, the media device may determine a first multimedia segment including a plurality of frames, where the first multimedia segment is being displayed or going to be displayed onto a display device within a predetermined time interval. The display device may include a first display area and a second display area, and each of the plurality of frames of the first multimedia segment is displayed within the first display area. The media device may further determine, based on a user profile or content of the first multimedia segment, a second multimedia segment related to the first multimedia segment to be displayed within the second display area of the display device within the predetermined time interval. In some embodiments, the user profile can be identified based on an identification of the display device. In addition, the media device may display the second multimedia segment within the second display area of the display device within the predetermined time interval when the first multimedia segment is displayed within the first display area of the display device.

[0018] Various embodiments of this disclosure may be implemented using and/or may be part of a multimedia environment **102** shown in FIG. **1**. It is noted, however, that multimedia environment **102** is provided solely for illustrative purposes, and is not limiting. Embodiments of this disclosure may be implemented using and/or may be part of environments different from and/or in addition to multimedia environment **102**, as will be appreciated by persons skilled in the relevant art(s) based on the teachings contained herein. An example of multimedia environment **102** shall now be described.

[0019] Multimedia Environment

[0020] FIG. **1** illustrates a block diagram of multimedia environment **102**, according to some embodiments. Multimedia environment **102** illustrates an example environment, architecture, ecosystem, etc., in which various embodiments of this disclosure may be implemented. However, multimedia environment **102** is provided solely for illustrative purposes, and is not limiting. Embodiments of this disclosure may be implemented and/or used in environments different from and/or in addition to multimedia environment **102** of FIG. **1**, as will be appreciated by persons skilled in the relevant art(s) based on the teachings contained herein.

[0021] In a non-limiting example, multimedia environment **102** may be directed to streaming media. However, this disclosure is applicable to any type of media (instead of or in addition to streaming media), as well as any mechanism, means, protocol, method and/or process for distributing media.

[0022] Multimedia environment **102** may include one or more media systems **104**. Media system **104** could represent a family room, a kitchen, a backyard, a home theater, a school classroom, a library, a car, a boat, a bus, a plane, a movie theater, a stadium, an auditorium, a park, a bar, a restaurant, or any other location or space where it is desired to receive and play streaming content. User(s) **132** may operate with media system **104** to select and consume content. User **132** may interact with media system **104** through a remote control device **110**. User **132** may be a viewer, a consumer, or both.

[0023] Each media system **104** may include one or more media devices **106** each coupled to one or more display devices **108**. Media device **106** may be referred to as a computing device as well. It is noted that terms such as "coupled," "connected to," "attached," "linked," "combined" and similar terms may refer to physical, electrical, magnetic, logical, etc., connections, unless otherwise specified herein.

[0024] Media device **106** may be a streaming media device, a streaming set-top box (STB), cable and satellite STB, a DVD or BLU-RAY device, an audio/video playback device, cable box, and/or a digital video recording device, to name just a few examples. Display device **108** may be a monitor, a television (TV or TV set), a computer, a computer monitor, a smart phone, a tablet, a wearable (such as a watch or glasses), an appliance, an internet of things (IoT) device, and/or a projector, to name just a few examples. In some embodiments, media device **106** can be a part of, integrated with, attached to, operatively coupled to, and/or connected to its respective display device **108**. Media device **106** can

provide media content, such as media segment **162** and media segment **164** to display device **108**.

[0025] In some embodiments, display device **108** can provide resolutions selected from **1920**×1080 pixels, 1280×720 pixels, 2560×1440 pixels, 2048×1080 pixels, 3840×2160 pixels, 7680×4320 pixels, 640×480 pixels, or any other resolutions known to one having ordinary skills in the art. Display device **108** can support a video aspect ratio such as 4:3, 16:9, 1.77:1, 1.9:1, as shown in FIG. **1**B. Display device **108** can support other aspect ratio as well. Display device **108** can be a TV set, such as a smart TV.

[0026] In some embodiments, display device **108** may include a first display area **171** to display multimedia segment **162** and a second display area **173** to display multimedia segment **164**. In some embodiments, the second display area **173** can be disjoint from the first display area **171**. The first display area **171** and the second display area **173** can be of a rectangular shape of a substantially same height. In some embodiments, the second display area **173** can overlay with the first display area **171**, and multimedia segment **164** can be an on-screen display (OSD) of multimedia segment **162**.

[0027] Each media device **106** may be configured to communicate with network **118** via a communication device **114**. Communication device **114** may include, for example, a cable modem or satellite TV transceiver. Media device **106** may communicate with communication device **114** over a link **116**, where link **116** may include wireless (such as WiFi) and/or wired connections.

[0028] In various embodiments, network **118** can include, without limitation, wired and/or wireless intranet, extranet, Internet, cellular, Bluetooth, infrared, and/or any other short range, long range, local, regional, global communications mechanism, means, approach, protocol and/or network, as well as any combination(s) thereof.

[0029] Media system **104** may include a remote control device **110**. Remote control device **110** can be any component, part, apparatus and/or method for controlling media device **106**, display device **108**, such as a remote control device, a tablet, laptop computer, smartphone, wearable, on-screen controls, integrated control buttons, audio controls, or any combination thereof, to name just a few examples. In an embodiment, remote control device **110** wirelessly communicates with media device **106**, or display device **108** using cellular, Bluetooth, infrared, etc., or any combination thereof.

[0030] Multimedia environment **102** may include a plurality of content servers **120** (also called content providers). Although only one content server **120** is shown in FIG. **1**A, in practice the multimedia environment **102** may include any number of content servers **120**. Each content server **120** may be configured to communicate with network **118**.

[0031] Each content server **120** may store content **122** and metadata **124**. Content **122** may include multimedia segment **162** and multimedia segment **164**, which can include any combination of music, videos, movies, TV programs, multimedia, images, still pictures, text, graphics, gaming applications, advertisements, programming content, public service content, government content, local community content, software, and/or any other content or data objects in electronic form. Content **122** may be the source for media content, e.g., multimedia segment **162** and multimedia segment **164**, stored in media device **106** and displayed on display device **108**.

[0032] In some embodiments, multimedia segment **164** can include an advertisement related to multimedia segment **162** or user profile **166** of multimedia segment **162**. The advertisement related to multimedia segment **162** can be fetched from an advertisement server **129** couple to content server **120**. The content of multimedia segment **162** can include audio content, and multimedia segment **164** can be related to the audio content of multimedia segment **162**. In some embodiments, the content of multimedia segment **162** can include at least one object included in a frame of multimedia segment **162**, and multimedia segment **164** can be related to the at least one object included in the frame of multimedia segment **162**. The at least one object included in the frame of the first multimedia segment can be identified by performing image recognition analysis of the frame. In some embodiments, the content of multimedia segment **162** can include automatic content recognition (ACR) content recognized by an ACR server **127**, and multimedia segment **164** can be related to the ACR content of multimedia segment **162**. In some embodiments, multimedia segment **162** can be in a first format, and the first display area **171** and the second display area **173** together has a capability to display multimedia segment **162** in a second format different from the first format. The first format can include a first video aspect ratio, and the second format includes a second video aspect ratio different from the first video aspect ratio.

[0033] In some embodiments, metadata **124** comprises data about content **122**. For example, metadata **124** may include associated or ancillary information indicating or related to writer, director, producer, composer, artist, actor, summary, chapters, production, history, year, trailers, alternate versions, related content, applications, and/or any other information pertaining or relating to content **122**. Metadata **124** can include user profile **166** of multimedia segment **162**. Metadata **124** may also or alternatively include links to any such information pertaining or relating to content **122**. Metadata **124** may also or alternatively include one or more indexes of content **122**, such as but not limited to a trick mode index.

[0034] Multimedia environment **102** may include one or more system servers **126**. System servers **126** may operate to support media device **106** from the cloud. It is noted that the structural and functional aspects of system servers **126** may wholly or partially exist in the same or different ones of system servers **126**. System servers **126** and content server **120** together may be referred to as a media server system. An overall media system may include a media server system and media system **104**. In some embodiments, a media system may refer to the overall media system including the media server system and media system **104**.

[0035] Media devices **106** may exist in thousands or millions of media systems **104**. Accordingly, media devices **106** may lend themselves to crowdsourcing embodiments and, thus, system servers **126** may include one or more crowdsource servers **128**.

[0036] For example, using information received from media devices **106** in the thousands and millions of media systems **104**, crowdsource server(s) **128** may identify similarities and overlaps between closed captioning requests issued by different users **132** watching a particular movie. Based on such information, crowdsource server(s) **128** may determine that turning closed captioning on may enhance users' viewing experience at particular portions of the movie (for example, when the soundtrack of the movie is difficult

to hear), and turning closed captioning off may enhance users' viewing experience at other portions of the movie (for example, when displaying closed captioning obstructs critical visual aspects of the movie). Accordingly, crowdsource server(s) **128** may operate to cause closed captioning to be automatically turned on and/or off during future streaming of the movie.

[0037] System servers **126** may also include an audio command processing module **130**. As noted above, remote control device **110** may include a microphone **112**. Microphone **112** may receive audio data from user **132** (as well as other sources, such as display device **108**). In some embodiments, media device **106** may be audio responsive, and the audio data may represent verbal commands from user **132** to control media device **106** as well as other components in media system **104**, such as display device **108**.

[0038] In some embodiments, the audio data received by microphone **112** in remote control device **110** is transferred to media device **106**, which is then forwarded to audio command processing module **130** in system servers **126**. Audio command processing module **130** may operate to process and analyze the received audio data to recognize a verbal command from user **132**. Audio command processing module **130** may then forward the verbal command back to media device **106** for processing.

[0039] In some embodiments, the audio data may be alternatively or additionally processed and analyzed by an audio command processing module **216** in media device **106** (see FIG. **2**). Media device **106** and system servers **126** may then cooperate to pick one of the verbal commands to process (either the verbal command recognized by audio command processing module **130** in system servers **126**, or the verbal command recognized by audio command processing module **216** in media device **106**).

[0040] In some embodiments, multimedia environment **102** may include a mobile device **150** accessed by a user or consumer **152**. In some embodiments, mobile device **150** can include a transceiver **154** configured to wirelessly communicate with a computing device, and a controller **156** coupled to the transceiver and configured to perform various operations. Communication between mobile device **150** with the computing device such as media device **106** or content sever **120** may be through transceiver **154** and network **118**. User **152** may generate multimedia segment **162** using mobile device **150**, where multimedia segment **162** may be uploaded into content server **120**, and further transmitted to media device **106** and displayed on display device **108**.

[0041] In some embodiments, multimedia segment **162** may be created in a vertical format by mobile device **150**, and display device **108** may be a smart television (TV) capable to display the multimedia segment in a horizontal format.

[0042] In some embodiments, mobile device **150** can include a handheld terminal, a cellular phone (e.g., a smart phone), a personal digital assistant (PDA), a wireless modem, a wireless communication device, a handheld device, a laptop, a desktop, a cordless phone, a wireless local loop station, a tablet, a camera, a gaming device, a netbook, an ultrabook, a wearable device (smart watch, smart clothing, smart glasses, smart wrist band, smart jewelry such as smart ring or smart bracelet), an entertainment device (e.g., a music or video device, or a satellite radio), a vehicular component, an Internet-of-Things (IoT) device, a machine-type communication (MTC) device, an evolved or enhanced machine-type communication (eMTC) device, or any other suitable device that is configured to communicate via a wireless medium.

[0043] FIG. **2** illustrates a block diagram of an example media device **106**, according to some embodiments. Media device **106** may include a streaming module **202**, a processing module **204**, a storage/buffers **208**, and a user interface module **206**. As described above, user interface module **206** may include audio command processing module **216**.

[0044] Media device **106** may also include one or more audio decoders **212** and one or more video decoders **214**.

[0045] Each audio decoder **212** may be configured to decode audio of one or more audio formats, such as but not limited to AAC, HE-AAC, AC3 (Dolby Digital), EAC3 (Dolby Digital Plus), WMA, WAV, PCM, MP3, OGG GSM, FLAC, AU, AIFF, and/or VOX, to name just some examples.

[0046] Similarly, each video decoder **214** may be configured to decode video of one or more video formats, such as but not limited to MP4 (mp4, m4a, m4v, f4v, f4a, m4b, m4r, f4b, mov), 3GP (3gp, 3gp2, 3g2, 3gpp, 3gpp2), OGG (ogg, oga, ogv, ogx), WMV (wmy, wma, asf), WEBM, FLV, AVI, QuickTime, HDV, MXF (OPla, OP-Atom), MPEG-TS, MPEG-2 PS, MPEG-2 TS, WAV, Broadcast WAV, LXF, GXF, and/or VOB, to name just some examples. Each video decoder **214** may include one or more video codecs, such as but not limited to H.263, H.264, HEV, MPEG1, MPEG2, MPEG-TS, MPEG-4, Theora, 3GP, DV, DVCPRO, DVCPRO, DVCProHD, IMX, XDCAM HD, XDCAM HD422, and/or XDCAM EX, to name just some examples.

[0047] Now referring to both FIGS. **1** and **2**, in some embodiments, user **132** may interact with media device **106** and display device **108** via, for example, remote control device **110**. For example, user **132** may use remote control device **110** to interact with user interface module **206** of media device **106** to select content, such as a movie, TV show, music, book, application, game, etc. Streaming module **202** of media device **106** may request the selected content from content server(s) **120** over network **118**. Content server(s) **120** may transmit the requested content to streaming module **202**. Media device **106** may transmit the received content to display device **108** for playback to user **132**. Mobile device **150** may provide additional control and communication with media device **106**.

[0048] In some embodiments, streaming module **202** may transmit the content to display device **108** in real time or near real time as it receives such content from content server(s) **120**. In some embodiments, media device **106** may store the content received from content server(s) **120** in storage/buffers **208** for later playback on display device **108**.

[0049] Coordination Between a Media Device, a Mobile Device, and a Display Device.

[0050] FIG. **3** illustrates an example process **300** for displaying multiple multimedia segments within multiple display areas of a display device, according to some embodiments. In some embodiments, process **300** can be performed by a computing device, such as media device **106** or display device **108**, or the combination of both even though some descriptions may be provided for media device **106** only. Descriptions below may use media device **106** as an example of a computing device. Processes **300** can be performed by processing logic that can comprise hardware (e.g., circuitry, dedicated logic, programmable logic, microcode, etc.), software (e.g., instructions executing on a pro-

cessing device, such as by controller or a processor), or a combination thereof. It is to be appreciated that not all steps may be needed to perform the disclosure provided herein. Further, some of the steps may be performed simultaneously, or in a different order than shown in FIG. **3**, as will be understood by a person of ordinary skill in the art.

[0051] At **302**, media device **106** can determine a first multimedia segment including a plurality of frames, where the first multimedia segment is being displayed or going to be displayed onto a display device within a predetermined time interval. The display device may include a first display area and a second display area, and each of the plurality of frames of the first multimedia segment is displayed within the first display area. For example, as shown in FIG. **4**, media device **106** can determine, by at least one processor of media device **106**, multimedia segment **162** including a plurality of frames, such as a frame **411**, a frame **413**, or a frame **415**. The multiple frames, such as frame **411**, frame **413**, or frame **415** may be generated by mobile device **150**, and may be processed by media device **106** and displayed by display device **108** in the first display area **171**. Display device **108** includes at least two different display areas, the first display area **171** and the second display area **173**. In some embodiments, the second display area **173** can be disjoint from the first display area **171**. In some embodiments, there may be a third display area **403** of display device **108**.

[0052] At **304**, media device **106** can determine, based on a user profile or content of the first multimedia segment, a second multimedia segment related to the first multimedia segment to be displayed within the second display area of the display device within the predetermined time interval. In some embodiment, the user profile can be identified based on an identification of the display device. For example, media device **106** can determine, based on user profile **166** or content of multimedia segment **162**, multimedia segment **164** related to multimedia segment **162** to be displayed within the second display area **173** of the display device **108** within the predetermined time interval. In some embodiment, the user profile **166** can be identified based on an identification of display device **108**, or based on an identification of media device **106**. Accordingly, multimedia segment **164** can be displayed substantially concurrently as multimedia segment **162** being displayed, or within a short predetermined time interval, such as 30 seconds, 1 minutes, or some other time intervals. In some embodiments, media device **106** may have user profile **166** displayed in the third display area **403**. The third display area **403** may further display an advertisement **423** related to use profile **166** or the content of multimedia segment **162**.

[0053] At **306**, media device **106** may display the second multimedia segment within the second display area of the display device within the predetermined time interval when the first multimedia segment is displayed within the first display area of the display device. For example, media device **106** may display multimedia segment **164** within the second display area **173** of the display device **108** within the predetermined time interval when multimedia segment **162** is displayed within the first display area **171** of display device **108**.

[0054] In some embodiments, as shown in FIG. **4**, each of the plurality of frames, such as frame **411**, frame **413**, and frame **415**, of the multimedia segment **162** are displayed within the first display area **171**. By limiting each of the plurality of frames, such as frame **411**, frame **413**, and frame **415**, of multimedia segment **162** to be displayed within the first display area **171**, embodiments can enable other display areas, such as the second display area **173** to be used for other purpose, since the content of multimedia segment **162** would not be displayed, overlap, or intersect with other display areas such as the second display area **173**. Accordingly, embodiments herein are different from displaying a multimedia segment into a display device, where a frame may only occupy a part of the display area. For multimedia segment **162**, all the content of frames of multimedia segment **162** are limited to be displayed within the first display area **171**. In addition, the size or ratio of the first display area **171** may be predetermined based on the format of multimedia segment **162**, but may not depend on the content of multimedia segment **162**, e.g., independent from the content of multimedia segment **162**. The content of multimedia segment **162**, such as frame **411**, frame **413**, and frame **415** can be represented by different video format including video aspect ratios, resolutions, and many other format parameters. In some embodiments, the format of multimedia segment **162** may be determined by the device generating multimedia segment **162**, such as mobile device **150**, which uses a format such as the vertical format different from the format for the display device **108** such as the horizontal format.

[0055] In some embodiments, the first display area **171** and the second display area **173** may be disjoint from each other, and may be of a rectangular shape of a substantially same height, as shown in FIG. **4**. In some embodiments, media device **106** may display substantially concurrently user profile **166** of multimedia segment **162** or an advertisement **423** related to multimedia segment **162** in the third display area **403** of display device **108**. Multimedia segment **164** related to multimedia segment **162** may be an advertisement as well.

[0056] Even though three display areas, such as the first display area **171**, the second display area **173**, and the third display area **403** are shown in FIG. **4**, in some embodiments, display device **108** may only include two display areas such as the first display area **171** and the second display area **173**. In some embodiments, the first display area **171** and the second display area **173** can be of different shapes, not shown. For example, the second display area **173** can be a smaller rectangle than the first display area **171**, or an oval, a circle, a square, or some other shapes. In some embodiments, there can be a plurality of display areas such as 2 display areas, 3 display areas, or more different and separated display areas of display device **108**.

[0057] In some embodiments, multimedia segment **162** may be in a first format, e.g., the vertical format, displayed in the first display area **171**. In addition, the first display area **171** and the second display area **173** together can have a capability to display the multimedia segment **162** in a second format different from the first format. In some embodiments, the first format can include a first video aspect ratio, and the second format includes a second video aspect ratio different from the first video aspect ratio. In some embodiments, at any given time the first video aspect ratio or the second video aspect ratio includes a ratio of one of 19:6, 4:3, 16:10, 47:20, 16:9, 1.375:1, 1.78:1, 1.85:1, 2.39:1, 2.40:1, 2.35:1, 2.39:1, 9:16, 4:5, or any other aspect ratio known to one having ordinary skills in the art.

[0058] In some embodiments, when display device **108** includes the third display area **403**, the third display area **403** may be disjoint from the first display area **171** and the second display area **173**. In some embodiments, the first display area **171**, the second display area **173**, and the third display area **403** may be of a rectangular shape of a substantially same height, as shown in FIG. **4**. In some embodiments, the second display area **173** can be adjacent to the first display area **171** at a first side, e.g., a right side, and the third display area **403** can be adjacent to the first display area **171** at a second side opposite to the first side, e.g., a left side. In some embodiments, media device **106** may display substantially concurrently user profile **166** of multimedia segment **162** in the third display area **403**, and display substantially concurrently multimedia segment **164**, e.g., an advertisement related to multimedia segment **162**, on the second display area **173**. In some embodiments, by being displayed substantially concurrently, user profile **166**, multimedia segment **164**, and frames of multimedia segment **162** can be displayed at an exact time instance, or within a small allowable time interval which may depend on the system performance and coordination. For example, in some embodiments, a small allowable time interval may be within 1 microsecond, or 1 second, depending on the content and the application of multimedia segment **162**, user profile **421**, and multimedia segment **164**.

[0059] In some embodiments, the content of multimedia segment **162** can include audio content, and multimedia segment **164** can be related to the audio content of multimedia segment **162**. In some embodiments, the content of multimedia segment **162** can include at least one object **441** included in a frame, e.g., frame **411** of multimedia segment **162**, and multimedia segment **164** can be related to object **441** included in frame **411**. In some embodiments, object **441** included in frame **411** can be identified by performing image recognition analysis of frame **411**. In some embodiments, the content of multimedia segment **162** can include ACR content recognized by ACR server **127**, and multimedia segment **164** can be related to the ACR content of multimedia segment **162**.

[0060] Example Computer System

[0061] Various embodiments may be implemented, for example, using one or more well-known computer systems, such as computer system **500** shown in FIG. **5**. For example, media device **106**, display device **108**, content server **120**, system server **126**, mobile device **150**, may be implemented using combinations or sub-combinations of computer system **500** to perform various functions described herein, e.g., by process **300**. Also or alternatively, one or more computer systems **500** may be used, for example, to implement any of the embodiments discussed herein, as well as combinations and sub-combinations thereof.

[0062] Computer system **500** may include one or more processors (also called central processing units, or CPUs), such as a processor **504**. Processor **504** may be connected to a communication infrastructure or bus **506**.

[0063] Computer system **500** may also include user input/output device(s) **503**, such as monitors, keyboards, pointing devices, etc., which may communicate with communication infrastructure **506** through user input/output interface(s) **502**.

[0064] One or more of processors **504** may be a graphics processing unit (GPU). In an embodiment, a GPU may be a processor that is a specialized electronic circuit designed to process mathematically intensive applications. The GPU may have a parallel structure that is efficient for parallel processing of large blocks of data, such as mathematically intensive data common to computer graphics applications, images, videos, etc.

[0065] Computer system **500** may also include a main or primary memory **508**, such as random access memory (RAM). Main memory **508** may include one or more levels of cache. Main memory **508** may have stored therein control logic (i.e., computer software) and/or data.

[0066] Computer system **500** may also include one or more secondary storage devices or memory **510**. Secondary memory **510** may include, for example, a hard disk drive **512** and/or a removable storage device or drive **514**. Removable storage drive **514** may be a floppy disk drive, a magnetic tape drive, a compact disk drive, an optical storage device, tape backup device, and/or any other storage device/drive.

[0067] Removable storage drive **514** may interact with a removable storage unit **518**. Removable storage unit **518** may include a computer usable or readable storage device having stored thereon computer software (control logic) and/or data. Removable storage unit **518** may be a floppy disk, magnetic tape, compact disk, DVD, optical storage disk, and/any other computer data storage device. Removable storage drive **514** may read from and/or write to removable storage unit **518**.

[0068] Secondary memory **510** may include other means, devices, components, instrumentalities or other approaches for allowing computer programs and/or other instructions and/or data to be accessed by computer system **500**. Such means, devices, components, instrumentalities or other approaches may include, for example, a removable storage unit **522** and an interface **520**. Examples of the removable storage unit **522** and the interface **520** may include a program cartridge and cartridge interface (such as that found in video game devices), a removable memory chip (such as an EPROM or PROM) and associated socket, a memory stick and USB or other port, a memory card and associated memory card slot, and/or any other removable storage unit and associated interface.

[0069] Computer system **500** may further include a communication or network interface **524**. Communication interface **524** may enable computer system **500** to communicate and interact with any combination of external devices, external networks, external entities, etc. (individually and collectively referenced by reference number **528**). For example, communication interface **524** may allow computer system **500** to communicate with external or remote devices **528** over communications path **526**, which may be wired and/or wireless (or a combination thereof), and which may include any combination of LANs, WANs, the Internet, etc. Control logic and/or data may be transmitted to and from computer system **500** via communication path **526**.

[0070] Computer system **500** may also be any of a personal digital assistant (PDA), desktop workstation, laptop or notebook computer, netbook, tablet, smart phone, smart watch or other wearable, appliance, part of the Internet-of-Things, and/or embedded system, to name a few non-limiting examples, or any combination thereof.

[0071] Computer system **500** may be a client or server, accessing or hosting any applications and/or data through any delivery paradigm, including but not limited to remote or distributed cloud computing solutions; local or on-premises software ("on-premise" cloud-based solutions); "as a

service" models (e.g., content as a service (CaaS), digital content as a service (DCaaS), software as a service (SaaS), managed software as a service (MSaaS), platform as a service (PaaS), desktop as a service (DaaS), framework as a service (FaaS), backend as a service (BaaS), mobile backend as a service (MBaaS), infrastructure as a service (IaaS), etc.); and/or a hybrid model including any combination of the foregoing examples or other services or delivery paradigms.

[0072] Any applicable data structures, file formats, and schemas in computer system **500** may be derived from standards including but not limited to JavaScript Object Notation (JSON), Extensible Markup Language (XML), Yet Another Markup Language (YAML), Extensible Hypertext Markup Language (XHTML), Wireless Markup Language (WML), MessagePack, XML User Interface Language (XUL), or any other functionally similar representations alone or in combination. Alternatively, proprietary data structures, formats or schemas may be used, either exclusively or in combination with known or open standards.

[0073] In some embodiments, a tangible, non-transitory apparatus or article of manufacture comprising a tangible, non-transitory computer useable or readable medium having control logic (software) stored thereon may also be referred to herein as a computer program product or program storage device. This includes, but is not limited to, computer system **500**, main memory **508**, secondary memory **510**, and removable storage units **518** and **522**, as well as tangible articles of manufacture embodying any combination of the foregoing. Such control logic, when executed by one or more data processing devices (such as computer system **500** or processor(s) **504**), may cause such data processing devices to operate as described herein.

[0074] Based on the teachings contained in this disclosure, it will be apparent to persons skilled in the relevant art(s) how to make and use embodiments of this disclosure using data processing devices, computer systems and/or computer architectures other than that shown in FIG. **5**. In particular, embodiments can operate with software, hardware, and/or operating system implementations other than those described herein.

CONCLUSION

[0075] It is to be appreciated that the Detailed Description section, and not any other section, is intended to be used to interpret the claims. Other sections can set forth one or more but not all exemplary embodiments as contemplated by the inventor(s), and thus, are not intended to limit this disclosure or the appended claims in any way.

[0076] While this disclosure describes exemplary embodiments for exemplary fields and applications, it should be understood that the disclosure is not limited thereto. Other embodiments and modifications thereto are possible, and are within the scope and spirit of this disclosure. For example, and without limiting the generality of this paragraph, embodiments are not limited to the software, hardware, firmware, and/or entities illustrated in the figures and/or described herein. Further, embodiments (whether or not explicitly described herein) have significant utility to fields and applications beyond the examples described herein.

[0077] Embodiments have been described herein with the aid of functional building blocks illustrating the implementation of specified functions and relationships thereof. The boundaries of these functional building blocks have been arbitrarily defined herein for the convenience of the description. Alternate boundaries can be defined as long as the specified functions and relationships (or equivalents thereof) are appropriately performed. Also, alternative embodiments can perform functional blocks, steps, operations, methods, etc. using orderings different than those described herein.

[0078] References herein to "one embodiment," "an embodiment," "an example embodiment," or similar phrases, indicate that the embodiment described may include a particular feature, structure, or characteristic, but every embodiment may not necessarily include the particular feature, structure, or characteristic. Moreover, such phrases are not necessarily referring to the same embodiment. Further, when a particular feature, structure, or characteristic is described in connection with an embodiment, it would be within the knowledge of persons skilled in the relevant art(s) to incorporate such feature, structure, or characteristic into other embodiments whether or not explicitly mentioned or described herein. Additionally, some embodiments can be described using the expression "coupled" and "connected" along with their derivatives. These terms are not necessarily intended as synonyms for each other. For example, some embodiments can be described using the tenns "connected" and/or "coupled" to indicate that two or more elements are in direct physical or electrical contact with each other. The term "coupled," however, can also mean that two or more elements are not in direct contact with each other, but yet still co-operate or interact with each other.

[0079] The breadth and scope of this disclosure should not be limited by any of the above-described exemplary embodiments, but should be defined only in accordance with the following claims and their equivalents.

1. A method, comprising:

determining, by at least one processor, a first multimedia segment including a plurality of frames, wherein the first multimedia segment is being displayed or going to be displayed onto a display device within a predetermined time interval, wherein the display device includes a first display area and a second display area, and each of the plurality of frames of the first multimedia segment is displayed within the first display area, and wherein both a first size of the first display area and a second size of the second display area are based on a first video aspect ratio of the first multimedia segment;

determining, based on a user profile or content of the first multimedia segment, a second multimedia segment related to the first multimedia segment to be displayed within the second display area of the display device within the predetermined time interval; and

displaying the second multimedia segment within the second display area of the display device within the predetermined time interval when the first multimedia segment is displayed within the first display area of the display device.

2. The method of claim **1**, wherein the second display area is disjoint from the first display area.

3. The method of claim **2**, wherein the first display area and the second display area are of a rectangular shape of a substantially same height.

4. The method of claim 1, wherein the second display area overlays with the first display area, and the second multimedia segment is an on-screen display (OSD) of the first multimedia segment.

5. The method of claim 1, wherein the second multimedia segment includes an advertisement related to the first multimedia segment or the user profile of the first multimedia segment.

6. The method of claim 5, wherein the user profile is identified based on an identification of the display device.

7. The method of claim 1, wherein the content of the first multimedia segment includes audio content, and the second multimedia segment is related to the audio content of the first multimedia segment.

8. The method of claim 1, wherein the content of the first multimedia segment includes at least one object included in a frame of the first multimedia segment, and the second multimedia segment is related to the at least one object included in the frame of the first multimedia segment.

9. The method of claim 8, wherein the at least one object included in the frame of the first multimedia segment is identified by performing image recognition analysis of the frame.

10. The method of claim 1, wherein the content of the first multimedia segment includes automatic content recognition (ACR) content recognized by an ACR server, and the second multimedia segment is related to the ACR content of the first multimedia segment.

11. The method of claim 1, wherein the first multimedia segment is in a first format, and the first display area and the second display area together have a capability to display the first multimedia segment in a second format different from the first format.

12. The method of claim 11, wherein the first format includes the first video aspect ratio, and the second format includes a second video aspect ratio different from the first video aspect ratio.

13. A computing device, comprising:

one or more memories; and

at least one processor, each coupled to at least one of the memories and configured to:

determine a first multimedia segment including a plurality of frames, wherein the first multimedia segment is being displayed or going to be displayed onto a display device within a predetermined time interval, wherein the display device includes a first display area and a second display area, and each of the plurality of frames of the first multimedia segment is displayed within the first display area, and wherein both a first size of the first display area and a second size of the second display area are based on a first video aspect ratio of the first multimedia segment;

determine, based on a user profile or content of the first multimedia segment, a second multimedia segment related to the first multimedia segment to be displayed within the second display area of the display device within the predetermined time interval; and

display the second multimedia segment within the second display area of the display device within the predetermined time interval when the first multimedia segment is displayed within the first display area of the display device.

14. The computing device of claim 13, wherein the second display area is disjoint from the first display area.

15. The computing device of claim 14, wherein the first display area and the second display area are of a rectangular shape of a substantially same height.

16. The computing device of claim 13, wherein the second multimedia segment includes an advertisement related to the first multimedia segment or the user profile of the first multimedia segment.

17. The computing device of claim 16, wherein the user profile is identified based on an identification of the display device.

18. The computing device of claim 13, wherein the content of the first multimedia segment includes at least one object included in a frame of the first multimedia segment, and the second multimedia segment is related to the at least one object included in the frame of the first multimedia segment.

19. A non-transitory computer-readable medium having instructions stored thereon that, when executed by a computing device, cause the computing device to perform operations comprising:

determining, by at least one processor, a first multimedia segment including a plurality of frames, wherein the first multimedia segment is being displayed or going to be displayed onto a display device within a predetermined time interval, wherein the display device includes a first display area and a second display area, and each of the plurality of frames of the first multimedia segment is displayed within the first display area, and wherein both a first size of the first display area and a second size of the second display area are based on a first video aspect ratio of the first multimedia segment;

determining, based on a user profile or content of the first multimedia segment, a second multimedia segment related to the first multimedia segment to be displayed within the second display area of the display device within the predetermined time interval; and

displaying the second multimedia segment within the second display area of the display device within the predetermined time interval when the first multimedia segment is displayed within the first display area of the display device.

20. The non-transitory computer-readable medium of claim 19, wherein the second display area is disjoint from the first display area; and

the first display area and the second display area are of a rectangular shape of a substantially same height.

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