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(54) **METHOD AND APPARATUS FOR LIVE VIDEO SHARING WITH MULTIMODAL MODES**

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(57) **ABSTRACT**

An approach is provided for enhancing a communication session. The approach involves receiving a request for communicating at least substantially live video data between a device and one or more other devices. The approach also involves determining capability information, resource availability information, or a combination thereof of the device, the one or more other devices, or a combination thereof. The approach further involves processing and/or facilitating a processing of the capability information, the resource availability information, or a combination thereof to cause, at least in part, an extraction of multimodal information from the at least substantially live video data. The approach additionally involves causing, at least in part, an exchange of the multimodal information in place of at least a portion of the at least substantially live video data in response to the request.

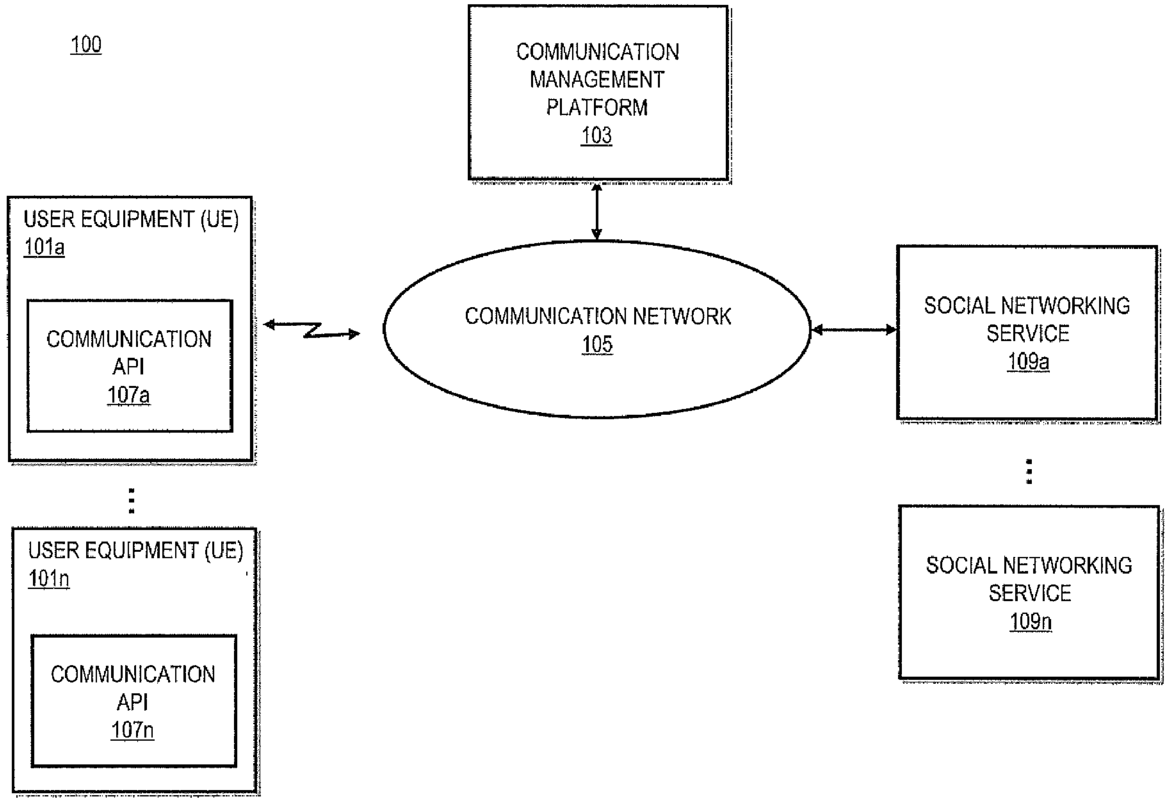
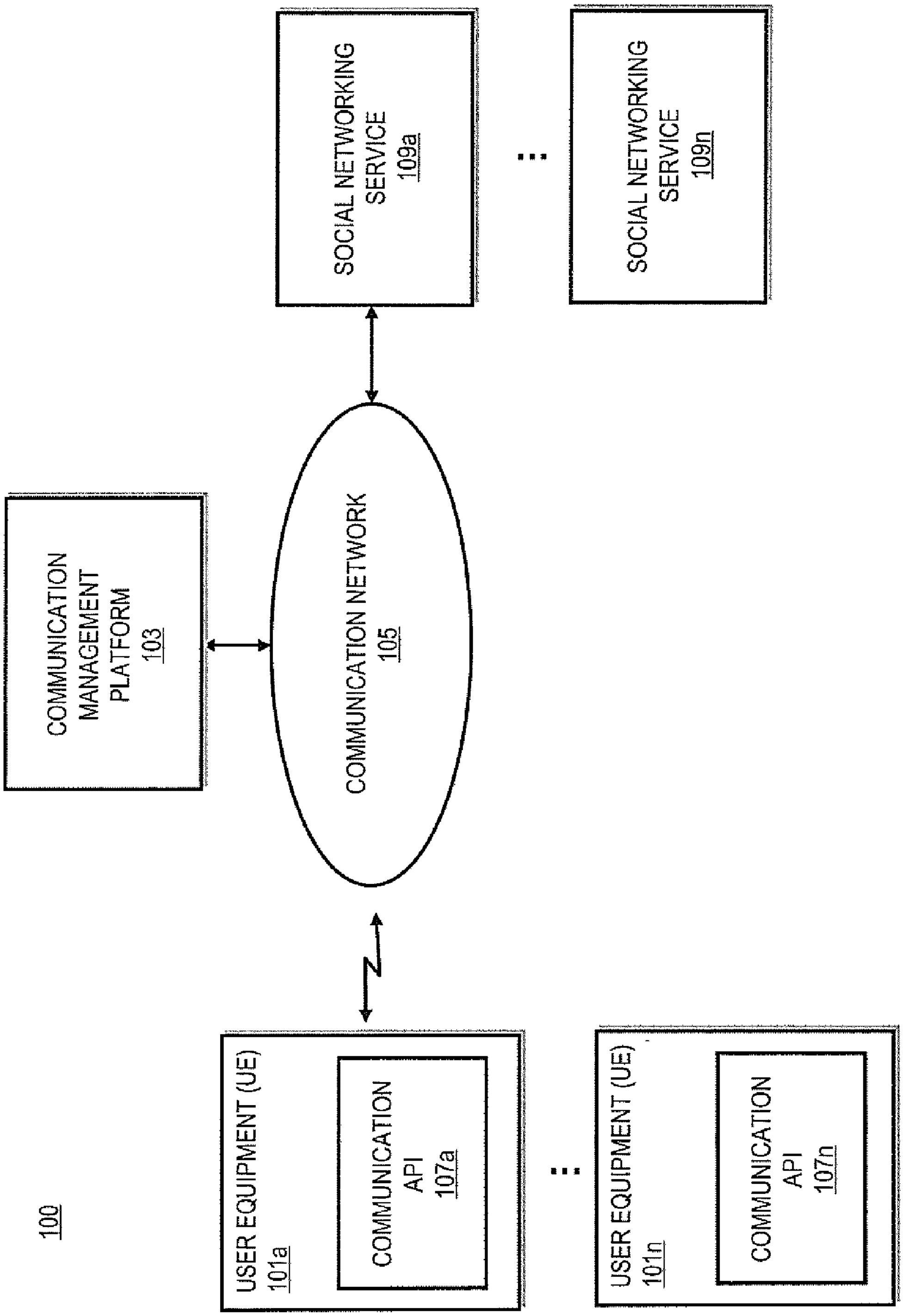


FIG. 1


100
USER EQUIPMENT (UE)
101a
COMMUNICATION
API
107a
USER EQUIPMENT (UE)
101n
COMMUNICATION
API
107n
COMMUNICATION
MANAGEMENT
PLATFORM
103
COMMUNICATION NETWORK
105
SOCIAL NETWORKING
SERVICE
109a
SOCIAL NETWORKING
SERVICE
109n

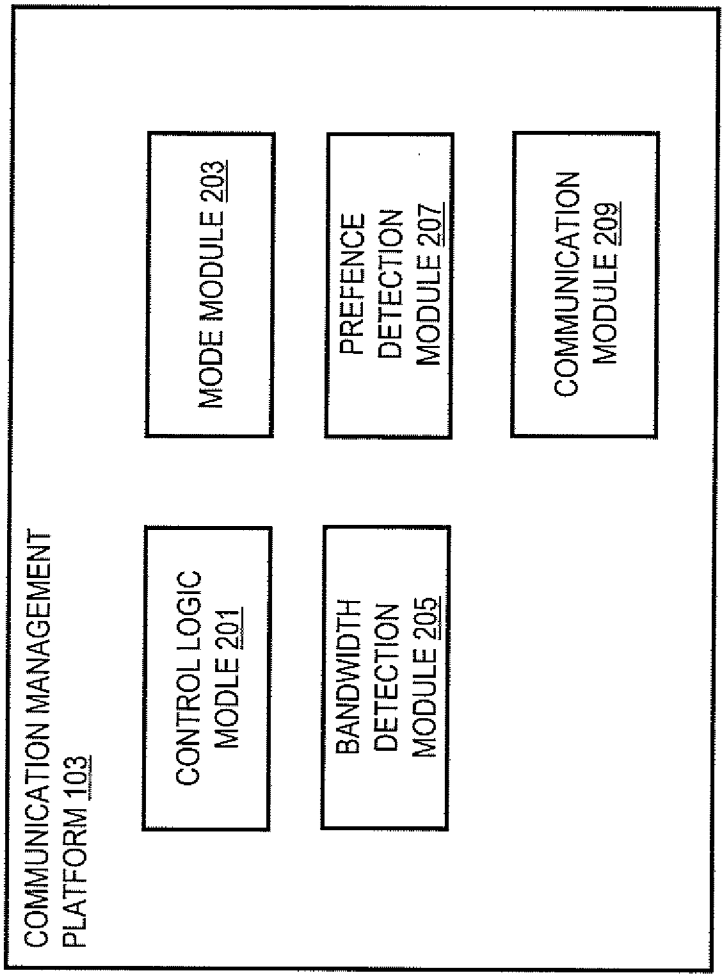

COMMUNICATION MANAGEMENT PLATFORM 103
CONTROL LOGIC MODLE 201
MODE MODULE 203
BANDWIDTH DETECTION MODULE 205
PREFENCE DETECTION MODULE 207
COMMUNICATION MODULE 209

FIG. 2

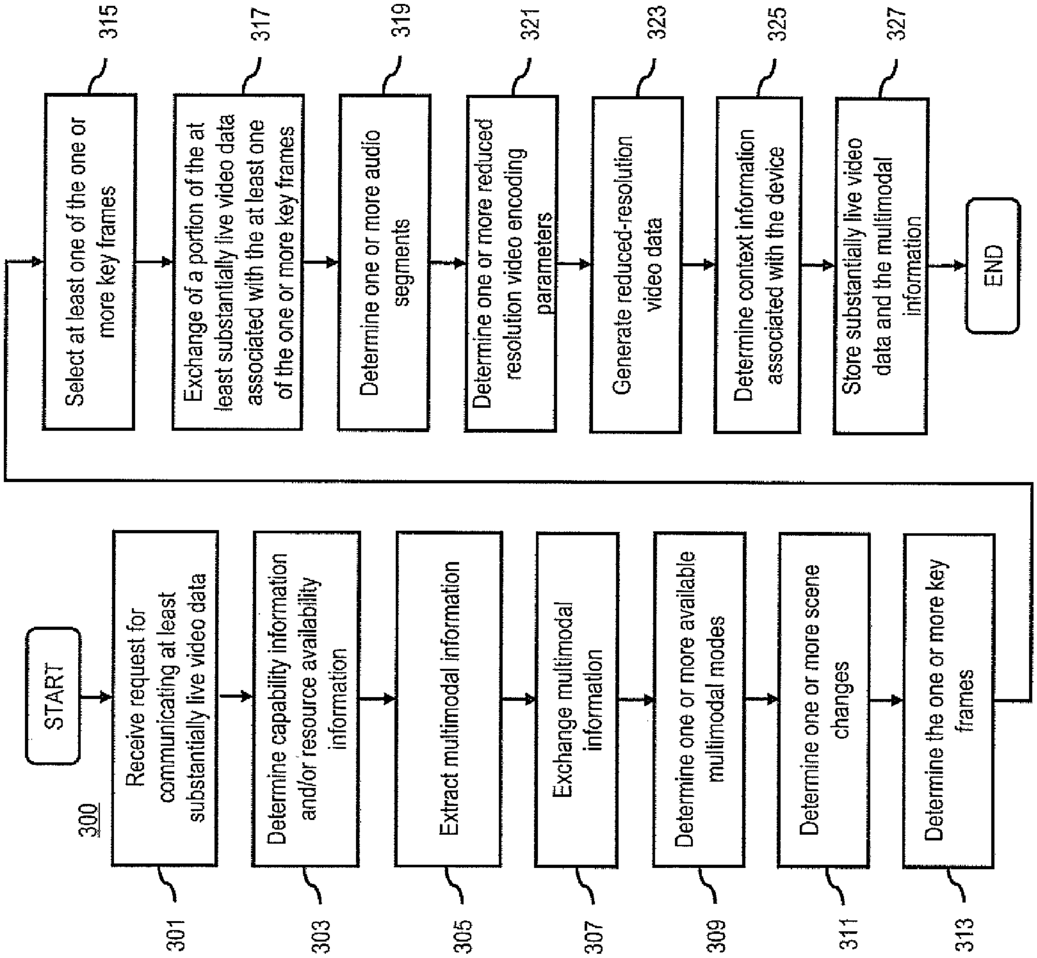

300
START
Receive request for communicating at least substantially live video data
301
Determine capability information and/or resource availability information
303
Extract multimodal information
305
Exchange multimodal information
307
Determine one or more available multimodal modes
309
Determine one or more scene changes
311
Determine the one or more key frames
313
Select at least one of the one or more key frames
315
Exchange of a portion of the at least substantially live video data associated with the at least one of the one or more key frames
317
Determine one or more audio segments
319
Determine one or more reduced resolution video encoding parameters
321
Generate reduced-resolution video data
323
Determine context information associated with the device
325
Store substantially live video data and the multimodal information
327
END

FIG. 3

FIG. 4

400

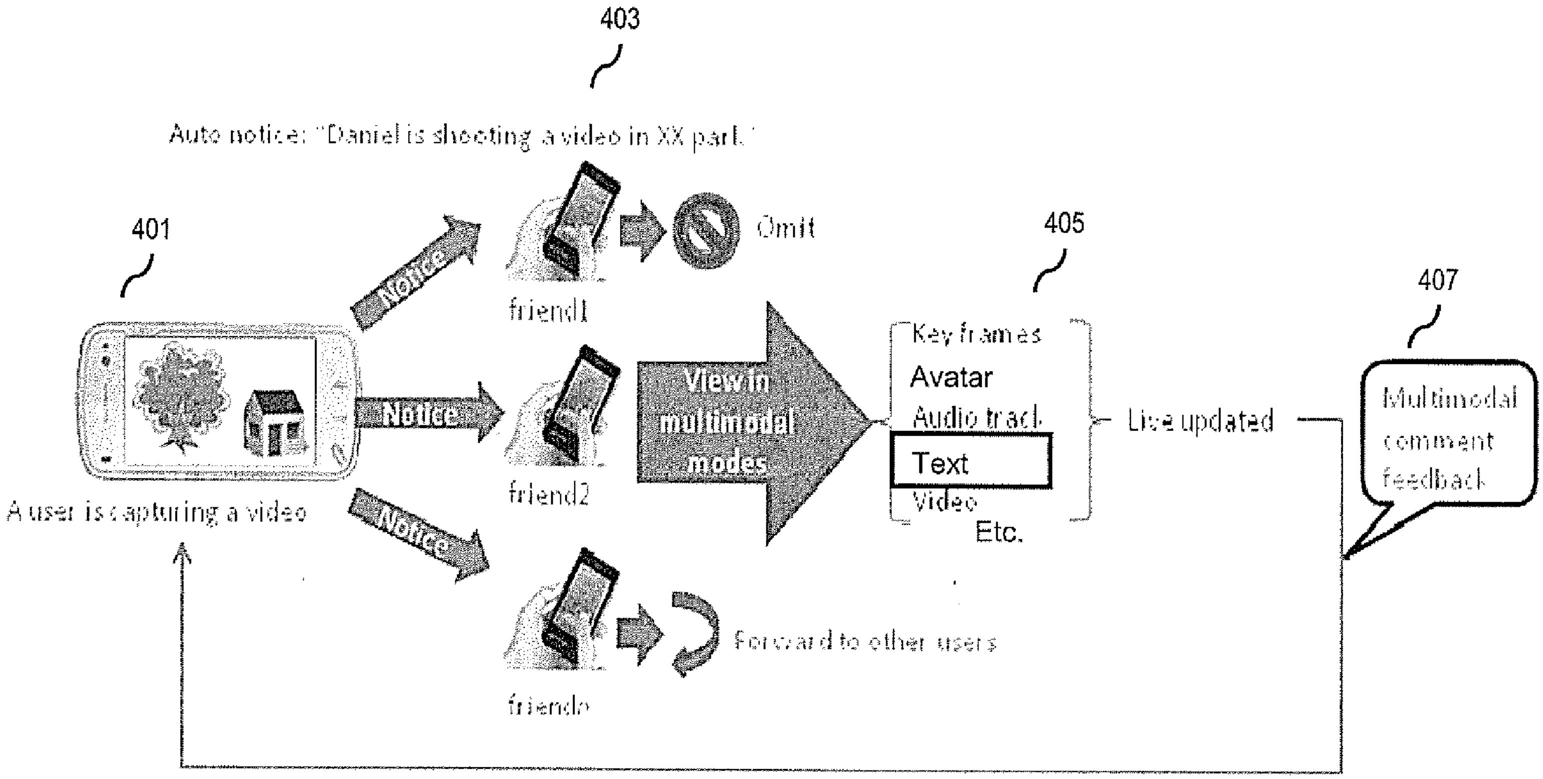

403
Auto notice: "Daniel is shooting a video in XX park."
401
Notice
Notice
Notice
friend1
Omit
friend2
View in multimodal modes
friendn
Forward to other users
A user is capturing a video
405
Key frames
Avatar
Audio track
Text
Video
Etc.
Live updated
407
Multimodal comment feedback

FIG. 5A

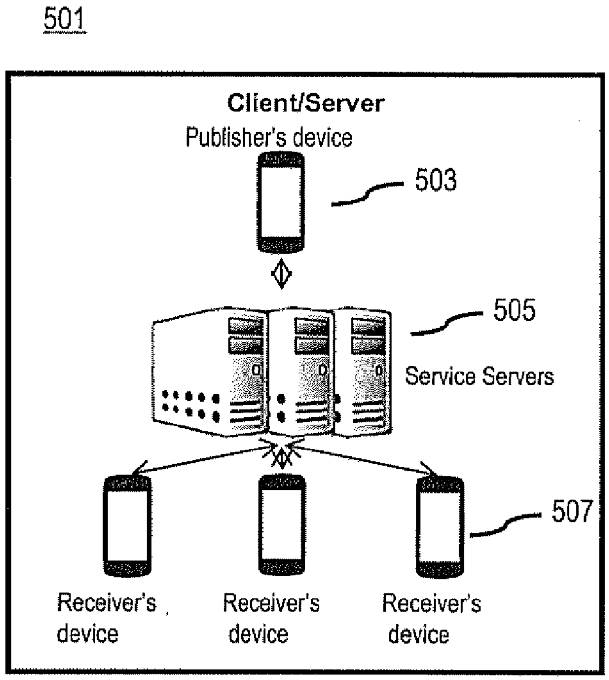

501
Client/Server
Publisher's device
503
505
Service Servers
507
Receiver's device
Receiver's device
Receiver's device

FIG. 5B

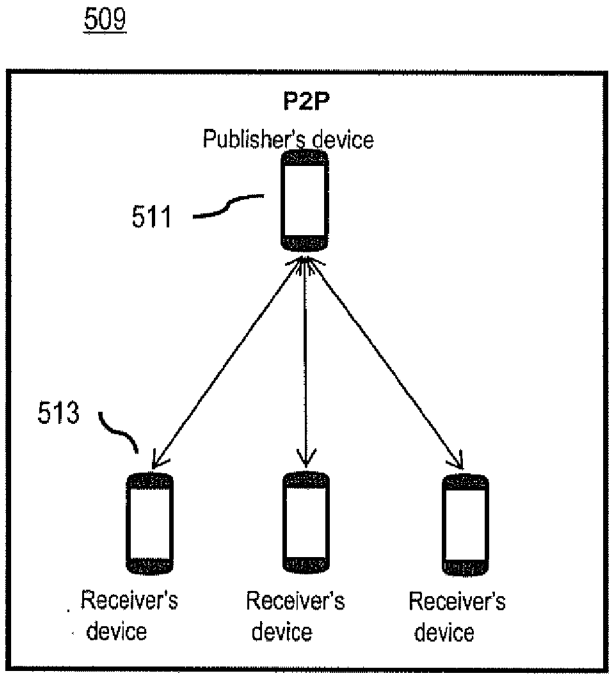
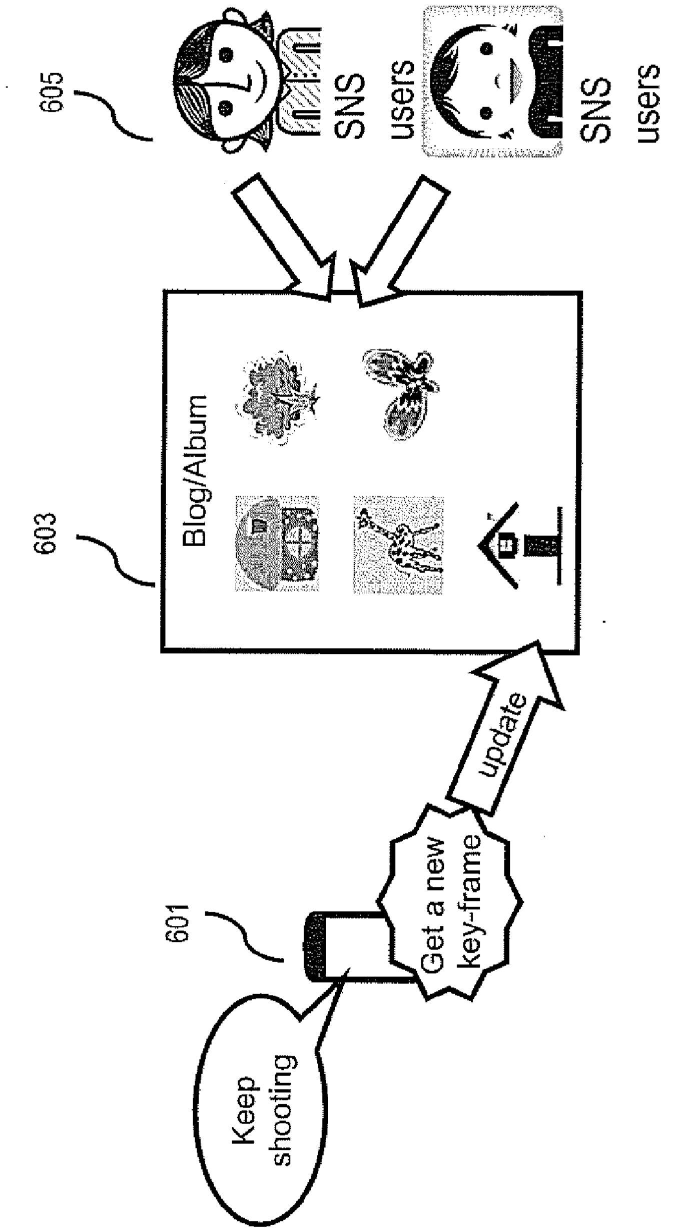

509
P2P
Publisher's device
511
513
Receiver's device
Receiver's device
Receiver's device

FIG. 6


605
SNS users
SNS users
603
Blog/Album
601
Keep shooting
Get a new key-frame
update

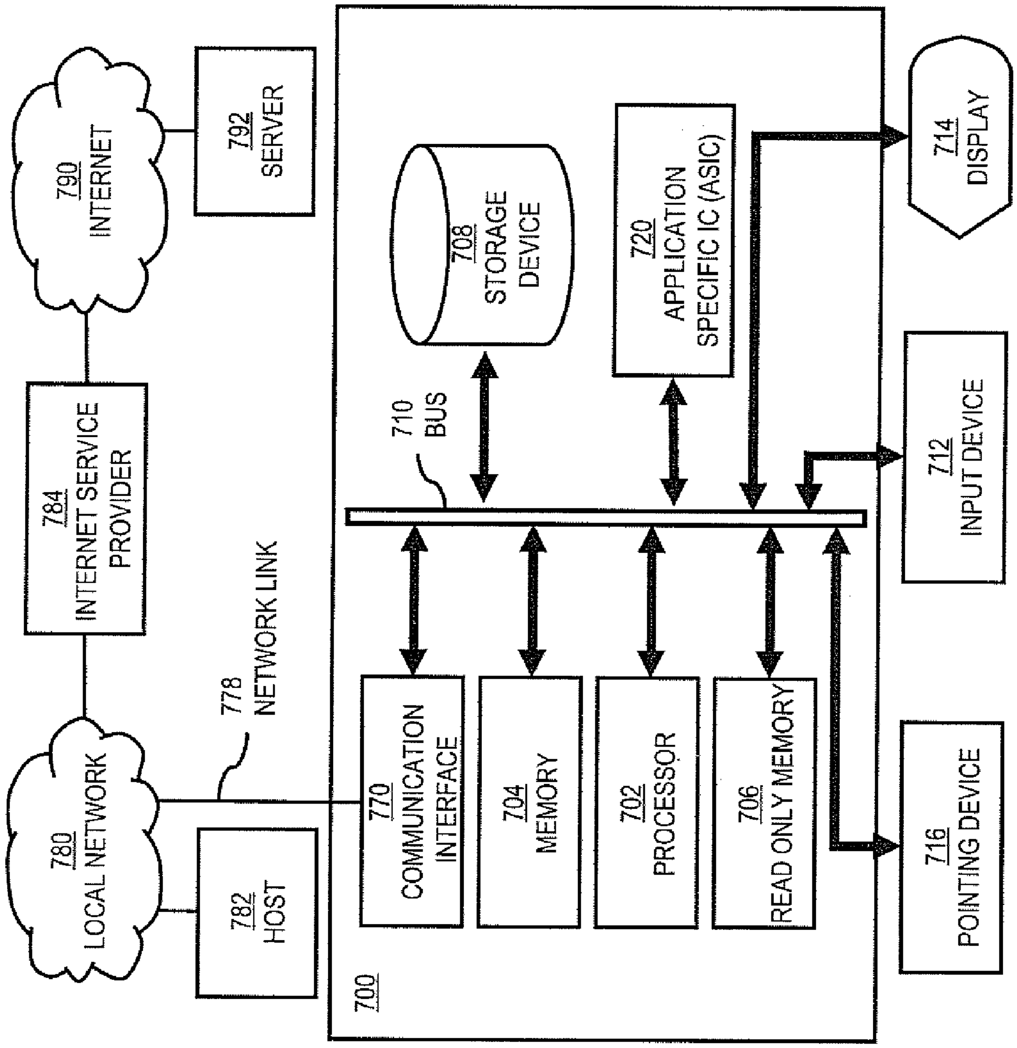

780
LOCAL NETWORK
782
HOST
784
INTERNET SERVICE PROVIDER
790
INTERNET
792
SERVER
778
NETWORK LINK
700
770
COMMUNICATION INTERFACE
704
MEMORY
702
PROCESSOR
706
READ ONLY MEMORY
710
BUS
708
STORAGE DEVICE
720
APPLICATION SPECIFIC IC (ASIC)
716
POINTING DEVICE
712
INPUT DEVICE
714
DISPLAY

FIG. 7

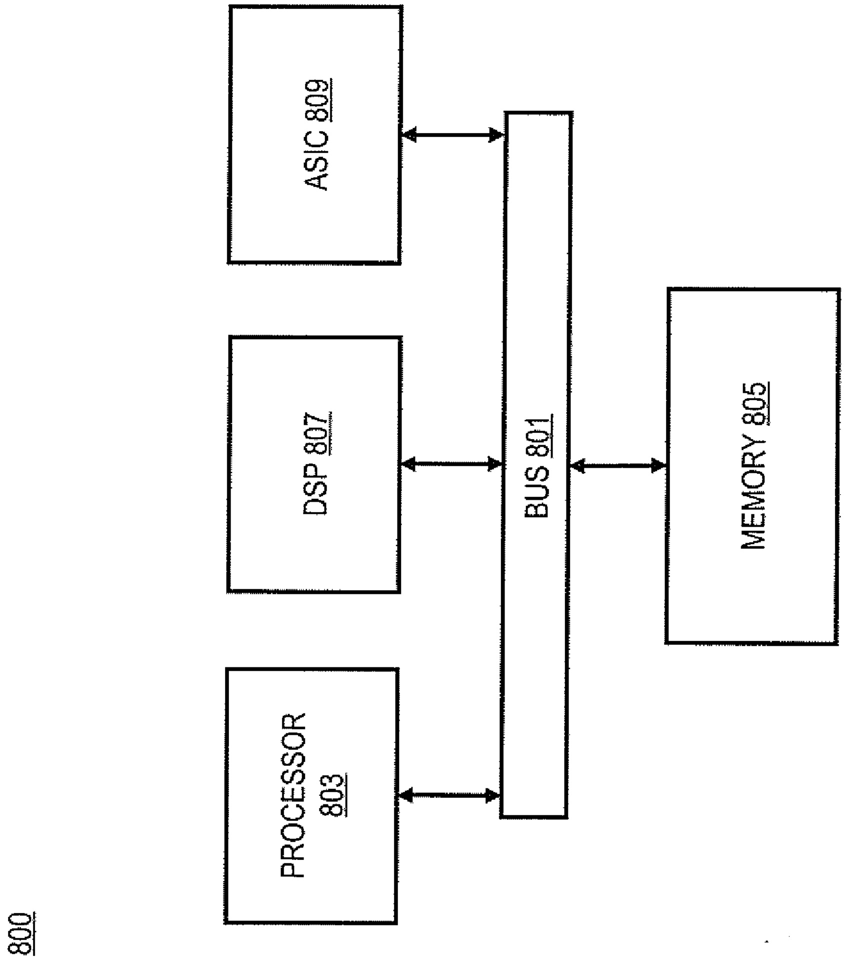
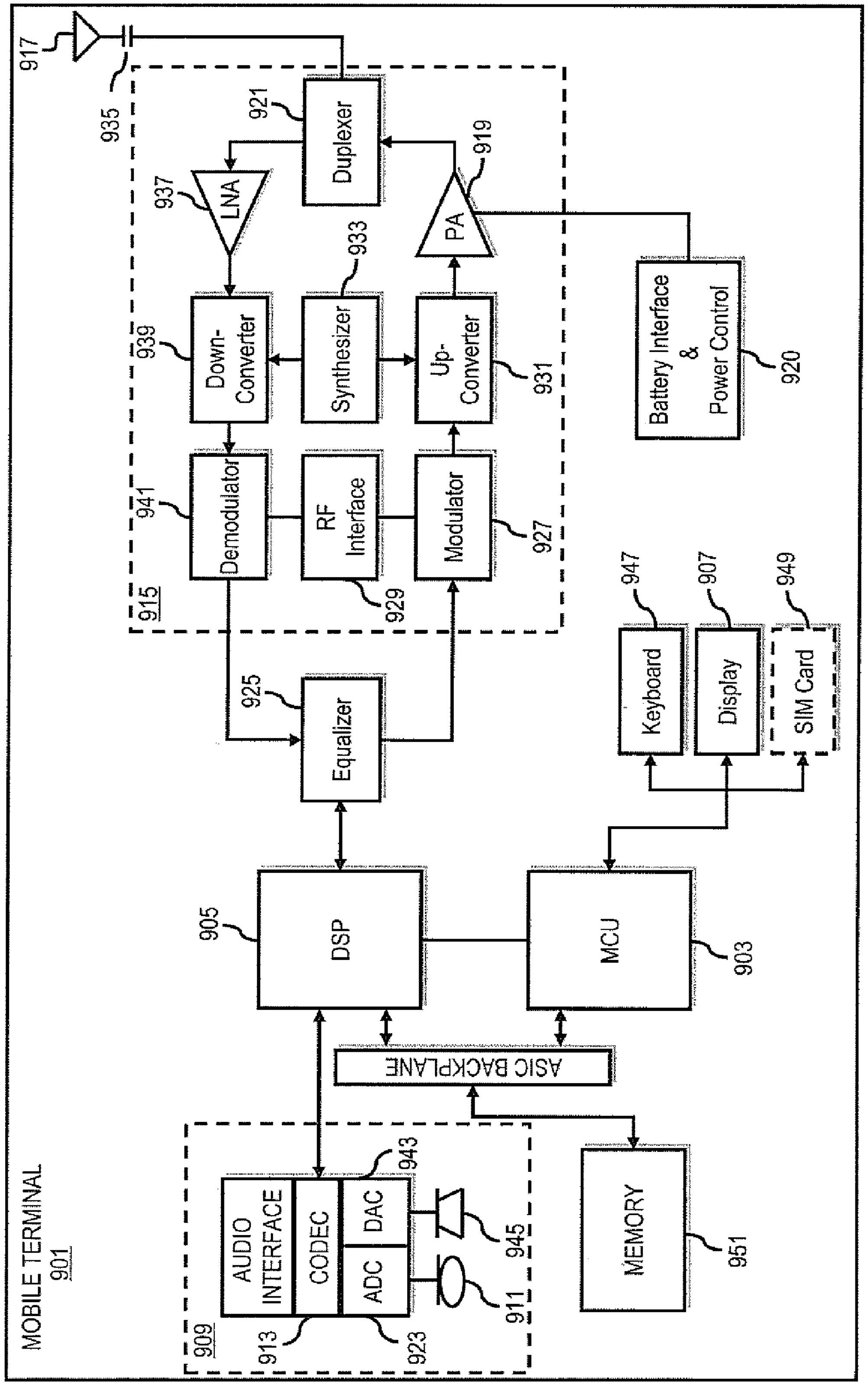


FIG. 8

FIG. 9


MOBILE TERMINAL
901
917
935
921
Duplexer
937
LNA
919
PA
933
939
Down-Converter
Synthesizer
Up-Converter
931
941
Demodulator
RF Interface
Modulator
927
929
915
Battery Interface & Power Control
920
925
Equalizer
947
Keyboard
907
Display
949
SIM Card
905
DSP
MCU
903
ASIC BACKPLANE
909
AUDIO INTERFACE
CODEC
DAC
ADC
943
945
911
913
923
MEMORY
951

METHOD AND APPARATUS FOR LIVE VIDEO SHARING WITH MULTIMODAL MODES

BACKGROUND

[0001] Service providers and device manufacturers (e.g., wireless, cellular, etc.) are continually challenged to deliver value and convenience to consumers by, for example, providing compelling network services. Thanks to the portability of mobile devices, more and more users prefer to capture their own video content by mobile device having high quality multimedia collectors such as cameras and microphones to record their daily lives. Mobile devices are also convenient for video reviewing thanks to their mobility. Video sharing is one of the hottest services in current social network services. It allows people to share their information or interesting things through videos. But, current mobile devices and network bandwidth limitations make it difficult for mobile users to enjoy video sharing to its fullest extent.

SOME EXAMPLE EMBODIMENTS

[0002] Therefore, there is a need for an approach for enhancing a communication session.

[0003] According to one embodiment, a method comprises receiving a request for communicating at least substantially live video data between a device and one or more other devices. The method also comprises determining capability information, resource availability information, or a combination thereof of the device, the one or more other devices, or a combination thereof. The method further comprises processing and/or facilitating a processing of the capability information, the resource availability information, or a combination thereof to cause, at least in part, an extraction of multimodal information from the at least substantially live video data. The method additionally comprises causing, at least in part, an exchange of the multimodal information in place of at least a portion of the at least substantially lie video data in response to the request.

[0004] According to another embodiment, an apparatus comprises at least one processor, and at least one memory including computer program code for one or more computer programs, the at least one memory and the computer program code configured to, with the at least one processor, cause, at least in part, the apparatus to receive a request for communicating at least substantially live video data between a device and one or more other devices. The apparatus is also caused to determine capability information, resource availability information, or a combination thereof of the device, the one or more other devices, or a combination thereof. The apparatus is further caused to process and/or facilitate a processing of the capability information, the resource availability information, or a combination thereof to cause, at least in part, an extraction of multimodal information from the at least substantially live video data. The apparatus is additionally caused to cause, at least in part, an exchange of the multimodal information in place of at least a portion of the at least substantially lie video data in response to the request.

[0005] According to another embodiment, a computer-readable storage medium carries one or more sequences of one or more instructions which, when executed by one or more processors, cause, at least in part, an apparatus to receive a request for communicating at least substantially live video data between a device and one or more other devices. The apparatus is also caused to determine capability information, resource availability information, or a combination thereof of the device, the one or more other devices, or a combination thereof. The apparatus is further caused to process and/or facilitate a processing of the capability information, the resource availability information, or a combination thereof to cause, at least in part, an extraction of multimodal information from the at least substantially live video data. The apparatus is additionally caused to cause, at least in part, an exchange of the multimodal information in place of at least a portion of the at least substantially lie video data in response to the request.

[0006] According to another embodiment, an apparatus comprises means for receiving a request for communicating at least substantially live video data between a device and one or more other devices. The apparatus also comprises means for determining capability information, resource availability information, or a combination thereof of the device, the one or more other devices, or a combination thereof. The apparatus further comprises means for processing and/or facilitating a processing of the capability information, the resource availability information, or a combination thereof to cause, at least in part, an extraction of multimodal information from the at least substantially live video data. The apparatus additionally comprises means for causing, at least in part, an exchange of the multimodal information in place of at least a portion of the at least substantially lie video data in response to the request.

[0007] In addition, for various example embodiments of the invention, the following is applicable: a method comprising facilitating a processing of and/or processing (1) data and/or (2) information and/or (3) at least one signal, the (1) data and/or (2) information and/or (3) at least one signal based, at least in part, on (or derived at least in part from) any one or any combination of methods (or processes) disclosed in this application as relevant to any embodiment of the invention.

[0008] For various example embodiments of the invention, the following is also applicable: a method comprising facilitating access to at least one interface configured to allow access to at least one service, the at least one service configured to perform any one or any combination of network or service provider methods (or processes) disclosed in this application.

[0009] For various example embodiments of the invention, the following is also applicable: a method comprising facilitating creating and/or facilitating modifying (1) at least one device user interface element and/or (2) at least one device user interface functionality, the (1) at least one device user interface element and/or (2) at least one device user interface functionality based, at least in part, on data and/or information resulting from one or any combination of methods or processes disclosed in this application as relevant to any embodiment of the invention, and/or at least one signal resulting from one or any combination of methods (or processes) disclosed in this application as relevant to any embodiment of the invention.

[0010] For various example embodiments of the invention, the following is also applicable: a method comprising creating and/or modifying (1) at least one device user interface element and/or (2) at least one device user interface functionality, the (1) at least one device user interface element and/or (2) at least one device user interface functionality based at least in part on data and/or information resulting from one or any combination of methods (or processes) disclosed in this application as relevant to any embodiment of the invention, and/or at least one signal resulting from one or any combination of methods (or processes) disclosed in this application as relevant to any embodiment of the invention.

[0011] In various example embodiments, the methods (or processes) can be accomplished on the service provider side or on the mobile device side or in any shared way between service provider and mobile device with actions being performed on both sides.

[0012] For various example embodiments, the following is applicable: An apparatus comprising means for performing the method of any of originally filed claims **1-10**, **21-30**, and **46-48**.

[0013] Still other aspects, features, and advantages of the invention are readily apparent from the following detailed description, simply by illustrating a number of particular embodiments and implementations, including the best mode contemplated for carrying out the invention. The invention is also capable of other and different embodiments, and its several details can be modified in various obvious respects, all without departing from the spirit and scope of the invention. Accordingly, the drawings and description are to be regarded as illustrative in nature, and not as restrictive.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The embodiments of the invention are illustrated by way of example, and not by way of limitation, in the figures of the accompanying drawings:

[0015] FIG. **1** is a diagram of a system capable of enhancing a communication session, according to one embodiment;

[0016] FIG. **2** is a diagram of the components of a communication management platform, according to one embodiment;

[0017] FIG. **3** is a flowchart of a process for enhancing a communication session, according to one embodiment;

[0018] FIG. **4** is a diagram illustrating a video communication session that is sent to multiple receivers, according to one embodiment;

[0019] FIGS. **5**A and **5**B are diagrams illustrating a client/server related video communication session and a peer-to-peer related video communication session, according to various embodiments;

[0020] FIG. **6** is a diagram illustrating a video communication session that is shared by way or a social network, according to one embodiment;

[0021] FIG. **7** is a diagram of hardware that can be used to implement an embodiment of the invention;

[0022] FIG. **8** is a diagram of a chip set that can be used to implement an embodiment of the invention; and

[0023] FIG. **9** is a diagram of a mobile terminal (e.g., handset) that can be used to implement an embodiment of the invention.

DESCRIPTION OF SOME EMBODIMENTS

[0024] Examples of a method, apparatus, and computer program for enhancing a communication session are disclosed. In the following description, for the purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of the embodiments of the invention. It is apparent, however, to one skilled in the art that the embodiments of the invention may be practiced without these specific details or with an equivalent arrangement. In other instances, well-known structures and devices are shown in block diagram form in order to avoid unnecessarily obscuring the embodiments of the invention.

[0025] FIG. **1** is a diagram of a system capable of enhancing a communication session, according to one embodiment. Current mobile devices and network bandwidth limitations make it difficult for mobile users to enjoy live video sharing to its fullest extent.

[0026] Information sharing is an interest for many people. This is one reason of why social networking is so popular. Social networking services allow users share their daily experiences with friends and family members. Recently, live video sharing services have been developed and bring new user experiences.

[0027] Live video sharing creates a better user experience than video sharing that has an inherent delay such as those that require downloading at a time after the video is recorded. Live video sharing may be beneficial, for example, when a user is travelling, at a social event, or for a live meeting. Live sharing is useful, vivid, and interesting, and is a growing trend for social networking services. In other words, live sharing brings the most direct experience to users.

[0028] Video plays an important role in people's information sharing thanks to the fast improvement of mobile multimedia devices. However, sharing video data in a mobile environment is still a nontrivial task because if the limitations of mobile devices and network bandwidths.

[0029] As discussed above, though live sharing is desirable to users, many mobile users are unable to enjoy this service because of poor devices or networks. To boost this valuable service, these limitations should be minimized.

[0030] To address this problem, a system **100** of FIG. **1** introduces the capability to share and enjoy video contents in a real-time manner; and it provides for highly configurable and adaptive services to fit various sharing requirements and different mobile network bandwidths.

[0031] A live video sharing service with multimodal modes would provide a better user experience compared to most conventional video sharing services that are restricted by narrow network bandwidths or cannot be applied in live manner.

[0032] Live sharing provides an instant sharing experience with no temporal delay, which is an important feature for social networking users. Users need not store their captured video for sharing purposes. Further, viewers can also know what their friends are doing or going through at that moment. Live sharing may be totally mobile based, which may be achieved by multimodal modes. That is, all the end users can use mobile devices to enjoy a live video service. The users need not transmit or download the shared content to a PC. This feature may be achieved by multimodal selection that allows a user to adjust the sharing content to fit any processability and network bandwidth limitation of the user or the viewer which are major challenges for live video sharing services. Further, live video sharing is easy to share, and combines and abundant context provided by various mobile device sensors (like GPS) and video content analysis. The publication process may be fully automatic, manual, or any combination thereof. While live video sharing is beneficial, there are challenges as discussed above, that must be overcome to enable users to fully enjoy live video sharing services in spite of device limitations and network bandwidth limitations.

[0033] Video contains more information than image or audio files. But the data volume of video is also bigger than other media types. Video transmitting, therefore, is the most nontrivial task in mobile environment, and its success mostly depends on the resources of a mobile device and available network bandwidth. To save network bandwidth, key frames, video segments, rendering changes, and audio portions extracted from video, for example, can be transmitted instead of an original video to fit those users who do not require viewing the whole video or just are limited by very narrow bandwidth. This is the core concept of sharing within a multimodal mode service.

[0034] To construct such an unsymmetrical and configurable framework/UI is a challenge. Since sharing is live, key frames of video must be extracted when the publisher is shooting the video. In addition, this function may be executed on the publisher's mobile device or on the server, according to a different use case. Thereby the extraction method should be scalable. To improve a user's sharing experience, abundant context may be considered to make sharing process automatic using information provided by sensors on a mobile phone that may be utilized. Furthermore, multimedia content may also be explored to provide more information about the publisher capturing the video.

[0035] The system **100** allows users to share their live video content in multimodal manner, such as image, audio, video, etc. to save mobile resources and improve an overall user experience. The system **100** enables at least the following options for a communication session:

[0036] 1). Original video with live sharing: When a user starts his video shooting, his friends can receive the synchronous content he is capturing by way of a live streaming video.

[0037] 2). Multimodal options instead of the original video for publishing and receiving/viewing: Multimodal information includes options such as using a key frame mode, an audio mode, a hybrid mode of key frames and audio, a text mode, a key video segment mode, an avatar mode, and a video in scalable resolution mode. Both publisher and receiver can choose their preferred mode for sending and receiving content related to the video that is shot by the sender. The selectable modes may be advantageous to a publisher and/or a receiver of the video content because of a user preference, device limitation, or a limited bandwidth. For example, the viewer can select to just receive key frames of the video if his network bandwidth is low or below a threshold value. Each mode that the system **100** enables may be characterized as follows:

[0038] a. Key frame mode: Key frames of the video being shot can be employed to represent the main content and save network bandwidth. Since key frame is very representative of video content, the viewer is able to spend less time for grasping the substance of video. Another advantage of key frame is that the viewer can gain a full view of the video at any time, which is different from a case when while watching a video, a user may miss something if the user doesn't keep looking at the screen.

[0039] b. Audio mode: In a case when auditory content is more important than visual content, the visual content is not needed, and may be removed from the communication session to save the bandwidth, such as during a meeting or presentation.

[0040] c. Text mode: This mode uses the least network bandwidth out of all of the modes. Text is automatically generated from two aspects: the information collected by sensors on a mobile device; and information explored from multimedia content, using techniques such as face recognition, voice recognition, event detection, and etc. In the text mode, receivers can obtain some live semantic information of the live video, such as location, human name, object name (like a building, animal, car, etc.).

[0041] d. Key video segment mode: Key video segments are 1 or 2 second video clips along with continuous audio. The key video segment mode may save available bandwidth, such that unimportant scenes are automatically detected and not transmitted. Once an interesting/typical scene or event is detected, the current video segment is considered as a key segment and transmitted.

[0042] e. Avatar mode: Avatar mode is a mode that covers both visual and auditory content and also requires much less bandwidth than transferring an entire video. In avatar mode, the people or object being captured are transformed to a cartoon profile and displayed to the viewer while audio is transmitted. The visual information in this mode is successive, in contrast to the key-frame mode. In this mode, only feature points of the captured object need be transferred, and the amount of required bandwidth is reduced. Besides the economy, avatar mode is also very interesting. For example, users can interact with the cartoon profile through gesture or some other multimodal input. Avatar mode is further divided into several categories, which are suitable for different situations:

[0043] 1) Decorations: When the video is almost about a human face, for communication or some other purpose, the viewer can add some virtual decorations to the face on the screen.

[0044] 2) Pure virtual face: Besides decorations, the viewer is also able to see a virtual face on the screen instead. In this mode, when an expression on the face changes, a virtual profile may be altered to correspond with the change in a synchronous manner.

[0045] 3) Virtual face & actual background: If a face is not the only content viewers may observe, the virtual face can be combined with actual background in the video. Considering a possible network overload and available visual information, the background may stay relatively still and only changes when the background is distinctly different. This is like the key frame detection, but for the background of the image.

[0046] 4) Entire virtualization: There is another option for the viewers that they can view a virtualization of the real video. Simple shapes and colors are used to reconstruct the content of video. In this case, the video on the viewer side looks like a cartoon.

[0047] f. Hybrid mode: A hybrid combination of any of the above mentioned modes, which is still a reduction of bandwidth usage from an original video stream.

[0048] g. Video of scalable resolution mode: If the network bandwidth is sufficient, users can transfer the entire video stream. However, in video mode, the system **100** also provides different resolution to receivers in different network conditions to accommodate limited available bandwidths.

[0049] Real-time information may also be extracted during the publisher's shooting of a video. To achieve the multimodal live sharing discussed above, it is a challenge as to how to extract valuable information from the video while shooting. For different modes, there are several strategies:

[0050] a. Live key frame extraction is different from almost all the existing methods which only applied to recorded video files. With the shooting occurring, new key frames are generated and transferred to the viewers. Due to the lack of entire video information, the key frames only can be extracted according to previous frames, audio, and etc. Scene change is an important indicator that a new key frame is needed; and when a person is shooting and sharing his video, human voice is also a valuable context for key frame extraction. However, publisher's manual key frame generation command is also supported in our service.

[0051] b. Live audio extraction can be accomplished by separating the microphone input. An additional optional may be available in which is it determined that only a human voice is meaningful, like in a meeting. After such a detection the system **100** detects a human voice for transferring and filters out a silence and noise audio segment of the audio portion of the transmission. This modification of the original audio stream could improve a reviewing user's experience.

[0052] Choice of location for information extraction and video resolution changes between different sides of the video transmission for different cases. This depends primarily on a publisher's selection. For example, if the publisher chooses a video mode for sharing, all the process tasks can be applied on a server side to save a calculation resource and bandwidth of the publisher. But, if the publisher chooses other multimodal modes for sharing, corresponding calculations have to be taken on his own device, in which case the complexity of any calculation algorithm needs be reduced to fit the end device.

[0053] Context collection and analysis is also integrated into our service. This information is utilized to enrich the sharing experience. The following types of context may be considered:

[0054] a. Sensor data: Currently, many mobile devices carry various sensors to collect data of GPS, gravity sensor, and compass. This data is easy to get and useful to make the sharing more understandable. In addition, any automatically collected data can be used to generate a simple title or description of the shared content, which can release publishers from adding that information manually.

[0055] b. Multimedia content based exploring: This type of context is higher level and is helpful in improving a user's experience. Many multimedia analysis technologies can be introduced into the service for automatic tagging the captured content. For example, face recognition and voice recognition may be helpful for distinguishing the people involved in the shared content; and the server can push this information to receivers to achieve annotation of the sharing.

[0056] Besides live sharing, the contents that are shared may be stored on a server side. Users can access those contents that are stored anytime, anywhere. Even when the contents are stored, the multimodal modes may also be supported.

[0057] As shown in FIG. **1**, the system **100** comprises user equipment (UE) **101***a*-**101***n* (discussed collectively as UE **101**) having connectivity to a communication management platform **103** and social networking services **109***a*-**109***n* (collectively referred to as social networking service **109**) via a communication network **105**. UE **101***a*-**101***n* are the end devices for publishing and receiving communication content, whereas communication management platform **103** provides multimodal services to enhance a communication session between any of the UE **101**.

[0058] The UE **101** may incorporate a camera that is either part of the UE **101** or external and may be used as a publishing device. The UE **101** may have a communication API **107***a*-**107***n* (collectively referred to as communication API **107**) for sharing, publishing and/or receiving video content. Captured content is optionally uploaded to the communication management platform **103**, which means that the publisher can choose the actual content for publishing, according to his desire or network condition. UE **101** is also able to act as a receiver, with which a user can view other user's videos. Different users may choose different modes during a sharing of video content. The communication management platform **103** may manage several services that are deployed on the server side to support data transmission, storage, analysis, and processing. Any complex computing may executed on the communication management platform **103**, which will result in any processed data to be sent to the UE **101**. However, the UE **101** may process all of the computing onboard the device and need to require the communication management platform **103** so long as the UE **101** is capable of processing such computations.

[0059] In one embodiment, a user of UE **101** may share a live video of a scene around him as a publisher with a user of another UE **101** as a receiver. The publisher may use the communication API **107** to manage the video sharing. The video sharing may be managed through the communication management platform **103** which may process a selection of video sharing modes, or it may automatically change or suggest a change in sharing modes. Such change may be from a live video stream to a key frame mode, or any of the other modes discussed above, among other modes that may become available.

[0060] In another embodiment, a user of UE **101** may share a live video of a scene around him as a publisher with a user of another UE **101** as a receiver. The publisher may use the communication API **107** to manage the video sharing. The video sharing may be directly shared as a peer-to-peer experience without interacting with an external communication management platform, but rather, because the communication management platform **103** may also be on board the UE **101** to process a selection of video sharing modes, or it may automatically change or suggest a change in sharing modes. Such change may be from a live video stream to a key frame mode, or any of the other modes discussed above, among other modes that may become available.

[0061] In another embodiment, a user of UE **101** may share a live video of a scene around him as a publisher with a user of another UE **101** as a receiver, or may share the video, key frames, or any other result of the modes directly with a social networking service **109**. The publisher may use the communication API **107** to manage the video sharing. The video sharing may be directly shared as peer-to-peer without interacting with an external communication management platform, but rather, because the communication management platform **103** may also be onboard the UE **101**, or through a communication management platform **103** to process a selection of video sharing modes, or it may automatically change or suggest a change in sharing modes. Such change may be from a live video stream to a key frame mode, or any of the other modes discussed above, among other modes that may become available. The social networking service **109** may automatically or selectively store the communication content for viewing by the publisher, the receiver, or any other contacts that the publisher may want to view the stored communication content.

[0062] By way of example, the UE **101**, communication management platform **103** and social networking service **109** communicate with each other and other components of the communication network **105** using well known, new or still developing protocols. In this context, a protocol includes a set of rules defining how the network nodes within the communication network **105** interact with each other based on information sent over the communication links. The protocols are effective at different layers of operation within each node, from generating and receiving physical signals of various types, to selecting a link for transferring those signals, to the format of information indicated by those signals, to identifying which software application executing on a computer system sends or receives the information. The conceptually different layers of protocols for exchanging information over a network are described in the Open Systems Interconnection (OSI) Reference Model.

[0063] By way of example, the communication network **105** of system **100** includes one or more networks such as a data network, a wireless network, a telephony network, or any combination thereof. It is contemplated that the data network may be any local area network (LAN), metropolitan area network (MAN), wide area network (WAN), a public data network (e.g., the Internet), short range wireless network, or any other suitable packet-switched network, such as a commercially owned, proprietary packet-switched network, e.g., a proprietary cable or fiber-optic network, and the like, or any combination thereof. In addition, the wireless network may be, for example, a cellular network and may employ various technologies including enhanced data rates for global evolution (EDGE), general packet radio service (GPRS), global system for mobile communications (GSM), Internet protocol multimedia subsystem (IMS), universal mobile telecommunications system (UMTS), etc., as well as any other suitable wireless medium, e.g., worldwide interoperability for microwave access (WiMAX), Long Term Evolution (LTE) networks, code division multiple access (CDMA), wideband code division multiple access (WCDMA), wireless fidelity (WiFi), wireless LAN (WLAN), Bluetooth®, Internet Protocol (IP) data casting, satellite, mobile ad-hoc network (MANET), and the like, or any combination thereof.

[0064] The UE **101** is any type of mobile terminal, fixed terminal, or portable terminal including a mobile handset, station, unit, device, multimedia computer, multimedia tablet, Internet node, communicator, desktop computer, laptop computer, notebook computer, netbook computer, tablet computer, personal communication system (PCS) device, personal navigation device, personal digital assistants (PDAs), audio/video player, digital camera/camcorder, positioning device, television receiver, radio broadcast receiver, electronic book device, game device, or any combination thereof, including the accessories and peripherals of these devices, or any combination thereof. It is also contemplated that the UE **101** can support any type of interface to the user (such as "wearable" circuitry, etc.).

[0065] Communications between the network nodes are typically effected by exchanging discrete packets of data. Each packet typically comprises (1) header information associated with a particular protocol, and (2) payload information that follows the header information and contains information that may be processed independently of that particular protocol. In some protocols, the packet includes (3) trailer information following the payload and indicating the end of the payload information. The header includes information such as the source of the packet, its destination, the length of the payload, and other properties used by the protocol. Often, the data in the payload for the particular protocol includes a header and payload for a different protocol associated with a different, higher layer of the OSI Reference Model. The header for a particular protocol typically indicates a type for the next protocol contained in its payload. The higher layer protocol is said to be encapsulated in the lower layer protocol. The headers included in a packet traversing multiple heterogeneous networks, such as the Internet, typically include a physical (layer 1) header, a data-link (layer 2) header, an internetwork (layer 3) header and a transport (layer 4) header, and various application (layer 5, layer 6 and layer 7) headers as defined by the OSI Reference Model.

[0066] FIG. **2** is a diagram of the components of communication management platform **103**, according to one embodiment. By way of example, the communication management platform **103** includes one or more components for providing enhancing a communication session. It is contemplated that the functions of these components may be combined in one or more components or performed by other components of equivalent functionality. In this embodiment, the communication management platform **103** includes a control logic module **201**, a mode module **203**, a bandwidth detection module **205**, a preference detection module **207** and a communication module **209**. The communication management platform **103** receives an indication that a video session is occurring by way of communication module **209**. The control logic module **201** manages the interaction between the mode module **203**, bandwidth detection module **205** and preference detection module **207**. The mode module **203** determines a best mode for enhancing the video communication session out of the multimodes discussed above, as well as any new modes that may be developed and incorporated into the choices available for the communication management platform **103**. The determination for the best mode may be based on an available bandwidth that is detected by the bandwidth detection module **205**, or a device limitation such as support for a particular mode, or a memory constraint that is determined by the mode module **203**. Each of the available modes may have a predetermined threshold value for the bandwidth that makes a particular mode more ideal than another. For example, a video mode or audio mode will need more bandwidth than a text mode. So, based on the available bandwidth determination, the mode module may automatically change the mode for the video transmission and/or reception to make the communication session better for the publisher and the receiver. Alternatively, the mode module may just cause the communication management platform **103** to suggest a best mode, or a list of available modes based on modes known to the system and/or the available bandwidth to the publisher or receiver of the video communication by way of the communication module **209**. The preference detection module **207** detects whether the publisher or the receiver of the video communication has any preferences for a preferred transmission mode, or a selection of a specific more for an instant video communication session to be transmitted.

[0067] FIG. **3** is a flowchart of a process for enhancing a communication session, according to one embodiment. In one embodiment, the communication management platform performs the process **300** and is implemented in, for instance, a chip set including a processor and a memory as shown in FIG. **8**. In step **301** the communication management platform **103** receives a request for communicating at least substantially live video data between a UE **101***a* and one or more other UE **101***n*'s. Next, in step **303**, the communication management platform **103** determines capability information, resource availability information, or a combination thereof of the UE **101** and/or the other UE **10111**. The process continues to step **305** in which the communication management platform **103** processes the capability information, the resource availability information, or a combination thereof to cause, at least in part, an extraction of multimodal information from the at least substantially live video data. The multimodal information being any of the modes discussed above such as a key frame mode, an audio mode, a reduced-resolution mode, a speech-to-text mode, an animated mode, etc., or any combination thereof. Next, in step **307**, the communication management platform **103** causes, at least in part, an exchange of the multimodal information in place of at feast a portion of the at least substantially lie video data in response to the request.

[0068] The process continues to step **309** in which the communication management platform **103** processes the capability information and/or the resource availability information to determine one or more available multimodal modes. The extraction of the multimodal information is based, at least in part, on the one or more available multimodal modes. Next, in step **311**, the communication management platform **103** determines one or more scene changes in a previously recorded portion of the at least substantially live video data. Then, in step **313**, the communication management platform **103** determines one or more key frames based, at least in part, on the one or more scene changes.

[0069] The process continues to step **315** in which the communication management platform **103** receives an input for selecting at least one of the one or more key frames. The input may be an indication that a key frame should be automatically selected and sent from one device to another, or a user directed selection that a key frame should be sent from one device to another. Next, in step **317**, the communication management platform **103** causes, at least in part, an exchange of a portion of the at least substantially live video data associated with the at least one of the one or more key frames. Then, in step **319**, the communication management platform **103** processes the previously recorded portion the at least substantially live video data and/or concurrently recorded audio data to determine one or more audio segments based, at least in part, on one or more audio selection criteria. The audio data may have at least in part the one or more audio segments. The process continues to step **321** in which the communication management platform **103** processes the capability information and/or the resource availability information to determine one or more reduced resolution video encoding parameters. Then, in step **323**, the communication management platform **103** causes, at least in part, a generation of the reduced-resolution video data based, at least in part, on the one or more reduced resolution video encoding parameters.

[0070] Next, in step **325**, the communication management platform **103** determines context information associated with the device, the one or more other devices, the at least substantially live video data, or a combination thereof. The multimodal information includes, at least in part, the context information. Then, in step **327**, to aid in speeding up any of the other steps or processes of the process, the communication management platform **103** causes a storage of the at least substantially live video data and the multimodal information for subsequent access.

[0071] FIG. **4** is a flowchart illustrating a live video sharing, session within multimodal modes, a typical sharing process, according to one embodiment. In this embodiment, a user is capturing video at **401**, his friends **1**-*n* may receive an automatically generated message at **403**, which may include information about who is publishing the video content, where the video content is being shot (location from GPS), what the video content is (content explored by automatic analysis, like face detection). When one of the publisher's friends receives the message about the video sharing at **403**, the receiver can choose to dive into the details, forward it or just omit it. When a receiver dives into his friend's capturing content, he can choose at **405** between the different modes discussed above according to his interest or bandwidth limitations, such as image mode (key frames), audio mode (suitable for speech video and etc.), text mode, avatar mode, hybrid mode, video mode, etc. which are live and may be dynamically updated while the video content is collected. For example, if a bandwidth condition changes, the mode made me changed automatically or a suggestion may be made to change modes by the communication management platform **103** to keep the live communication session going. For example, if a user selects "video mode" when he is in WIFI network; with his movement, WIFI signal becomes unavailable; to keep the sharing ongoing, system changes his mode to "key-frame mode" automatically. Also, if image mode is selected, for example, each key frame may be generated and transferred together with current context (from sensors' data or content analysis). A viewer also may provide live comments to other users including the publisher and other receivers. The publisher may then adjust his capturing of the video according to the instant feedback that is provided.

[0072] Several algorithms are involved in this service, mainly involving instant key frame extraction, human voice detection and recognition, human face recognition, etc. These algorithms are usually executed on an external communication management platform **103** as discussed above to simplify the calculation on user's mobile phone. But if the publisher doesn't share an entire video, or the UE **101** is capable of processing the algorithm without consulting an external communication management platform, the corresponding algorithm maybe executed on the UE **101**.

[0073] For audio extraction, the simplest mode that users can choose is just to transfer the audio data captured by the publisher's microphone. Or users can select another mode which filters out silent and meaningless noise segment to save bandwidth. In this mode, the most important audio segments are those which contain human voice; in addition, some audio events are also considered meaningful, such as wedding march, birthday song, yelp, etc.

[0074] For key frame extraction, there are three conditions that may trigger new key frame generation and transferring.

[0075] a. Significant visual content change. Since key frame is representative frame that could present the main content of a video segment/scene, it may be necessary to detect the segment/scene change and choose one or more frames to transfer. The key frames should be selected in a limited context. That is, when it is decided whether a frame is or not a key frame, the visual information of posterior frames cannot be used because they are not captured yet. Motion is an essential and important feature of videos, which can be utilized to distinguish the change of visual content. When motion of large amplitude is detected, a key frame can be output by further examine whether current visual content is obvious different from that before the motion. However, the frames output just after a meaningful motion may not be very representative, though it is transferred to the reviewer. With the shooting going on, continuous examination is executed and the old key frame can be updated once a better frame is found. The key frame on the receiver's side can be optimized using such a method.

[0076] b. Audio event. Besides pure visual content analysis, key frames also can be generated by audio information. When a user is publishing his video content, he may say something to annotate the scene. This is a good indicator that points out meaningful content in his opinion. So frames at the position where human voice is detected is usually important in live sharing. Furthermore, other audio events can be detected as those discussed above and can also be employed as a trigger in key frame extraction.

[0077] c. Manual command by the publisher. Automatic key frame extraction method may not be exactly accord with the results selected by people. In traditional key frame extraction method, users have a difficult time with the extracting process. But in the system **100**, the publisher can easily choose the frame that he considers being important. The publisher can select a feature on UE **101** to indicate a key frame as his demand; and the result will be shared in time.

[0078] For context integration, some additional options may be made available such as route/map information, people involved with one another, recommendations for places to go and things to do, etc. Examples of context that may be considered are as follows:

[0079] a. Sensor data. To extract such context data is relatively easy. The corresponding API can be recalled to obtain the data. However, the original data may need be translated to another form for easy understanding. For example, GPS data of longitude and latitude is not very meaningful for the end users. So a location service should be queried to translate the coordinates to a comprehendible location name.

[0080] b. Multimedia content analysis results. Several methods can be used to enrich the context data. Facial recognition and voice recognition can be used to detect the human appearing in the video. This information is more useful when the face and voice are benchmarked in the service. For example, if one person's face and name are manually related to video sharing that is managed by the communication API **107** or communication management platform **103** his name can be automatically tagged onto the sharing frames once the person appears in the video.

[0081] FIGS. **5**A and **5**B illustrate example variations of the hierarchy of flow of video content. FIG. **5**A illustrates a client/server relationship **501** in which a publisher's device **503** is used for publishing a communication session like a video transmission to receiver devices **507** by way of a server system **505**. The server **505** may manage the communication session, as discussed above with regard to communication management platform **103**.

[0082] FIG. **5**B illustrates a peer-to-peer relationship **509** in which a publisher's device **511** directly publishes a communication session like a video transmission to receiver devices **513**. In this embodiment, any communication management is handled by the devices **511** and **513**, as discussed above.

[0083] FIG. **6** is an illustration of a video communication session in which the video is shared on a social networking service so that other users may view the communication session. A user of device **601** may initiate a video communication session, that may be managed and altered to be in accordance with any of the modes discussed above. The video communication session may be shared with receivers at other devices, and/or shared by way of a social networking service **603** so that other users **605**, that are not receivers having compatible devices, may view the content that is being transmitted by the user of device **601** either live, or at a later time.

[0084] The processes described herein for enhancing a communication session may be advantageously implemented via software, hardware, firmware or a combination of software and/or firmware and/or hardware. For example, the processes described herein, may be advantageously implemented via processor(s), Digital Signal Processing (DSP) chip, an Application Specific Integrated Circuit (ASIC), Field Programmable Gate Arrays (FPGAs), etc. Such exemplary hardware for performing the described functions is detailed below.

[0085] FIG. **7** illustrates a computer system **700** upon which an embodiment of the invention may be implemented. Although computer system **700** is depicted with respect to a particular device or equipment, it is contemplated that other devices or equipment (e.g., network elements, servers, etc.) within FIG. **7** can deploy the illustrated hardware and components of system **700**. Computer system **700** is programmed (e.g., via computer program code or instructions) to enhance a communication session as described herein and includes a communication mechanism such as a bus **710** for passing information between other internal and external components of the computer system **700**. Information (also called data) is represented as a physical expression of a measurable phenomenon, typically electric voltages, but including, in other embodiments, such phenomena as magnetic, electromagnetic, pressure, chemical, biological, molecular, atomic, subatomic and quantum interactions. For example, north and south magnetic fields, or a zero and non-zero electric voltage, represent two states (**0**, **1**) of a binary digit (bit). Other phenomena can represent digits of a higher base. A superposition of multiple simultaneous quantum states before measurement represents a quantum bit (qubit). A sequence of one or more digits constitutes digital data that is used to represent a number or code for a character. In some embodiments, information called analog data is represented by a near continuum of measurable values within a particular range. Computer system **700**, or a portion thereof, constitutes a means for performing one or more steps of enhancing a communication session.

[0086] A bus **710** includes one or more parallel conductors of information so that information is transferred quickly among devices coupled to the bus **710**. One or more processors **702** for processing information are coupled with the bus **710**.

[0087] A processor (or multiple processors) **702** performs a set of operations on information as specified by computer program code related to enhance a communication session. The computer program code is a set of instructions or statements providing instructions for the operation of the processor and/or the computer system to perform specified functions. The code, for example, may be written in a computer programming language that is compiled into a native instruction set of the processor. The code may also be written directly using the native instruction set (e.g., machine language). The set of operations include bringing information in from the bus **710** and placing information on the bus **710**. The set of operations also typically include comparing two or more units of information, shifting positions of units of information, and combining two or more units of information, such as by addition or multiplication or logical operations like OR, exclusive OR (XOR), and AND. Each operation of the set of operations that can be performed by the processor is represented to the processor by information called instructions, such as an operation code of one or more digits. A sequence of operations to be executed by the processor **702**, such as a sequence of operation codes, constitute processor instructions, also called computer system instructions or, simply, computer instructions. Processors may be implemented as mechanical, electrical, magnetic, optical, chemical or quantum components, among others, alone or in combination.

[0088] Computer system **700** also includes a memory **704** coupled to bus **710**. The memory **704**, such as a random access memory (RAM) or any other dynamic storage device, stores information including processor instructions for enhancing a communication session. Dynamic memory allows information stored therein to be changed by the computer system **700**. RAM allows a unit of information stored at a location called a memory address to be stored and retrieved independently of information at neighboring addresses. The memory **704** is also used by the processor **702** to store temporary values during execution of processor instructions. The computer system **700** also includes a read only memory (ROM) **706** or any other static storage device coupled to the bus **710** for storing static information, including instructions, that is not changed by the computer system **700**. Some memory is composed of volatile storage that loses the information stored thereon when power is lost. Also coupled to bus **710** is a non-volatile (persistent) storage device **708**, such as a magnetic disk, optical disk or flash card, for storing information, including instructions, that persists even when the computer system **700** is turned off or otherwise loses power.

[0089] Information, including instructions for enhancing a communication session, is provided to the bus **710** for use by the processor from an external input device **712**, such as a keyboard containing alphanumeric keys operated by a human user, a microphone, an Infrared (IR) remote control, a joystick, a game pad, a stylus pen, a touch screen, or a sensor. A sensor detects conditions in its vicinity and transforms those detections into physical expression compatible with the measurable phenomenon used to represent information in computer system **700**. Other external devices coupled to bus **710**, used primarily for interacting with humans, include a display device **714**, such as a cathode ray tube (CRT), a liquid crystal display (LCD), a light emitting diode (LED) display, an organic LED (OLED) display, a plasma screen, or a printer for presenting text or images, and a pointing device **716**, such as a mouse, a trackball, cursor direction keys, or a motion sensor, for controlling a position of a small cursor image presented on the display **714** and issuing commands associated with graphical elements presented on the display **714**. In some embodiments, for example, in embodiments in which the computer system **700** performs all functions automatically without human input, one or more of external input device **712**, display device **714** and pointing device **716** is omitted.

[0090] In the illustrated embodiment, special purpose hardware, such as an application specific integrated circuit (ASIC) **720**, is coupled to bus **710**. The special purpose hardware is configured to perform operations not performed by processor **702** quickly enough for special purposes. Examples of ASICs include graphics accelerator cards for generating images for display **714**, cryptographic boards for encrypting and decrypting messages sent over a network, speech recognition, and interfaces to special external devices, such as robotic arms and medical scanning equipment that repeatedly perform some complex sequence of operations that are more efficiently implemented in hardware.

[0091] Computer system **700** also includes one or more instances of a communications interface **770** coupled to bus **710**. Communication interface **770** provides a one-way or two-way communication coupling to a variety of external devices that operate with their own processors, such as printers, scanners and external disks. In general the coupling is with a network link **778** that is connected to a local network **780** to which a variety of external devices with their own processors are connected. For example, communication interface **770** may be a parallel port or a serial port or a universal serial bus (USB) port on a personal computer. In some embodiments, communications interface **770** is an integrated services digital network (ISDN) card or a digital subscriber line (DSL) card or a telephone modem that provides an information communication connection to a corresponding type of telephone line. In some embodiments, a communication interface **770** is a cable modem that converts signals on bus **710** into signals for a communication connection over a coaxial cable or into optical signals for a communication connection over a fiber optic cable. As another example, communications interface **770** may be a local area network (LAN) card to provide a data communication connection to a compatible LAN, such as Ethernet. Wireless links may also be implemented. For wireless links, the communications interface **770** sends or receives or both sends and receives electrical, acoustic or electromagnetic signals, including infrared and optical signals, that carry information streams, such as digital data. For example, in wireless handheld devices, such as mobile telephones like cell phones, the communications interface **770** includes a radio band electromagnetic transmitter and receiver called a radio transceiver. In certain embodiments, the communications interface **770** enables connection to the communication network **105** for enhancing a communication session to the UE **101**.

[0092] The term "computer-readable medium" as used herein refers to any medium that participates in providing information to processor **702**, including instructions for execution. Such a medium may take many forms, including, but not limited to computer-readable storage medium (e.g., non-volatile media, volatile media), and transmission media. Non-transitory media, such as non-volatile media, include, for example, optical or magnetic disks, such as storage device **708**. Volatile media include, for example, dynamic memory **704**. Transmission media include, for example, twisted pair cables, coaxial cables, copper wire, fiber optic cables, and carrier waves that travel through space without wires or cables, such as acoustic waves and electromagnetic waves, including radio, optical and infrared waves. Signals include man-made transient variations in amplitude, frequency, phase, polarization or other physical properties transmitted through the transmission media. Common forms of computer-readable media include, for example, a floppy disk, a flexible disk, hard disk, magnetic tape, any other magnetic medium, a CD-ROM, CDRW, DVD, any other optical medium, punch cards, paper tape, optical mark sheets, any other physical medium with patterns of holes or other optically recognizable indicia, a RAM, a PROM, an EPROM, a FLASH-EPROM, an EEPROM, a flash memory, any other memory chip or cartridge, a carrier wave, or any other medium from which a computer can read. The term computer-readable storage medium is used herein to refer to any computer-readable medium except transmission media.

[0093] Logic encoded in one or more tangible media includes one or both of processor instructions on a computer-readable storage media and special purpose hardware, such as ASIC **720**.

[0094] Network link **778** typically provides information communication using transmission media through one or more networks to other devices that use or process the information. For example, network link **778** may provide a connection through local network **780** to a host computer **782** or to equipment **784** operated by an Internet Service Provider (ISP). ISP equipment **784** in turn provides data communication services through the public, world-wide packet-switching communication network of networks now commonly referred to as the Internet **790**.

[0095] A computer called a server host **792** connected to the Internet hosts a process that provides a service in response to information received over the Internet. For example, server host **792** hosts a process that provides information representing video data for presentation at display **714**. It is contemplated that the components of system **700** can be deployed in various configurations within other computer systems, e.g., host **782** and server **792**.

[0096] At least some embodiments of the invention are related to the use of computer system **700** for implementing some or all of the techniques described herein. According to one embodiment of the invention, those techniques are performed by computer system **700** in response to processor **702** executing one or more sequences of one or more processor instructions contained in memory **704**. Such instructions, also called computer instructions, software and program code, may be read into memory **704** from another computer-readable medium such as storage device **708** or network link **778**. Execution of the sequences of instructions contained in memory **704** causes processor **702** to perform one or more of the method steps described herein. In alternative embodiments, hardware, such as ASIC **720**, may be used in place of or in combination with software to implement the invention. Thus, embodiments of the invention are not limited to any specific combination of hardware and software, unless otherwise explicitly stated herein.

[0097] The signals transmitted over network link **778** and other networks through communications interface **770**, carry information to and from computer system **700**. Computer system **700** can send and receive information, including program code, through the networks **780**, **790** among others, through network link **778** and communications interface **770**. In an example using the Internet **790**, a server host **792** transmits program code for a particular application, requested by a message sent from computer **700**, through Internet **790**, ISP equipment **784**, local network **780** and communications interface **770**. The received code may be executed by processor **702** as it is received, or may be stored in memory **704** or in storage device **708** or any other non-volatile storage for later execution, or both. In this manner, computer system **700** may obtain application program code in the form of signals on a carrier wave.

[0098] Various forms of computer readable media may be involved in carrying one or more sequence of instructions or data or both to processor **702** for execution. For example, instructions and data may initially be carried on a magnetic disk of a remote computer such as host **782**. The remote computer loads the instructions and data into its dynamic memory and sends the instructions and data over a telephone line using a modem. A modem local to the computer system **700** receives the instructions and data on a telephone line and uses an infra-red transmitter to convert the instructions and data to a signal on an infra-red carrier wave serving as the network link **778**. An infrared detector serving as communications interface **770** receives the instructions and data carried in the infrared signal and places information representing the instructions and data onto bus **710**. Bus **710** carries the information to memory **704** from which processor **702** retrieves and executes the instructions using some of the data sent with the instructions. The instructions and data received in memory **704** may optionally be stored on storage device **708**, either before or after execution by the processor **702**.

[0099] FIG. **8** illustrates a chip set or chip **800** upon which an embodiment of the invention may be implemented. Chip set **800** is programmed to enhance a communication session as described herein and includes, for instance, the processor and memory components described with respect to FIG. **7** incorporated in one or more physical packages (e.g., chips). By way of example, a physical package includes an arrangement of one or more materials, components, and/or wires on a structural assembly (e.g., a baseboard) to provide one or more characteristics such as physical strength, conservation of size, and/or limitation of electrical interaction. It is contemplated that in certain embodiments the chip set **800** can be implemented in a single chip. It is further contemplated that in certain embodiments the chip set or chip **800** can be implemented as a single "system on a chip." It is further contemplated that in certain embodiments a separate ASIC would not be used, for example, and that all relevant functions as disclosed herein would be performed by a processor or processors. Chip set or chip **800**, or a portion thereof, constitutes a means for performing one or more steps of providing user interface navigation information associated with the availability of functions. Chip set or chip **800**, or a portion thereof, constitutes a means for performing one or more steps of enhancing a communication session.

[0100] In one embodiment, the chip set or chip **800** includes a communication mechanism such as a bus **801** for passing information among the components of the chip set **800**. A processor **803** has connectivity to the bus **801** to execute instructions and process information stored in, for example, a memory **805**. The processor **803** may include one or more processing cores with each core configured to perform independently. A multi-core processor enables multiprocessing within a single physical package. Examples of a multi-core processor include two, four, eight, or greater numbers of processing cores. Alternatively or in addition, the processor **803** may include one or more microprocessors configured in tandem via the bus **801** to enable independent execution of instructions, pipelining, and multithreading. The processor **803** may also be accompanied with one or more specialized components to perform certain processing functions and tasks such as one or more digital signal processors (DSP) **807**, or one or more application-specific integrated circuits (ASIC) **809**. A DSP **807** typically is configured to process real-world signals (e.g., sound) in real time independently of the processor **803**. Similarly, an ASIC **809** can be configured to performed specialized functions not easily performed by a more general purpose processor. Other specialized components to aid in performing the inventive functions described herein may include one or more field programmable gate arrays (FPGA), one or more controllers, or one or more other special-purpose computer chips.

[0101] In one embodiment, the chip set or chip **800** includes merely one or more processors and some software and/or firmware supporting and/or relating to and/or for the one or more processors.

[0102] The processor **803** and accompanying components have connectivity to the memory **805** via the bus **801**. The memory **805** includes both dynamic memory (e.g., RAM, magnetic disk, writable optical disk, etc.) and static memory (e.g., ROM, CD-ROM, etc.) for storing executable instructions that when executed perform the inventive steps described herein to enhance a communication session. The memory **805** also stores the data associated with or generated by the execution of the inventive steps.

[0103] FIG. **9** is a diagram of exemplary components of a mobile terminal (e.g., handset) for communications, which is capable of operating in the system of FIG. **1**, according to one embodiment. In some embodiments, mobile terminal **901**, or a portion thereof, constitutes a means for performing one or more steps of enhancing a communication session. Generally, a radio receiver is often defined in terms of front-end and back-end characteristics. The front-end of the receiver encompasses all of the Radio Frequency (RF) circuitry whereas the back-end encompasses all of the base-band processing circuitry. As used in this application, the term "circuitry" refers to both: (1) hardware-only implementations (such as implementations in only analog and/or digital circuitry), and (2) to combinations of circuitry and software (and/or firmware) (such as, if applicable to the particular context, to a combination of processor(s), including digital signal processor(s), software, and memory(ies) that work together to cause an apparatus, such as a mobile phone or server, to perform various functions). This definition of "circuitry" applies to all uses of this term in this application, including in any claims. As a further example, as used in this application and if applicable to the particular context, the term "circuitry" would also cover an implementation of merely a processor (or multiple processors) and its (or their) accompanying software/or firmware. The term "circuitry" would also cover if applicable to the particular context, for example, a baseband integrated circuit or applications processor integrated circuit in a mobile phone or a similar integrated circuit in a cellular network device or other network devices.

[0104] Pertinent internal components of the telephone include a Main Control Unit (MCU) **903**, a Digital Signal Processor (DSP) **905**, and a receiver/transmitter unit including a microphone gain control unit and a speaker gain control unit. A main display unit **907** provides a display to the user in support of various applications and mobile terminal functions that perform or support the steps of enhancing a communication session. The display **907** includes display circuitry configured to display at least a portion of a user interface of the mobile terminal (e.g., mobile telephone). Additionally, the display **907** and display circuitry are configured to facilitate user control of at least some functions of the mobile terminal. An audio function circuitry **909** includes a microphone **911** and microphone amplifier that amplifies the speech signal output from the microphone **911**. The amplified speech signal output from the microphone **911** is fed to a coder/decoder (CODEC) **913**.

[0105] A radio section **915** amplifies power and converts frequency in order to communicate with a base station, which is included in a mobile communication system, via antenna **917**. The power amplifier (PA) **919** and the transmitter/modulation circuitry are operationally responsive to the MCU **903**, with an output from the PA **919** coupled to the duplexer **921** or circulator or antenna switch, as known in the art. The PA **919** also couples to a battery interface and power control unit **920**.

[0106] In use, a user of mobile terminal **901** speaks into the microphone **911** and his or her voice along with any detected background noise is converted info an analog voltage. The analog voltage is then converted into a digital signal through the Analog to Digital Converter (ADC) **923**. The control unit **903** routes the digital signal into the DSP **905** for processing therein, such as speech encoding, channel encoding, encrypting, and interleaving. In one embodiment, the processed voice signals are encoded, by units not separately shown, using a cellular transmission protocol such as enhanced data rates for global evolution (EDGE), general packet radio service (GPRS), global system for mobile communications (GSM), Internet protocol multimedia subsystem (IMS), universal mobile telecommunications system (UMTS), etc., as well as any other suitable wireless medium, e.g., microwave access (WiMAX), Long Term Evolution (LTE) networks, code division multiple access (CDMA), wideband code division multiple access (WCDMA), wireless fidelity (WiFi), satellite, and the like, or any combination thereof.

[0107] The encoded signals are then routed to an equalizer **925** for compensation of any frequency-dependent impairments that occur during transmission though the air such as phase and amplitude distortion. After equalizing the bit stream, the modulator **927** combines the signal with a RF signal generated in the RF interface **929**. The modulator **927** generates a sine wave by way of frequency or phase modulation. In order to prepare the signal for transmission, an up-converter **931** combines the sine wave output from the modulator **927** with another sine wave generated by a synthesizer **933** to achieve the desired frequency of transmission. The signal is then sent through a PA **919** to increase the signal to an appropriate power level. In practical systems, the PA **919** acts as a variable gain amplifier whose gain is controlled by the DSP **905** from information received from a network base station. The signal is then filtered within the duplexer **921** and optionally sent to an antenna coupler **935** to match impedances to provide maximum power transfer. Finally, the signal is transmitted via antenna **917** to a local base station. An automatic gain control (AGC) can be supplied to control the gain of the final stages of the receiver. The signals may be forwarded from there to a remote telephone which may be another cellular telephone, any other mobile phone or a land-line connected to a Public Switched Telephone Network (PSTN), or other telephony networks.

[0108] Voice signals transmitted to the mobile terminal **901** are received via antenna **917** and immediately amplified by a low noise amplifier (LNA) **937**. A down-converter **939** lowers the carrier frequency while the demodulator **941** strips away the RF leaving only a digital bit stream. The signal then goes through the equalizer **925** and is processed by the DSP **905**. A Digital to Analog Converter (DAC) **943** converts the signal and the resulting output is transmitted to the user through the speaker **945**, all under control of a Main Control Unit (MCU) **903** which can be implemented as a Central Processing Unit (CPU).

[0109] The MCU **903** receives various signals including input signals from the keyboard **947**. The keyboard **947** and/or the MCU **903** in combination with other user input components (e.g., the microphone **911**) comprise a user interface circuitry for managing user input. The MCU **903** runs a user interface software to facilitate user control of at least some functions of the mobile terminal **901** to enhance a communication session. The MCU **903** also delivers a display command and a switch command to the display **907** and to the speech output switching controller, respectively. Further, the MCU **903** exchanges information with the DSP **905** and can access an optionally incorporated SIM card **949** and a memory **951**. In addition, the MCU **903** executes various control functions required of the terminal. The DSP **905** may, depending upon the implementation, perform any of a variety of conventional digital processing functions on the voice signals. Additionally, DSP **905** determines the background noise level of the local environment from the signals detected by microphone **911** and sets the gain of microphone **911** to a level selected to compensate for the natural tendency of the user of the mobile terminal **901**.

[0110] The CODEC **913** includes the ADC **923** and DAC **943**. The memory **951** stores various data including call incoming tone data and is capable of storing other data including music data received via, e.g., the global Internet. The software module could reside in RAM memory, flash memory, registers, or any other form of writable storage medium known in the art. The memory device **951** may be, but not limited to, a single memory, CD, DVD, ROM, RAM, EEPROM, optical storage, magnetic disk storage, flash memory storage, or any other non-volatile storage medium capable of storing digital data.

[0111] An optionally incorporated SIM card **949** carries, for instance, important information, such as the cellular phone number, the carrier supplying service, subscription details, and security information. The SIM card **949** serves primarily to identify the mobile terminal **901** on a radio network. The card **949** also contains a memory for storing a personal telephone number registry, text messages, and user specific mobile terminal settings.

[0112] While the invention has been described in connection with a number of embodiments and implementations, the invention is not so limited but covers various obvious modifications and equivalent arrangements, which fall within the purview of the appended claims. Although features of the invention are expressed in certain combinations among the claims, it is contemplated that these features can be arranged in any combination and order.

1-38. (canceled)

39. An apparatus comprising:

at least one processor; and

at least one memory including computer program code for one or more programs,

the at least one memory and the computer program code configured to, with the at least one processor, cause the apparatus to perform at least the following,

receive a request for communicating at least substantially live video data between a device and one or more other devices;

determine capability information, resource availability information, or a combination thereof of the device, the one or more other devices, or a combination thereof;

process and/or facilitate a processing of the capability information, the resource availability information, or a combination thereof to cause, at least in part, an extraction of multimodal information from the at least substantially live video data; and

cause, at least in part, an exchange of the multimodal information in place of at least a portion of the at least substantially lie video data in response to the request.

40. An apparatus of claim **39**, wherein the apparatus is further caused to perform at least the following:

process and/or facilitate a processing of the capability information, the resource availability information, or a combination thereof to determine one or more available multimodal modes,

wherein the extraction of the multimodal information is based, at least in part, on the one or more available multimodal modes.

41. An apparatus of claim **39**, wherein the multimodal information includes, at least in part, one or more key frames, audio data, reduced-resolution video data, speech-to-text data, or a combination thereof.

42. An apparatus of claim **41**, wherein the apparatus is further caused to perform at least the following:

process and/or facilitate a processing of a previously recorded portion of the at least substantially live video data to determine the one or more key frames.

43. An apparatus of claim **42**, wherein the apparatus is further caused to perform at least the following:

determine one or more scene changes in the previously recorded portion of the at least substantially live video data; and

determine the one or more key frames based, at least in part, on the one or more scene changes.

44. An apparatus of claim **41**, wherein the apparatus is further caused to perform at least the following:

receive an input for selecting at least one of the one or more key frames; and

cause, at least in part, an exchange of a portion of the at least substantially live video data associated with the at least one of the one or more key frames.

45. An apparatus of claim **41**, wherein the apparatus is further caused to perform at least the following:

process and/or facilitate a processing of the previously recorded portion the at least substantially live video data, concurrently recorded audio data, or a combination thereof to determine one or more audio segments based, at least in part, on one or more audio selection criteria,

wherein the audio data comprises at least in part the one or more audio segments.

46. An apparatus of claim **41**, wherein the apparatus is further caused to perform at least the following:

process and/or facilitate a processing of the capability information, the resource availability information, or a combination thereof to determine one or more reduced resolution video encoding parameters; and

cause, at least in part, a generation of the reduced-resolution video data based, at least in part, on the one or more reduced resolution video encoding parameters.

47. An apparatus of claim **39**, wherein the apparatus is further caused to perform at least the following:

determine context information associated with the device, the one or more other devices, the at least substantially live video data, or a combination thereof,

wherein the multimodal information includes, at least in part, the context information.

48. A method comprising:

receiving a request for communicating at least substantially live video data between a device and one or more other devices;

determining capability information, resource availability information, or a combination thereof of the device, the one or more other devices, or a combination thereof;

processing and/or facilitating a processing of the capability information, the resource availability information, or a combination thereof to cause, at least in part, an extraction of multimodal information from the at least substantially live video data; and

causing, at least in part, an exchange of the multimodal information in place of at least a portion of the at least substantially lie video data in response to the request.

49. A method of claim **48**, further comprising:

processing and/or facilitating a processing of the capability information, the resource availability information, or a combination thereof to determine one or more available multimodal modes,

wherein the extraction of the multimodal information is based, at least in part, on the one or more available multimodal modes.

50. A method of claim **48**, wherein the multimodal information includes, at least in part, one or more key frames, audio data, reduced-resolution video data, speech-to-text data, or a combination thereof.

51. A method of claim **50**, further comprising:

processing and/or facilitating a processing of a previously recorded portion of the at least substantially live video data to determine the one or more key frames.

52. A method of claim **51**, further comprising:

determining one or more scene changes in the previously recorded portion of the at least substantially live video data; and

determining the one or more key frames based, at least in part, on the one or more scene changes.

53. A method of claim **50**, further comprising:

receiving an input for selecting at least one of the one or more key frames; and

causing, at least in part, an exchange of a portion of the at least substantially live video data associated with the at least one of the one or more key frames.

54. A method of claim **50**, further comprising:

processing and/or facilitating a processing of the previously recorded portion the at least substantially live video data, concurrently recorded audio data, or a combination thereof to determine one or more audio segments based, at least in part, on one or more audio selection criteria,

wherein the audio data comprises at least in part the one or more audio segments.

55. A method of claim **50**, further comprising:

processing and/or facilitating a processing of the capability information, the resource availability information, or a combination thereof to determine one or more reduced resolution video encoding parameters; and

causing, at least in part, a generation of the reduced-resolution video data based, at least in part, on the one or more reduced resolution video encoding parameters.

56. A method of claim **48**, further comprising:

determining context information associated with the device, the one or more other devices, the at least substantially live video data, or a combination thereof,

wherein the multimodal information includes, at least in part, the context information.

57. A computer program product including one or more sequences of one or more instructions which, when executed by one or more processors, cause an apparatus to at least perform the steps:

receiving a request for communicating at least substantially live video data between a device and one or more other devices;

determining capability information, resource availability information, or a combination thereof of the device, the one or more other devices, or a combination thereof;

processing and/or facilitating a processing of the capability information, the resource availability information, or a combination thereof to cause, at least in part, an extraction of multimodal information from the at least substantially live video data; and

causing, at least in part, an exchange of the multimodal information in place of at least a portion of the at least substantially lie video data in response to the request.

58. A computer program product of claim **57**, wherein the apparatus is caused, at least in part, to further perform:

processing and/or facilitating a processing of the capability information, the resource availability information, or a combination thereof to determine one or more available multimodal modes,

wherein the extraction of the multimodal information is based, at least in part, on the one or more available multimodal modes.

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