where $Audiovisual_Quality$ is the multimedia initial quality, NR is the number of rebufferings, ARL is the rebuffering duration, MRF is the impact factor between multiple rebufferings, and *av7, av8, av9, av10, av11* and *av12* ~~*av7*–*av12*~~ are constants.

[0015] In another possible implementation manner of the first aspect, the determining quality of the multimedia according to the reference quality of the multimedia and the multimedia distortion quality includes: determining the multimedia quality due to packet loss according to the reference quality of the multimedia and the multimedia distortion quality due to packet loss; and determining the quality of the multimedia according to the reference quality of the multimedia or the multimedia quality due to packet loss, and the distortion quality due to rebuffering.

[0016] In another possible implementation manner of the first aspect, the determining the multimedia quality due to packet loss according to the reference quality of the multimedia and the multimedia distortion quality due to packet loss includes: determining the multimedia quality due to packet loss AV_MOSP according to $AV_MOSP = AV_MOSC - AV_DP$, where AV_MOSC is the reference quality of the multimedia, and AV_DP is the multimedia distortion quality due to packet loss.

[0017] In another possible implementation manner of the first aspect, the determining the quality of the multimedia according to the reference quality of the multimedia or the multimedia quality due to packet loss, and the distortion quality due to rebuffering includes: determining the quality AV_MOSR of the multimedia according to $AV_MOSR = Audiovisual_Quality - AV_DR$, where $Audiovisual_Quality$ is the reference quality of the multimedia or the multimedia quality due to packet loss, and AV_DR is the distortion quality due to rebuffering.

[0018] According to ~~yet another~~a second aspect, an embodiment of the present invention provides a multimedia quality monitoring apparatus, including:

a first determining module, configured to determine reference quality of multimedia according to reference video quality and reference audio quality of the multimedia;

a second determining module, configured to acquire multimedia distortion quality that is after video distortion and/or audio distortion of the multimedia occur/occurs; and

a third determining module, configured to determine quality of the multimedia according to the reference quality of the multimedia and the multimedia distortion quality.

[0019] In a possible implementation manner of ~~a~~ the second aspect, the first determining module is specifically configured to:

determine the reference quality of the multimedia according to $AV_MOSC = av1 \cdot V_MOSC + av2 \cdot A_MOSC + av3 \cdot V_MOSC \cdot A_MOSC + av4$, where AV_MOSC is the reference quality of the multimedia, V_MOSC is the reference video quality, *A_MOSC* is the reference audio quality, and *av1*, *av2*, *av3*, and *av4* are constants.

[0020] In a possible implementation manner of the second aspect, the multimedia distortion quality includes: multimedia distortion quality due to packet loss and/or multimedia distortion quality due to rebuffering; and the second determining module is specifically configured to: determine, according to the reference video quality and a video packet loss rate, video quality due to packet loss that is after a packet in a video of the multimedia is lost, and/or determine, according to the reference audio quality and an audio packet loss rate, audio quality due to packet loss that is after a packet in an audio of the multimedia is lost; acquire the multimedia distortion quality due to packet loss according to the video quality due to packet loss and/or the audio quality due to packet loss, and/or acquire the multimedia distortion quality due to rebuffering according to a rebuffering parameter, during a transmission process, of the multimedia.

[0021] In a possible implementation manner of the second aspect, the second determining module is specifically configured to: determine video distortion quality due to packet loss according to the video quality due to packet loss and the reference video quality, and determine audio packet loss distortion quality according to the audio quality due to packet loss and the reference audio quality; determine a video packet loss distortion factor according to the video distortion quality due to packet loss and the reference video quality, and determine an audio packet loss distortion factor according to the audio packet loss distortion quality and the reference audio quality; determine a multimedia packet loss distortion factor

module is specifically configured to: determine the multimedia distortion quality due to packet loss AV_DP according to $AV_DP = (AV_MOSC - MOS_MIN) \cdot AV_DF$, where AV_MOSC is the reference quality of the multimedia, MOS_MIN is lowest quality of the multimedia, and AV_DF is the multimedia packet loss distortion factor.

[0026] In a possible implementation manner of the second aspect, the rebuffering parameter includes one or any combination of the following: the number of rebufferings, rebuffering duration, an impact factor between multiple rebufferings, and multimedia initial quality.

[0027] In a possible implementation manner of the second aspect, the second determining module is specifically configured to: according to

$$AV_DR = (Audiovisual_Quality - MOS_MIN) \cdot \frac{\left(\frac{NR}{av7}\right)^{av8} \cdot \left(\frac{ARL}{av9}\right)^{av10} \cdot \left(\frac{MRF}{av11}\right)^{av12}}{1 + \left(\frac{NR}{av7}\right)^{av8} \cdot \left(\frac{ARL}{av9}\right)^{av10} \cdot \left(\frac{MRF}{av11}\right)^{av12}},$$

acquire the multimedia distortion quality due to rebuffering, where $Audiovisual_Quality$ is the multimedia initial quality, NR is the number of rebufferings, ARL is the rebuffering duration, MRF is the impact factor between multiple rebufferings, and av7, av8, av9, av10, av11 and av12 ~~av7 – av12~~ are constants.

[0028] In a possible implementation manner of the second aspect, the third determining module is specifically configured to: determine the multimedia quality due to packet loss according to the reference quality of the multimedia and the multimedia distortion quality due to packet loss; and determine the quality of the multimedia according to the reference quality of the multimedia or the multimedia quality due to packet loss, and the distortion quality due to rebuffering.

[0029] In a possible implementation manner of the second aspect, the third determining module is specifically configured to: determine the multimedia quality due to packet loss AV_MOSP according to $AV_MOSP = AV_MOSC - AV_DP$, where AV_MOSC is the reference quality of the multimedia, and AV_DP is the multimedia distortion quality due to packet loss.

[0030] In a possible implementation manner of the second aspect, the third determining module is specifically configured to: determine the quality AV_MOSR of the multimedia according to $AV_MOSR = Audiovisual_Quality - AV_DR$, where $Audiovisual_Quality$ is the reference quality of the multimedia or the multimedia quality due to packet loss, and AV_DR is the distortion quality due to rebuffering.

[0031] According to ~~another~~ a third aspect, an embodiment of the present invention further provides a terminal, including a receiving module, configured to receive multimedia; and further including the multimedia quality monitoring apparatus provided in the embodiment of the present invention.

[0032] According to ~~another~~a fourth aspect, an embodiment of the present invention further provides a terminal, including a receiver, configured to receive multimedia; and further including: a processor, configured to execute the multimedia quality monitoring method provided in the embodiment of the present invention.

[0033] According to ~~another~~ a sixth aspect, an embodiment of the present invention further provides a network device, including a receiving module, configured to receive multimedia; and further including the multimedia quality monitoring apparatus provided in the embodiment of the present invention.

[0034] According to ~~another~~ a seventh aspect, an embodiment of the present invention further provides a network device, including a receiver, configured to receive multimedia; and further including: a processor, configured to execute the multimedia quality monitoring method provided in the embodiment of the present invention.

[0035] According to the multimedia quality monitoring method, and the device that are provided in the embodiments of the present invention, reference quality of multimedia is obtained by using reference video quality and reference audio quality of the multimedia, multimedia distortion quality that is after video distortion and/or audio distortion of the multimedia occur/occurs is acquired, and quality of the multimedia is determined according to the reference quality of the multimedia and the multimedia distortion quality. Therefore, accuracy of a multimedia quality monitoring result is improved.

BRIEF DESCRIPTION OF DRAWINGS

[0036] To describe the technical solutions in the embodiments of the present invention or in the prior art more clearly, the following briefly introduces the accompanying drawings required for describing the embodiments or the prior art. Apparently, the accompanying drawings in the following description show some embodiments of the present invention, and a person of ordinary skill in the art may still derive other drawings from these accompanying drawings without creative efforts.

[0037] FIG. 1 is a schematic ~~structural diagram~~ flowchart of an embodiment of a multimedia quality monitoring method according to the present invention;

[0038] FIG. 2 is a schematic ~~structural diagram~~ flowchart of yet another embodiment of a multimedia quality monitoring method according to the present invention;

[0039] FIG. 3 is a schematic structural diagram of an embodiment of a multimedia quality monitoring apparatus according to the present invention;

[0040] FIG. 4 is a schematic structural diagram of an embodiment of a terminal according to the present invention;

[0041] FIG. 5 is a schematic structural diagram of yet another embodiment of a terminal according to the present invention;

[0042] FIG. 6 is a schematic structural diagram of an embodiment of a network device according to the present invention; and

[0043] FIG. 7 is a schematic structural diagram of yet another embodiment of a network device according to the present invention.

DESCRIPTION OF EMBODIMENTS

[0044] To make the objectives, technical solutions, and advantages of the embodiments of the present invention clearer, the following clearly and completely describes the technical solutions in the embodiments of the present invention with reference to the accompanying drawings in the embodiments of the present invention. Apparently, the described embodiments are a part rather than all of the embodiments of the present invention. All other embodiments obtained by a person of ordinary skill in the art based on the embodiments of

the present invention without creative efforts shall fall within the protection scope of the present invention.

[0045] Technologies described in this specification may be applied to various communications systems, for example, current 2G and 3G communications systems and next-generation communications systems, for example, a Global System for Mobile Communications (GSM, Global System for Mobile communications), a Code Division Multiple Access (CDMA, Code Division Multiple Access) system, a Time Division Multiple Access (TDMA, Time Division Multiple Access) system, a Wideband Code Division Multiple Access (WCDMA, Wideband Code Division Multiple Access ~~Wireless~~) system, a Frequency Division Multiple Access (FDMA, Frequency Division Multiple ~~Addressing~~Access) system, an Orthogonal Frequency-Division Multiple Access (OFDMA, Orthogonal Frequency-Division Multiple Access) system, a single-carrier FDMA (SC-FDMA) system, a General Packet Radio Service (GPRS, General Packet Radio Service) system, a Long Term Evolution (LTE, Long Term Evolution) system, and other similar communications systems.

[0046] A terminal involved in this application, that is, a user device, may be a wireless terminal or a wired terminal. The wireless terminal may refer to a device that provides a user with voice and/or data connectivity, a handheld device with a radio connection function, or another processing device connected to a radio modem. The wireless terminal may communicate with one or more core networks through a radio access network (such as RAN, Radio Access Network). The wireless terminal may be a mobile terminal, such as a mobile phone (also referred to as a "cellular" phone) and a computer with a mobile terminal, for example, may be a portable, pocket-sized, handheld, computer built-in, or vehicle-mounted mobile apparatus, which exchanges voice and/or data with the radio access network. For example, it may be a device such as a personal communication service (PCS, Personal Communication Service) phone, a cordless telephone set, a Session Initiation Protocol (SIP) phone, a wireless local loop (WLL, Wireless Local Loop) station, or a personal digital assistant (PDA, Personal Digital Assistant). The wireless terminal may also be called a system, a subscriber unit (Subscriber Unit), a subscriber station (Subscriber Station), a mobile station (Mobile Station), a mobile terminal (Mobile), a remote station (Remote Station), an access point (Access Point), a remote terminal (Remote Terminal), an access terminal (Access

Terminal), a user terminal (User Terminal), a user agent (User Agent), a user device (User Device), or a user equipment (User Equipment).

[0047] Network devices involved in the application may be various network node devices, such as base stations, base station controllers, access points (Access Point, AP) on various networks, or network elements such as controllers or authenticators behind the access points and the base stations mentioned above.

[0048] In addition, the terms "system" and "network" may be used interchangeably in this specification. The term "and/or" in this specification describes only an association relationship for describing associated objects and represents that three relationships may exist. For example, A and/or B may represent the following three cases: Only A exists, both A and B exist, and only B exists. In addition, the character "/" in this specification generally represents an "or" relationship between the associated objects.

[0049] FIG. 1 is a schematic ~~structural diagram~~ flowchart of an embodiment of a multimedia quality monitoring method according to the present invention. As shown in FIG. 1, the method includes:

[0050] S101: Determine reference quality of multimedia according to reference video quality and reference audio quality of the multimedia.

[0051] S102: Acquire multimedia distortion quality that is after video distortion and/or audio distortion of the multimedia occur/occurs.

[0052] S103: Determine quality of the multimedia according to the reference quality of the multimedia and the multimedia distortion quality.

[0053] Multimedia involved in this embodiment of the present invention refers to various multimedia files including video and audio, for example, multimedia data that is received when a terminal performs a service process, such as video on demand, web television, and video telephone.

[0054] The multimedia needs to be encoded before being transmitted, and video data and audio data in the multimedia generally need to be encoded separately. After the encoding, two transport streams, namely a video stream and an audio stream, may be transmitted; or interleaved packetization may be performed on the encoded video data and the encoded audio data, that is, one packet includes not only the video data but also the audio data, and the video

audio of the multimedia is lost may also be determined according to the reference audio quality and an audio packet loss rate, and the audio quality due to packet loss may also be determined according to various existing methods.

[0061] Further, multimedia distortion quality due to packet loss may be acquired according to the video quality due to packet loss and/or the audio quality due to packet loss.

[0062] Optionally, video distortion quality due to packet loss may be determined according to the video quality due to packet loss and the reference video quality, and audio packet loss distortion quality may be determined according to the audio quality due to packet loss and the reference audio quality. For example, the video distortion quality due to packet loss may be a difference between the reference video quality and the video quality due to packet loss, and similarly, the audio packet loss distortion quality may be a difference between the reference audio quality and the audio quality due to packet loss.

[0063] Further, a video packet loss distortion factor may be further determined according to the video distortion quality due to packet loss and the reference video quality, and an audio packet loss distortion factor may be determined according to the audio packet loss distortion quality and the reference audio quality. For example, the video packet loss distortion factor may be a ratio of the video distortion quality due to packet loss to the reference video quality, and similarly, the audio packet loss distortion factor may be a ratio of the audio packet loss distortion quality to the reference audio quality.

[0064] Further, a multimedia packet loss distortion factor may be determined according to the video packet loss distortion factor and the audio packet loss distortion factor. For example, the multimedia packet loss distortion factor may have a linear or non-linear relationship with the video packet loss distortion factor or the audio packet loss distortion factor, or may be a combination of linearity and non-linearity.

[0065] Finally, the multimedia distortion quality due to packet loss may be determined according to the multimedia packet loss distortion factor and the reference quality of the multimedia.

[0066] ~~As~~ In another feasible implementation manner, a rebuffering parameter, such as the number of rebufferings, rebuffering duration, and an impact factor between multiple rebufferings, of multimedia during a transmission process may be acquired, and further, the

multimedia distortion quality due to rebuffering is acquired according to the rebuffering parameter. The rebuffering parameter or a combination of the rebuffering parameters may have a linear or non-linear relationship with the multimedia distortion quality due to rebuffering, or may be in a linearity or non-linearity combined relationship.

[0067] After the multimedia distortion quality is determined, the quality of the multimedia may be determined according to the reference quality of the multimedia and the multimedia distortion quality. The multimedia distortion quality may include a multimedia distortion quality~~vector~~ due to packet loss, or include the multimedia distortion quality due to rebuffering, or include the multimedia distortion quality~~vector~~ due to packet loss and the multimedia distortion quality due to rebuffering.

[0068] Specifically, during a transmission process of multimedia, if no rebuffering occurs and only a case of video packet loss and/or audio packet loss occurs, the multimedia distortion quality may include only the multimedia distortion quality due to packet loss; during a transmission process of multimedia, if a rebuffering occurs but a case of video packet loss and/or audio packet loss does not occur, the multimedia distortion quality may include only the multimedia distortion quality due to rebuffering; and during a transmission process of multimedia, if not only a rebuffering occurs, but also a case of video packet loss and/or audio packet loss occurs, the multimedia distortion quality not only includes the multimedia distortion quality due to rebuffering, but also includes the multimedia distortion quality due to packet loss.

[0069] According to the multimedia quality monitoring method provided in this embodiment, reference quality of multimedia is obtained by using reference video quality and reference audio quality of the multimedia, multimedia distortion quality that is after video distortion and/or audio distortion of the multimedia occur/occurs is acquired, and quality of the multimedia is determined according to the reference quality of the multimedia and the multimedia distortion quality. Therefore, accuracy of a multimedia quality monitoring result is improved.

[0070] FIG. 2 is a schematic ~~structural diagram~~ flowchart of another embodiment of a multimedia quality monitoring method according to the present invention. As shown in FIG. 2, the method includes:

multimedia, that is, if packet loss does not occur in audio of the multimedia, the quality is reference quality, and if packet loss occurs, the quality is packet loss quality.

[0079] The video distortion quality due to packet loss may also be equal to the reference video quality minus the video quality due to packet loss.

[0080] Similarly, the audio packet loss distortion quality may be equal to the reference audio quality minus the audio quality due to packet loss.

[0081] S204: Determine reference quality (AV_MOSC) of the multimedia according to the reference video quality and the reference audio quality of the multimedia. The reference quality of the multimedia may be determined by using various existing methods.

[0082] Optionally, the reference quality of the multimedia may be determined according to $AV_MOSC = av1 \cdot V_MOSC + av2 \cdot A_MOSC + av3 \cdot V_MOSC \cdot A_MOSC + av4$.

[0083] AV_MOSC is the reference quality of the multimedia, V_MOSC is the reference video quality, A_MOSC is the reference audio quality, and *av1*, *av2*, *av3*, and *av4* are constants.

[0084] S205: Determine a video packet loss distortion factor (AV_DFV) of the multimedia according to the video distortion quality due to packet loss (V_DP) and the reference video quality (V_MOSC) of the multimedia, and determine an audio packet loss distortion factor (AV_DFA) of the multimedia according to the audio packet loss distortion quality (A_DP) and the reference audio quality (A_MOSC) of the multimedia.

[0085] Optionally, the video packet loss distortion factor (AV_DFV) of the multimedia may be determined according to $AV_DFV = \frac{V_DP}{V_MOSC}$ or $AV_DFV = \frac{V_MOSC - Video_MOS}{V_MOSC}$, where V_MOSC is the reference video quality, and V_DP is the video distortion quality due to packet loss of the multimedia.

[0086] Similarly, the audio packet loss distortion factor (AV_DFA) of the multimedia may be determined according to $AV_DFA = \frac{A_DP}{A_MOSC}$ or $AV_DFA = \frac{A_MOSC - Audio_MOS}{A_MOSC}$, where A_MOSC is the reference audio quality, and A_DP is the audio distortion quality due to packet loss of the

[0094] Optionally, the multimedia quality due to packet loss AV_MOSP may be determined according to $AV_MOSP = AV_MOSC - AV_DP$, where AV_MOSC is the reference quality of the multimedia, and AV_DP is the multimedia distortion quality due to packet loss that is after video packet loss distortion and/or audio packet loss distortion.

[0095] S209: Acquire multimedia distortion quality due to rebuffering according to a rebuffering parameter, during a transmission process, of the multimedia.

[0096] The rebuffering parameter includes one or any combination of the following: the number of rebufferings (NR), rebuffering duration (ARL), an impact factor between multiple rebufferings (MRF), and multimedia initial quality. Multimedia distortion quality due to rebuffering is calculated. The rebuffering duration may be average duration of multiple rebufferings, or may be total duration of multiple rebufferings~~averages.~~

[0097] Optionally, the multimedia distortion quality due to rebuffering AV_DR may be determined according to

$$AV_DR = (Audiovisual_Quality - MOS_MIN)\cdot\frac{\left(\frac{NR}{av7}\right)^{av8}\cdot\left(\frac{ARL}{av9}\right)^{av10}\cdot\left(\frac{MRF}{av11}\right)^{av12}}{1+\left(\frac{NR}{av7}\right)^{av8}\cdot\left(\frac{ARL}{av9}\right)^{av10}\cdot\left(\frac{MRF}{av11}\right)^{av12}},$$

where $av7$, $av8$, $av9$, $av10$, $av11$ and $av12$ ~~$av7$ — $av12$~~ are constants, and $Audiovisual_Quality$ is multimedia initial quality. Specifically, the multimedia initial quality may be the reference quality of the multimedia or the multimedia quality due to packet loss, that is, if packet loss does not occur in the multimedia, the multimedia initial quality may be the reference quality, and if packet loss occurs, the multimedia initial quality may be the multimedia quality due to packet loss.

[0098] S210: Determine quality of the multimedia according to the reference quality of the multimedia or the multimedia quality due to packet loss, and the distortion quality due to rebuffering.

[0099] Optionally, multimedia rebuffering quality AV_MOSR may be determined according to $AV_MOSR = Audiovisual_Quality - AV_DR$. $Audiovisual_Quality$ is the reference quality of the multimedia or the multimedia quality due to packet loss, AV_DR is

$$AV_DR = (Audiovisual_Quality - MOS_MIN) \cdot \frac{\left(\frac{NR}{av7}\right)^{av8} \cdot \left(\frac{ARL}{av9}\right)^{av10} \cdot \left(\frac{MRF}{av11}\right)^{av12}}{1 + \left(\frac{NR}{av7}\right)^{av8} \cdot \left(\frac{ARL}{av9}\right)^{av10} \cdot \left(\frac{MRF}{av11}\right)^{av12}},$$

where $Audiovisual_Quality$ is the multimedia initial quality, NR is the number of rebufferings, ARL is the rebuffering duration, MRF is the impact factor between multiple rebufferings, and *av7, av8, av9, av10, av11* and *av12* ~~*av7–av12*~~ are constants.

[0114] Optionally, the third determining module 13 may be specifically configured to: determine multimedia quality due to packet loss according to the reference quality of the multimedia and the multimedia distortion quality due to packet loss; and determine quality of the multimedia according to the reference quality of the multimedia or the multimedia quality due to packet loss, and the distortion quality due to rebuffering.

[0115] Optionally, the third determining module 13 may be specifically configured to:

determine the multimedia quality due to packet loss AV_MOSP according to $AV_MOSP = AV_MOSC - AV_DP$, where AV_MOSC is the reference quality of the multimedia, and AV_DP is the multimedia distortion quality due to packet loss.

[0116] Optionally, the third determining module 13 may be specifically configured to:

determine the quality AV_MOSR of the multimedia according to $AV_MOSR = Audiovisual_Quality - AV_DR$, where $Audiovisual_Quality$ is the reference quality of the multimedia or the multimedia quality due to packet loss, and AV_DR is the distortion quality due to rebuffering.

[0117] The multimedia quality monitoring apparatus provided in the embodiment of the present invention corresponds to the multimedia quality monitoring method provided in the embodiment of the present invention, and is a device for executing the multimedia quality monitoring method. For a process of executing, by the apparatus, the multimedia quality monitoring method, refer to method embodiments, and no details are repeatedly described herein.

[0118] According to the multimedia quality monitoring apparatus provided in this embodiment of the present invention, reference quality of multimedia is obtained by using

reference video quality and reference audio quality of the multimedia, multimedia distortion quality due to packet loss is determined by using video quality of the multimedia that is after packet loss and audio quality of the multimedia that is after packet loss, multimedia distortion quality due to rebuffering is obtained by using a rebuffering parameter, and finally, ultimate quality of the multimedia is determined according to the reference quality of the multimedia, and/or the multimedia distortion quality due to packet loss and/or the multimedia distortion quality due to rebuffering. Therefore, accuracy of a multimedia quality monitoring result is improved.

[0119] FIG. 4 is a schematic structural diagram of an embodiment of a terminal according to the present invention. As shown in FIG. 4, the terminal includes: a receiving module 21 and a multimedia quality monitoring apparatus 22.

[0120] The receiving module 21 is configured to receive multimedia.

[0121] For a structure of the multimedia quality monitoring apparatus 22 and functions of modules in the multimedia quality monitoring apparatus 22, refer to related description in the embodiment shown in FIG. 3, and no details are repeatedly described herein.

[0122] FIG. 5 is a schematic structural diagram of yet another embodiment of a terminal according to the present invention. As shown in FIG. 5, the terminal includes: a receiver 31 and a processor 32.

[0123] The receiver 31 is configured to receive multimedia.

[0124] The processor 32 may execute the multimedia quality monitoring methods provided in the embodiments, shown in FIG. 1 and FIG. 2, of the present invention. For specific processes of executing, by the processor 32, the multimedia quality monitoring methods, refer to related description in the embodiments shown in FIG. 1 and FIG. 2, and no details are repeatedly described herein.

[0125] According to the terminal provided in this embodiment of the present invention, reference quality of multimedia is obtained by using reference video quality and reference audio quality of the multimedia, multimedia distortion quality that is after multimedia distortion is determined by using video quality that is after video distortion of the multimedia and audio quality that is after audio distortion of the multimedia, and finally, quality of the multimedia is determined according to the reference quality of the multimedia and the multimedia quality

processor to perform all or a part of the steps of the methods described in the embodiments of the present application. The foregoing storage medium includes: any medium that may store program code, such as a USB flash drive, a removable hard disk, a read-only memory (ROM, Read-Only Memory), a random access memory (RAM, Random Access Memory), a magnetic disk, or an optical disc.

[0138] The foregoing embodiments are merely intended for describing the technical solutions of the present application, but not for limiting the present application. Although the present application is described in detail with reference to the foregoing embodiments, persons of ordinary skill in the art should understand that they may still make modifications to the technical solutions described in the foregoing embodiments or make equivalent replacements to some technical features thereof, without departing from ~~the spirit~~ and scope of the technical solutions of the embodiments of the present application.

CLAIMS

What is claimed is:

1. A multimedia quality monitoring method, comprising:

determining reference quality of multimedia according to reference video quality and reference audio quality of the multimedia;

acquiring multimedia distortion quality that is after video distortion and/or audio distortion of the multimedia occur/occurs; and

determining quality of the multimedia according to the reference quality of the multimedia and the multimedia distortion quality.

2. The method according to claim 1, wherein the determining reference quality of multimedia according to reference video quality and reference audio quality of the multimedia comprises:

determining the reference quality of the multimedia according to $AV_MOSC = av1 \cdot V_MOSC + av2 \cdot A_MOSC + av3 \cdot V_MOSC \cdot A_MOSC + av4$, wherein

AV_MOSC is the reference quality of the multimedia, V_MOSC is the reference video quality, A_MOSC is the reference audio quality, and av1, av2, av3, and av4 are constants.

3. The method according to claim 1 or 2, wherein the multimedia distortion quality comprises: multimedia distortion quality due to packet loss and/or multimedia distortion quality due to rebuffering; and the acquiring multimedia distortion quality that is after video distortion and/or audio distortion of the multimedia occur/occurs comprises:

determining, according to the reference video quality and a video packet loss rate, video quality due to packet loss that is after a packet in a video of the multimedia is lost, and/or determining, according to the reference audio quality and an audio packet loss rate, audio quality due to packet loss that is after a packet in an audio of the multimedia is lost; acquiring the multimedia distortion quality due to packet loss according to the video quality due to packet loss and/or the audio quality due to packet loss; and/or

acquiring the multimedia distortion quality due to rebuffering according to a rebuffering parameter, during a transmission process, of the multimedia.

4. The method according to claim 3, wherein the acquiring the multimedia distortion quality due to packet loss according to the video quality due to packet loss and/or the audio quality due to packet loss comprises:

determining video distortion quality due to packet loss according to the video quality due to packet loss and the reference video quality, and determining audio packet loss distortion quality according to the audio quality due to packet loss and the reference audio quality;

determining a video packet loss distortion factor according to the video distortion quality due to packet loss and the reference video quality, and determining an audio packet loss distortion factor according to the audio packet loss distortion quality and the reference audio quality;

determining a multimedia packet loss distortion factor according to the video packet loss distortion factor and the audio packet loss distortion factor; and

determining the multimedia distortion quality due to packet loss according to the multimedia packet loss distortion factor and the reference quality of the multimedia.

5. The method according to claim 4, wherein the determining video distortion quality due to packet loss according to the video quality due to packet loss and the reference video quality, and determining audio packet loss distortion quality according to the audio quality due to packet loss and the reference audio quality comprises:

determining the video distortion quality due to packet loss V_DP according to $V_DP = V_MOSC - Video_MOS$, wherein V_MOSC is the reference video quality, and $Video_MOS$ is the video quality due to packet loss; and

determining the audio packet loss distortion quality A_DP according to $A_DP = A_MOSC - Audio_MOS$, wherein A_MOSC is the reference audio quality, and $Audio_MOS$ is the audio quality due to packet loss.

6. The method according to claim 4 or 5, wherein the determining a video packet loss distortion factor according to the video distortion quality due to packet loss and the reference video quality, and determining an audio packet loss distortion factor according to the audio packet loss distortion quality and the reference audio quality comprises:

determining the video packet loss distortion factor AV_DFV according to $AV_DFV = \frac{V_DP}{V_MOSC}$ or $AV_DFV = \frac{V_MOSC - Video_MOS}{V_MOSC}$, wherein V_MOSC is the reference video quality, and V_DP is the video distortion quality due to packet loss; and/or

determining the audio packet loss distortion factor AV_DFA according to $AV_DFA = \frac{A_DP}{A_MOSC}$ or $AV_DFA = \frac{A_MOSC - Audio_MOS}{A_MOSC}$, wherein A_MOSC is the reference audio quality, and A_DP is the audio packet loss distortion quality.

7. The method according to any one of claims 4 to 6, wherein the determining a multimedia packet loss distortion factor according to the video packet loss distortion factor and the audio packet loss distortion factor comprises:

determining the multimedia packet loss distortion factor AV_DF according to $\frac{av5 \cdot AV_DFV + av6 \cdot AV_DFA}{1 + av5 \cdot AV_DFV + av6 \cdot AV_DFA}$ or $AV_DF = av5 + av6 \cdot AV_DFV + av7 \cdot AV_DFA$, wherein AV_DFA is the audio packet loss distortion factor, AV_DFV is the video packet loss distortion factor, and av5, av6 and av7 are constants.

8. The method according to any one of claims 4 to 7, wherein the determining the multimedia distortion quality due to packet loss according to the multimedia packet loss distortion factor and the reference quality of the multimedia comprises:

determining the multimedia distortion quality due to packet loss AV_DP according to $AV_DP = (AV_MOSC - MOS_MIN) \cdot AV_DF$, wherein AV_MOSC is the reference quality of the multimedia, MOS_MIN is lowest quality of the multimedia, and AV_DF is the multimedia packet loss distortion factor.

9. The method according to any one of claims 3 to 8, wherein the rebuffering parameter comprises one or any combination of the following: the number of rebufferings, rebuffering duration, an impact factor between multiple rebufferings, and multimedia initial quality.

10. The method according to claim 9, wherein the acquiring the multimedia distortion quality due to rebuffering according to a rebuffering parameter, during a transmission process, of the multimedia comprises: acquiring the multimedia distortion quality due to rebuffering

AV_DR according to

$$AV_DR = (Audiovisual_Quality - MOS_MIN) \cdot \frac{\left(\frac{NR}{av7}\right)^{av8} \cdot \left(\frac{ARL}{av9}\right)^{av10} \cdot \left(\frac{MRF}{av11}\right)^{av12}}{1+\left(\frac{NR}{av7}\right)^{av8} \cdot \left(\frac{ARL}{av9}\right)^{av10} \cdot \left(\frac{MRF}{av11}\right)^{av12}},$$

wherein $Audiovisual_Quality$ is the multimedia initial quality, NR is the number of rebufferings, ARL is the rebuffering duration, MRF is the impact factor between multiple rebufferings, and $av7-av12$ are constants.

11. The method according to claim 10, wherein the determining quality of the multimedia according to the reference quality of the multimedia and the multimedia distortion quality comprises:

determining the multimedia quality due to packet loss according to the reference quality of the multimedia and the multimedia distortion quality due to packet loss; and

determining the quality of the multimedia according to the reference quality of the multimedia or the multimedia quality due to packet loss, and the distortion quality due to rebuffering.

12. The method according to claim 11, wherein the determining the multimedia quality due to packet loss according to the reference quality of the multimedia and the multimedia distortion quality due to packet loss comprises:

determining the multimedia quality due to packet loss AV_MOSP according to $AV_MOSP = AV_MOSC - AV_DP$, wherein AV_MOSC is the reference quality of the multimedia, and AV_DP is the multimedia distortion quality due to packet loss.

13. The method according to claim 11 or 12, wherein the determining the quality of the multimedia according to the reference quality of the multimedia or the multimedia quality due to packet loss, and the distortion quality due to rebuffering comprises:

determining the quality AV_MOSR of the multimedia according to $AV_MOSR = Audiovisual_Quality - AV_DR$, wherein $Audiovisual_Quality$ is the reference quality of the multimedia or the multimedia quality due to packet loss, and AV_DR is the

distortion quality due to rebuffering.

14. A multimedia quality monitoring apparatus comprising:

a first determining module, configured to determine reference quality of multimedia according to reference video quality and reference audio quality of the multimedia;

a second determining module, configured to acquire multimedia distortion quality that is after video distortion and/or audio distortion of the multimedia occur/occurs; and

a third determining module, configured to determine quality of the multimedia according to the reference quality of the multimedia and the multimedia distortion quality.

15. The apparatus according to claim 14, wherein the first determining module is specifically configured to:

determine the reference quality of the multimedia according to $AV_MOSC = av1 \cdot V_MOSC + av2 \cdot A_MOSC + av3 \cdot V_MOSC \cdot A_MOSC + av4$, wherein

AV_MOSC is the reference quality of the multimedia, V_MOSC is the reference video quality, A_MOSC is the reference audio quality, and $av1$, $av2$, $av3$, and $av4$ are constants.

16. The apparatus according to claim 14 or 15, wherein the multimedia distortion quality comprises: multimedia distortion quality due to packet loss and/or multimedia distortion quality due to rebuffering; and the second determining module is specifically configured to: determine, according to the reference video quality and a video packet loss rate, video quality due to packet loss that is after a packet in a video of the multimedia is lost, and/or determine, according to the reference audio quality and an audio packet loss rate, audio quality due to packet loss that is after a packet in an audio of the multimedia is lost; acquire the multimedia distortion quality due to packet loss according to the video quality due to packet loss and/or the audio quality due to packet loss; and/or

acquire the multimedia distortion quality due to rebuffering according to a rebuffering parameter, during a transmission process, of the multimedia.

17. The apparatus according to claim 16, wherein the second determining module is specifically configured to: determine video distortion quality due to packet loss according to the video quality due to packet loss and the reference video quality, and determine audio packet loss distortion quality according to the audio quality due to packet loss and the

reference audio quality; determine a video packet loss distortion factor according to the video distortion quality due to packet loss and the reference video quality, and determine an audio packet loss distortion factor according to the audio packet loss distortion quality and the reference audio quality; determine a multimedia packet loss distortion factor according to the video packet loss distortion factor and the audio packet loss distortion factor; and determine the multimedia distortion quality due to packet loss according to the multimedia packet loss distortion factor and the reference quality of the multimedia.

18. The apparatus according to claim 17, wherein the second determining module is specifically configured to: determine the video distortion quality due to packet loss V_DP according to $V_DP = V_MOSC - Video_MOS$, wherein V_MOSC is the reference video quality, and $Video_MOS$ is the video quality due to packet loss; and

determine the audio packet loss distortion quality A_DP according to $A_DP = A_MOSC - Audio_MOS$, wherein A_MOSC is the reference audio quality, and $Audio_MOS$ is the audio quality due to packet loss.

19. The apparatus according to claim 17 or 18, wherein the second determining module is specifically configured to:

determine the video packet loss distortion factor AV_DFV according to $AV_DFV = \frac{V_DP}{V_MOSC}$ or $AV_DFV = \frac{V_MOSC - Video_MOS}{V_MOSC}$, wherein V_MOSC is the reference video quality, and V_DP is the video distortion quality due to packet loss; and/or,

determine the audio packet loss distortion factor AV_DFA according to $AV_DFA = \frac{A_DP}{A_MOSC}$ or $AV_DFA = \frac{A_MOSC - Audio_MOS}{A_MOSC}$, wherein A_MOSC is the reference audio quality, and A_DP is the audio packet loss distortion quality.

20. The apparatus according to any one of claims 17 to 19, wherein the second determining module is specifically configured to: determine the multimedia packet loss

distortion factor AV_DF according to $\frac{av5 \cdot AV_DFV + av6 \cdot AV_DFA}{1 + av5 \cdot AV_DFV + av6 \cdot AV_DFA}$ or $AV_DF = av5 + av6 \cdot AV_DFV + av7 \cdot AV_DFA$, wherein AV_DFA is the audio packet loss distortion factor, AV_DFV is the video packet loss distortion factor, and $av5$, $av6$ and $av7$ are constants.

21. The apparatus according to any one of claims 17 to 20, wherein the second determining module is specifically configured to: determine the multimedia distortion quality due to packet loss AV_DP according to $AV_DP = (AV_MOSC - MOS_MIN) \cdot AV_DF$, wherein AV_MOSC is the reference quality of the multimedia, MOS_MIN is lowest quality of the multimedia, and AV_DF is the multimedia packet loss distortion factor.

22. The apparatus according to any one of claims 16 to 21, wherein the rebuffering parameter comprises one or any combination of the following: the number of rebufferings, rebuffering duration, an impact factor between multiple rebufferings, and multimedia initial quality.

23. The apparatus according to claim 22, wherein the second determining module is specifically configured to: according to

$$AV_DR = (Audiovisual_Quality - MOS_MIN) \cdot \frac{\left(\frac{NR}{av7}\right)^{av8} \cdot \left(\frac{ARL}{av9}\right)^{av10} \cdot \left(\frac{MRF}{av11}\right)^{av12}}{1 + \left(\frac{NR}{av7}\right)^{av8} \cdot \left(\frac{ARL}{av9}\right)^{av10} \cdot \left(\frac{MRF}{av11}\right)^{av12}},$$

acquire the multimedia distortion quality due to rebuffering AV_DR, wherein $Audiovisual_Quality$ is the multimedia initial quality, NR is the number of rebufferings, ARL is the rebuffering duration, MRF is the impact factor between multiple rebufferings, and $av7$–$av12$ are constants.

24. The apparatus according to claim 23, wherein the third determining module is specifically configured to:

determine the multimedia quality due to packet loss according to the reference quality of the multimedia and the multimedia distortion quality due to packet loss; and

determine the quality of the multimedia according to the reference quality of the multimedia or the multimedia quality due to packet loss, and the distortion quality due to rebuffering.

25. The apparatus according to claim 24, wherein the third determining module is specifically configured to: determine the multimedia quality due to packet loss AV_MOSP according to $AV_MOSP = AV_MOSC - AV_DP$, wherein AV_MOSC is the reference quality of the multimedia, and AV_DP is the multimedia distortion quality due to packet loss.

26. The apparatus according to claim 24 or 25, wherein the third determining module is specifically configured to: determine the quality AV_MOSR of the multimedia according to $AV_MOSR = Audiovisual_Quality - AV_DR$, wherein $Audiovisual_Quality$ is the reference quality of the multimedia or the multimedia quality due to packet loss, and AV_DR is the distortion quality due to rebuffering.

27. A terminal, comprising a receiving module, configured to receive multimedia; and further comprising: the multimedia quality monitoring apparatus according to any one of claims 14 to 26.

28. A terminal, comprising a receiver, configured to receive multimedia; and further comprising: a processor, configured to execute the multimedia quality monitoring method according to any one of claims 1 to 13.

29. A network device, comprising: a receiving module, configured to receive multimedia; and further comprising: the multimedia quality monitoring apparatus according to any one of claims 14 to 26.

30. A network device, comprising a receiver, configured to receive multimedia; and further comprising: a processor, configured to execute the multimedia quality monitoring method according to any one of claims 1 to 13.

CLAIMS

1. A multimedia quality monitoring method, comprising:

determining, by a multimedia quality monitoring apparatus, reference quality of multimedia according to reference video quality and reference audio quality of the multimedia;

acquiring, by the multimedia quality monitoring apparatus, multimedia distortion quality after at least one of video distortion and audio distortion of the multimedia occurs; and

determining, by the multimedia quality monitoring apparatus, quality of the multimedia according to the reference quality of the multimedia and the multimedia distortion quality;

wherein the multimedia distortion quality comprises: multimedia distortion quality due to at least one of packet loss and rebuffering; and

wherein acquiring the multimedia distortion quality after at least one of video distortion and audio distortion of the multimedia occurs comprises:

determining, at least one of the following:

(a) according to the reference video quality and a video packet loss rate, video quality due to packet loss after a packet in a video of the multimedia is lost, and

(b) according to the reference audio quality and an audio packet loss rate, audio quality due to packet loss after a packet in an audio of the multimedia is lost;

acquiring the multimedia distortion quality due to at least one of the following:

(i) packet loss according to the video quality; and

(ii) rebuffing parameter, during a transmission process, of the multimedia;

wherein acquiring the multimedia distortion quality due to at least one of the video quality due to packet loss and the audio quality due to packet loss comprises:

determining at least one of video distortion quality due to packet loss and audio packet loss distortion quality due to packet loss, wherein the video distortion quality due to packet loss is determined according to the video quality due to packet loss and the reference video quality, and the audio packet loss distortion quality due to packet loss is determined according to the audio quality due to packet loss and the reference audio quality;

determining at least one of a video packet loss distortion factor and an audio packet loss distortion factor, wherein the video packet loss distortion factor is determined according to the video distortion quality due to packet loss and the reference video quality,

and the audio packet loss distortion factor is determined according to the audio packet loss distortion quality and the reference audio quality;

determining a multimedia packet loss distortion factor according to at least one of the video packet loss distortion factor and the audio packet loss distortion factor; and

determining the multimedia distortion quality due to packet loss according to the multimedia packet loss distortion factor and the reference quality of the multimedia.

2. The method according to claim 1, wherein determining the reference quality of the multimedia according to the reference video quality and the reference audio quality of the multimedia comprises:

determining the reference quality of the multimedia according to AV_MOSC=av1·V_MOSC+av2·A_MOSC+av3·V_MOSC·A_MOSC+av4, wherein

AV_MOSC is the reference quality of the multimedia, V_MOSC is the reference video quality, A_MOSC is the reference audio quality, and av1, av2, av3, and av4 are constants.

3. The method according to claim 1, wherein determining the video distortion quality due to packet loss according to the video quality due to packet loss and the reference video quality, and determining the audio packet loss distortion quality according to the audio quality due to packet loss and the reference audio quality comprises:

determining the video distortion quality due to packet loss V_DP according to V_DP=V_MOSC−Video_MOS, wherein V_MOSC is the reference video quality, and Video_MOS is the video quality due to packet loss; and

determining the audio packet loss distortion quality A_DP according to A_DP=A_MOSC−Audio_MOS wherein A_MOSC is the reference audio quality, and Audio_MOS is the audio quality due to packet loss.

4. The method according to claim 1, wherein determining the video packet loss distortion factor according to the video distortion quality due to packet loss and the reference video quality, and determining the audio packet loss distortion factor according to the audio packet loss distortion quality and the reference audio quality comprises at least one of the following:

(a) determining the video packet loss distortion factor AV_DFV according to

$$AV_DFV=\frac{V_DP}{V_MOSC} \text{ or } AV_DFV=\frac{V_MOSC-Video_MOS}{V_MOSC},$$

wherein V_MOSC is the reference video quality, and V_DP is the video distortion quality due to packet loss; and

(b) determining the audio packet loss distortion factor AV_DFA according to

$$AV_DFA=\frac{A_DP}{A_MOSC} \text{ or } AV_DFA=\frac{A_MOSC-Audio_MOS}{A_MOSC},$$

wherein A_MOSC is the reference audio quality, and A_DP is the audio packet loss distortion quality.

5. The method according to claim 1, wherein determining the multimedia packet loss distortion factor according to the video packet loss distortion factor and the audio packet loss distortion factor comprises:

determining the multimedia packet loss distortion factor AV_DF according to

$$\frac{av5\cdot AV_DFV+av6\cdot AV_DFA}{1+av5\cdot AV_DFV+av6\cdot AV_DFA}$$

wherein AV_DFA is the audio packet loss distortion factor, AV_DFV is the video packet loss distortion factor, and av5, av6 and av7 are constants.

6. The method according to claim 1, wherein determining the multimedia distortion quality due to packet loss according to the multimedia packet loss distortion factor and the reference quality of the multimedia comprises:

determining the multimedia distortion quality due to packet loss AV_DP according to AV_DP=(AV_MOSC−MOS_MIN)·AV_DF, wherein AV_MOSC is the reference quality of the multimedia, MOS_MIN is lowest quality of the multimedia, and AV_DF is the multimedia packet loss distortion factor,

wherein AV_MOSC is the reference quality of the multimedia, MOS_MIN is lowest quality of the multimedia, and AV_DF is the multimedia packet loss distortion factor.

7. A multimedia quality monitoring method, comprising:

determining, by a multimedia quality monitoring apparatus, reference quality of multimedia according to reference video quality and reference audio quality of the multimedia;

acquiring, by the multimedia quality monitoring apparatus, multimedia distortion quality after at least one of video distortion and audio distortion of the multimedia occurs; and

determining, by the multimedia quality monitoring apparatus, quality of the multimedia according to the reference quality of the multimedia and the multimedia distortion quality;

wherein the multimedia distortion quality comprises: multimedia distortion quality due to at least one of packet loss and rebuffering; and

wherein acquiring the multimedia distortion quality after at least one of video

distortion and audio distortion of the multimedia occurs comprises:

determining, at least one of the following:

(a) according to the reference video quality and a video packet loss rate, video quality due to packet loss after a packet in a video of the multimedia is lost, and

(b) according to the reference audio quality and an audio packet loss rate, audio quality due to packet loss after a packet in an audio of the multimedia is lost;

acquiring the multimedia distortion quality due to at least one of the following:

(i) packet loss according to the video quality; and

(ii) rebuffing parameter, during a transmission process, of the multimedia;

wherein the rebuffering parameter comprises one or any combination of the following: a quantity of rebufferings, rebuffering duration, an impact factor between multiple rebufferings, and multimedia initial quality;

wherein acquiring the multimedia distortion quality due to rebuffering according to the rebuffering parameter, comprises: acquiring the multimedia distortion quality due to rebuffering AV_DR according to

$$AV_DR = (Audiovisual_Quality - MOS_MIN) \cdot \frac{\left(\frac{NR}{av7}\right)^{av8} \cdot \left(\frac{ARL}{av9}\right)^{av10} \cdot \left(\frac{MRF}{av11}\right)^{av12}}{1 + \left(\frac{NR}{av7}\right)^{av8} \cdot \left(\frac{ARL}{av9}\right)^{av10} \cdot \left(\frac{MRF}{av11}\right)^{av12}},$$

wherein Audiovisual_Quality is the multimedia initial quality, NR is the quantity of rebufferings, ARL is the rebuffering duration, MRF is the impact factor between multiple rebufferings, and av7, av8, av9, av10, av11 and av12 are constants.

8. The method according to claim 7, wherein determining the quality of the multimedia according to the reference quality of the multimedia and the multimedia distortion quality comprises:

determining a multimedia quality due to packet loss according to the reference quality of the multimedia and the multimedia distortion quality due to packet loss; and

determining the quality of the multimedia according to the reference quality of the multimedia or the multimedia quality due to packet loss, and the multimedia distortion quality due to rebuffering.

9. The method according to claim 8, wherein determining the multimedia quality due to packet loss according to the reference quality of the multimedia and the multimedia distortion quality due to packet loss comprises:

determining the multimedia quality due to packet loss AV_MOSP according to

AV_MOSP=AV_MOSC−AV_DP, wherein AV_MOSC is the reference quality of the multimedia, and AV_DP is the multimedia distortion quality due to packet loss.

10. The method according to claim 8, wherein determining the quality of the multimedia according to the reference quality of the multimedia or the multimedia quality due to packet loss, and the multimedia distortion quality due to rebuffering comprises:

determining the quality AV_MOSR of the multimedia according to AV_MOSR=Audiovisual_Quality−AV_DR, wherein Audiovisual_Quality is the reference quality of the multimedia or the multimedia quality due to packet loss, and AV_DR is the multimedia distortion quality due to rebuffering.

11. A multimedia quality monitoring apparatus comprising a processor and a memory, wherein the memory stores an instruction that enables the processor to implement the following operations:

determining reference quality of multimedia according to reference video quality and reference audio quality of the multimedia;

acquiring multimedia distortion quality after at least one of video distortion and audio distortion of the multimedia occurs; and

determining quality of the multimedia according to the reference quality of the multimedia and the multimedia distortion quality;

wherein the multimedia distortion quality comprises: multimedia distortion quality due to at least one of packet loss and rebuffering; and

wherein acquiring the multimedia distortion quality after at least one of video distortion and audio distortion of the multimedia occurs comprises:

determining, at least one of the following:

(a) according to the reference video quality and a video packet loss rate, video quality due to packet loss after a packet in a video of the multimedia is lost, and

(b) according to the reference audio quality and an audio packet loss rate, audio quality due to packet loss after a packet in an audio of the multimedia is lost;

acquiring the multimedia distortion quality due to at least one of the following:

(i) packet loss according to the video quality; and

(ii) rebuffing parameter, during a transmission process, of the multimedia;

wherein acquiring the multimedia distortion quality due to at least one of the video quality due to packet loss and the audio quality due to packet loss comprises:

determining at least one of video distortion quality due to packet loss and audio packet loss distortion quality due to packet loss, wherein the video distortion quality due to

packet loss is determined according to the video quality due to packet loss and the reference video quality, and the audio packet loss distortion quality due to packet loss is determined according to the audio quality due to packet loss and the reference audio quality;

determining at least one of a video packet loss distortion factor and an audio packet loss distortion factor, wherein the video packet loss distortion factor is determined according to the video distortion quality due to packet loss and the reference video quality, and the audio packet loss distortion factor is determined according to the audio packet loss distortion quality and the reference audio quality;

determining a multimedia packet loss distortion factor according to at least one of the video packet loss distortion factor and the audio packet loss distortion factor; and

determining the multimedia distortion quality due to packet loss according to the multimedia packet loss distortion factor and the reference quality of the multimedia.

12. The apparatus according to claim 11, wherein determining the reference quality of the multimedia according to the reference video quality and the reference audio quality of the multimedia comprises:

determining the reference quality of the multimedia according to AV_MOSC=av1·V_MOSC+av2·A_MOSC+av3·V_MOSC·A_MOSC+av4, wherein

AV_MOSC is the reference quality of the multimedia, V_MOSC is the reference video quality, A_MOSC is the reference audio quality, and av1, av2, av3, and av4 are constants.

13. The apparatus according to claim 11, wherein determining the video distortion quality due to packet loss according to the video quality due to packet loss and the reference video quality, and determining the audio packet loss distortion quality according to the audio quality due to packet loss and the reference audio quality comprises:

determining the video distortion quality due to packet loss V_DP according to V_DP=V_MOSC−Video_MOS, wherein V_MOSC is the reference video quality, and Video_MOS is the video quality due to packet loss; and

determining the audio packet loss distortion quality A_DP according to A_DP=A_MOSC−Audio_MOS, wherein A_MOSC is the reference audio quality, and Audio_MOS is the audio quality due to packet loss.

14. The apparatus according to claim 11, wherein determining the video packet loss distortion factor according to the video distortion quality due to packet loss and the reference video quality, and determining the audio packet loss distortion factor according to the audio packet loss distortion quality and the reference audio quality comprises at least one

of the following:

(a) determining the video packet loss distortion factor AV_DFV according to

$$AV_DFV = \frac{V_DP}{V_MOSC} \text{ or } AV_DFV = \frac{V_MOSC - Video_MOS}{V_MOSC},$$

wherein V_MOSC is the reference video quality, and V_DP is the video distortion quality due to packet loss; and

(b) determining the audio packet loss distortion factor AV_DFA according to

$$AV_DFA = \frac{A_DP}{A_MOSC} \text{ or } AV_DFA = \frac{A_MOSC - Audio_MOS}{A_MOSC},$$

wherein A_MOSC is the reference audio quality, and A_DP is the audio packet loss distortion quality.

15. The apparatus according to claim 11, wherein determining the multimedia packet loss distortion factor according to the video packet loss distortion factor and the audio packet loss distortion factor comprises:

determining the multimedia packet loss distortion factor AV_DF according to

$$\frac{av5 \cdot AV_DFV + av6 \cdot AV_DFA}{1 + av5 \cdot AV_DFV + av6 \cdot AV_DFA}$$

wherein AV_DFA is the audio packet loss distortion factor, AV_DFV is the video packet loss distortion factor, and av5, av6 and av7 are constants.

16. The apparatus according to claim 11, wherein determining the multimedia distortion quality due to packet loss according to the multimedia packet loss distortion factor and the reference quality of the multimedia comprises:

determining the multimedia distortion quality due to packet loss AV_DP according to AV_DP=(AV_MOSC−MOS_MIN)·AV_DF, wherein AV_MOSC is the reference quality of the multimedia, MOS_MIN is lowest quality of the multimedia, and AV_DF is the multimedia packet loss distortion factor,

wherein AV_MOSC is the reference quality of the multimedia, MOS_MIN is lowest quality of the multimedia, and AV_DF is the multimedia packet loss distortion factor.

17. A multimedia quality monitoring apparatus comprising a processor and a memory, wherein the memory stores an instruction that enables the processor to implement the following operations:

determining reference quality of multimedia according to reference video quality and reference audio quality of the multimedia;

acquiring multimedia distortion quality after at least one of video distortion and

audio distortion of the multimedia occurs; and

determining quality of the multimedia according to the reference quality of the multimedia and the multimedia distortion quality;

wherein the multimedia distortion quality comprises: multimedia distortion quality due to at least one of packet loss and rebuffering; and

wherein acquiring the multimedia distortion quality after at least one of video distortion and audio distortion of the multimedia occurs comprises:

determining, at least one of the following:

(a) according to the reference video quality and a video packet loss rate, video quality due to packet loss after a packet in a video of the multimedia is lost, and

(b) according to the reference audio quality and an audio packet loss rate, audio quality due to packet loss after a packet in an audio of the multimedia is lost;

acquiring the multimedia distortion quality due to at least one of the following:

(i) packet loss according to the video quality; and

(ii) rebuffing parameter, during a transmission process, of the multimedia;

wherein the rebuffering parameter comprises one or any combination of the following: a quantity of rebufferings, rebuffering duration, an impact factor between multiple rebufferings, and multimedia initial quality;

wherein acquiring the multimedia distortion quality due to rebuffering according to the rebuffering parameter, comprises: acquiring the multimedia distortion quality due to rebuffering AV_DR according to

$$AV_DR = (Audiovisual_Quality - MOS_MIN) \cdot \frac{\left(\frac{NR}{av7}\right)^{av8} \cdot \left(\frac{ARL}{av9}\right)^{av10} \cdot \left(\frac{MRF}{av11}\right)^{av12}}{1 + \left(\frac{NR}{av7}\right)^{av8} \cdot \left(\frac{ARL}{av9}\right)^{av10} \cdot \left(\frac{MRF}{av11}\right)^{av12}},$$

wherein Audiovisual_Quality is the multimedia initial quality, NR is the quantity of rebufferings, ARL is the rebuffering duration, MRF is the impact factor between multiple rebufferings, and av7, av8, av9, av10, av11 and av12 are constants.

18. The apparatus according to claim 17, wherein determining the quality of the multimedia according to the reference quality of the multimedia and the multimedia distortion quality comprises:

determining a multimedia quality due to packet loss according to the reference quality of the multimedia and the multimedia distortion quality due to packet loss; and

determining the quality of the multimedia according to the reference quality of the

multimedia or the multimedia quality due to packet loss, and the multimedia distortion quality due to rebuffering.

19. The apparatus according to claim 18, wherein determining the multimedia quality due to packet loss according to the reference quality of the multimedia and the multimedia distortion quality due to packet loss comprises:

determining the multimedia quality due to packet loss AV_MOSP according to AV_MOSP=AV_MOSC−AV_DP, wherein AV_MOSC is the reference quality of the multimedia, and AV_DP is the multimedia distortion quality due to packet loss.

20. The apparatus according to claim 18, wherein determining the quality of the multimedia according to the reference quality of the multimedia or the multimedia quality due to packet loss, and the multimedia distortion quality due to rebuffering comprises:

determining the quality AV_MOSR of the multimedia according to AV_MOSR=Audiovisual_Quality−AV_DR, wherein Audiovisual_Quality is the reference quality of the multimedia or the multimedia quality due to packet loss, and AV_DR is the multimedia distortion quality due to rebuffering.

21. A method for acquiring a multimedia distortion quality due to packet loss, the method comprising:

determining at least one of (a) a video distortion quality due to packet loss and (b) an audio packet loss distortion quality due to packet loss, where the video distortion quality is determined according to a video quality due to packet loss and a reference video quality, and the audio packet loss distortion quality is determined according to an audio quality due to packet loss and a reference audio quality;

determining at least one of (a) a video packet loss distortion factor and (b) an audio packet loss distortion factor, where the video packet loss distortion factor is determined according to the video distortion quality and the reference video quality, and the audio packet loss distortion factor is determined according to the audio packet loss distortion quality and the reference audio quality;

determining a multimedia packet loss distortion factor according to at least one of the video packet loss distortion factor and the audio packet loss distortion factor; and

determining the multimedia distortion quality due to packet loss according to the multimedia packet loss distortion factor and the reference quality of the multimedia.

22. A method for acquiring a multimedia distortion quality due to packet loss due to rebuffering according to a rebuffering parameter, the method comprising:

acquiring a multimedia distortion quality due to rebuffering AV_DR according to

$$AV_DR = (Audiovisual_Quality - MOS_MIN) \cdot \frac{\left(\frac{NR}{av7}\right)^{av8} \cdot \left(\frac{ARL}{av9}\right)^{av10} \cdot \left(\frac{MRF}{av11}\right)^{av12}}{1 + \left(\frac{NR}{av7}\right)^{av8} \cdot \left(\frac{ARL}{av9}\right)^{av10} \cdot \left(\frac{MRF}{av11}\right)^{av12}},$$

wherein Audiovisual_Quality is a multimedia initial quality, NR is a quantity of rebufferings, ARL is a rebuffering duration, MRF is an impact factor between multiple rebufferings, and av7, av8, av9, av10, av11 and av12 are constants.

23. A multimedia quality monitoring apparatus comprising a processor and a memory, wherein the memory stores an instruction that enables the processor to implement the following operations to acquire a multimedia distortion quality due to packet loss, the operations comprising:

determining at least one of (a) a video distortion quality due to packet loss and (b) an audio packet loss distortion quality due to packet loss, where the video distortion quality is determined according to a video quality due to packet loss and a reference video quality, and the audio packet loss distortion quality is determined according to an audio quality due to packet loss and a reference audio quality;

determining at least one of (a) a video packet loss distortion factor and (b) an audio packet loss distortion factor, where the video packet loss distortion factor is determined according to the video distortion quality and the reference video quality, and the audio packet loss distortion factor is determined according to the audio packet loss distortion quality and the reference audio quality;

determining a multimedia packet loss distortion factor according to at least one of the video packet loss distortion factor and the audio packet loss distortion factor; and

determining the multimedia distortion quality due to packet loss according to the multimedia packet loss distortion factor and the reference quality of the multimedia.

24. A multimedia quality monitoring apparatus comprising a processor and a memory, wherein the memory stores an instruction that enables the processor to implement the following operations to acquire a multimedia distortion quality due to packet loss, due to rebuffering according to a rebuffering parameter, the operations comprising:

acquiring a multimedia distortion quality due to rebuffering AV_DR according to

$$AV_DR = (Audiovisual_Quality - MOS_MIN) \cdot \frac{\left(\frac{NR}{av7}\right)^{av8} \cdot \left(\frac{ARL}{av9}\right)^{av10} \cdot \left(\frac{MRF}{av11}\right)^{av12}}{1 + \left(\frac{NR}{av7}\right)^{av8} \cdot \left(\frac{ARL}{av9}\right)^{av10} \cdot \left(\frac{MRF}{av11}\right)^{av12}},$$

wherein Audiovisual_Quality is a multimedia initial quality, NR is a quantity of rebufferings, ARL is a rebuffering duration, MRF is an impact factor between multiple rebufferings, and av7, av8, av9, av10, av11 and av12 are constants