

A WIRELESS COMMUNICATION METHOD AND A WIRELESS HEADSET**TECHNICAL FIELD**

[0001] The present disclosure generally relates to a wireless communication method and a wireless headset.

BACKGROUND

[0002] Esports, short for electronic sports, refers to organized, competitive video gaming. In esports competition setup, gaming machines are connected to the gaming server. Headsets are normally used by players in competition. In the conventional setup, players typically use a Voice over Internet Protocol (VoIP) software (e.g. Discord) to chat among themselves during a competition. There is inherent latency due to communication between gaming machines and network server.

[0003] Therefore, there exists a need to provide an improved wireless communication method for wireless headsets.

SUMMARY

[0004] According to a first aspect of the present disclosure, a wireless communication method is provided. The method includes: communicating with a computing device, by a primary headset connected with the computing device, to obtain parameters for configuring a wireless network of transmitting and receiving audio data; configuring, by the primary headset, the wireless network; connecting and providing, by the primary headset, the parameters to one or more secondary headsets for joining the wireless network; and communicating audio data between the primary headset and the one or more secondary headsets via the wireless network.

[0005] According to a second aspect of the present disclosure, a wireless headset is provided. The wireless headset includes at least one memory; and at least one processor communicatively coupled to the at least one memory and configured to: communicate with a computing device connected with the wireless headset, to obtain parameters for configuring a wireless network of transmitting and receiving audio data, the wireless headset being a primary headset; configure the wireless network; connect and provide the parameters to one or more

secondary headsets for joining the wireless network; and communicate audio data with the one or more secondary headsets via the wireless network.

[0006] According to a third aspect of the present disclosure, a computer program element is provided. The computer program element comprises program instructions, which, when executed by one or more processors, cause the one or more processors to perform the method as described herein.

[0007] According to a fourth aspect of the present disclosure, a computer-readable medium is provided. The computer-readable medium comprises program instructions, which, when executed by one or more processors, cause the one or more processors to perform the method as described herein.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] Embodiments of the present disclosure will be better understood and readily apparent to one of ordinary skill in the art from the following written description, by way of example only, and in conjunction with the drawings, in which:

FIG. 1 is a flowchart showing a wireless communication method according to various embodiments of the present disclosure;

FIG. 2 is a flowchart showing a wireless communication method according to various embodiments of the present disclosure;

FIG. 3A is a block diagram depicting an exemplary system using a wireless communication method according to various embodiments of the present disclosure; FIG. 3B depicts audio data transmission of the exemplary system of FIG. 3A; FIGS. 3C and 3D show an exemplary system using a wireless communication method according to various embodiments of the present disclosure;

FIG. 4A shows a schematic diagram depicting a wireless headset according to various embodiments of the present disclosure; FIG. 4B depicts data transmission of the wireless headset of FIG. 4A;

FIG. 5A shows a schematic diagram depicting a wireless headset according to various embodiments of the present disclosure; FIG. 5B depicts data transmission of the wireless headset of FIG. 5A; and

FIG. 6 a block diagram showing an example computing device, according to various embodiments of the present disclosure.

DETAILED DESCRIPTION

[0009] Embodiments described below in the context of a method are analogously valid for the respective element, device, apparatus, or system, and *vice versa*. Furthermore, it will be understood that the embodiments described below may be combined, for example, a part of one embodiment may be combined with a part of another embodiment, and a part of one embodiment may be combined with a part of another embodiment.

[00010] It should be understood that the singular terms "a", "an", and "the" include plural references unless context clearly indicates otherwise. Similarly, the word "or" is intended to include "and" unless the context clearly indicates otherwise.

[00011] It will be further understood that the terms "comprise" (and any form of comprise, such as "comprises" and "comprising"), "have" (and any form of have, such as "has" and "having"), "include" (and any form of include, such as "includes" and "including"), and "contain" (and any form of contain, such as "contains" and "containing") are open-ended linking verbs. As a result, a method or device that "comprises," "has," "includes" or "contains" one or more steps or elements possesses those one or more steps or elements, but is not limited to possessing only those one or more steps or elements. Likewise, a step of a method or an element of a device that "comprises," "has," "includes" or "contains" one or more features possesses those one or more features, but is not limited to possessing only those one or more features. Furthermore, a device or structure that is configured in a certain way is configured in at least that way, but may also be configured in ways that are not listed.

[00012] Approximating language, as used herein throughout the specification and claims, may be applied to modify any quantitative representation that could permissibly vary without resulting in a change in the basic function to which it is related. Accordingly, a value modified by a term or terms, such as "about," "substantially", is not limited to the precise value specified but within tolerances that are acceptable for operation of the embodiment for an application for which it is intended. In some instances, the approximating language may correspond to the precision of an instrument for measuring the value.

[00013] The term "exemplary" may be used herein to mean "serving as an example, instance, or illustration". Any aspect or design described herein as "exemplary" is not necessarily to be construed as preferred or advantageous over other aspects or designs.

[00014] The terms "at least one" and "one or more" may be understood to include a numerical quantity greater than or equal to one (e.g., one, two, three, four, [...], etc.). The term "a plurality" may be understood to include a numerical quantity greater than or equal to two (e.g., two, three, four, five, [...], etc.). The phrase "at least one of" with regard to a group of elements may be used herein to mean at least one element from the group consisting of the

elements. For example, the phrase “at least one of” with regard to a group of elements may be used herein to mean a selection of: one of the listed elements, a plurality of one of the listed elements, a plurality of individual listed elements, or a plurality of a multiple of listed elements.

[00015] The term “first”, “second”, “third” detailed herein are used to distinguish one element from another similar element and may not necessarily denote order or relative importance, unless otherwise stated. For example, a first transaction data, a second transaction data may be used to distinguish two transactions based on two different foreign currency exchange.

[00016] The term “data” as used herein may be understood to include information in any suitable analog or digital form, e.g., provided as a file, a portion of a file, a set of files, a signal or stream, a portion of a signal or stream, a set of signals or streams, and the like. Further, the term “data” may also be used to mean a reference to information, e.g., in form of a pointer. The term “data”, however, is not limited to the aforementioned examples and may take various forms and represent any information as understood in the art. Any type of information, as described herein, may be handled for example via one or more processors in a suitable way, e.g. as data. The term “audio data” refers to analog or digital information that represents sound in a format suitable for storage, transmission, and processing by electronic devices. In the context of various embodiments, audio data may refer to signals captured and/or processed by the headsets including voices.

[00017] The term “computing device” may be used herein to mean any suitable device and/or system such as, by way of example and not as a limitation, a personal computer, a laptop, a game console, a mobile phone and the like.

[00018] The term “headset” may be used herein to mean any suitable system and/or device that receives/transmits (i.e. transceives) and/or processes audio signals, such as, by way of example and not as a limitation, a pair of audio devices worn on or around a user’s head, consisting of speakers (or headphones) and a microphone for various purposes such as communication, gaming, listening to music, and more.

[00019] As used herein, the term “primary headset” may refer to a main and controlling headset that configures a wireless network of transmitting and receiving audio data and controls access of the wireless network. The term “secondary headset” may refer to a following headset that connects to the wireless network after being authorized by the primary headset.

[00020] As used herein, the term “connect/connected/connection” may refer to a wired or wireless communication link formed between electronic devices that enables data transmission.

[00021] The terms “processor” or “controller” as, for example, used herein may be understood as any kind of entity that allows handling data. The data may be handled according to one or more specific functions executed by the processor or controller. Further, a processor or controller as used herein may be understood as any kind of circuit, e.g., any kind of analog or digital circuit. A processor or a controller may thus be or include an analog circuit, digital circuit, mixed-signal circuit, logic circuit, processor, microprocessor, Central Processing Unit (CPU), Graphics Processing Unit (GPU), Digital Signal Processor (DSP), Field Programmable Gate Array (FPGA), integrated circuit, Application Specific Integrated Circuit (ASIC), etc., or any combination thereof. Any other kind of implementation of the respective functions, which will be described below in further detail, may also be understood as a processor, controller, or logic circuit. It is understood that any two (or more) of the processors, controllers, or logic circuits detailed herein may be realized as a single entity with equivalent functionality or the like, and conversely that any single processor, controller, or logic circuit detailed herein may be realized as two (or more) separate entities with equivalent functionality or the like.

[00022] The term “memory” detailed herein may be understood to include any suitable type of memory or memory device, e.g., a hard disk drive (HDD), a solid-state drive (SSD), a flash memory, etc.

[00023] Various techniques may be described herein in the general context of software, hardware elements, or program modules. Generally, such modules include routines, programs, objects, elements, components, data structures, and so forth that perform particular tasks or implement particular abstract data types. The terms “module,” “functionality,” and “component” as used herein generally represent software, firmware, hardware, or a combination thereof. The features of the techniques described herein are platform independent, meaning that the techniques may be implemented on a variety of commercial computing platforms having a variety of processors.

[00024] Unless specifically stated otherwise, and as apparent from the following, it will be appreciated that throughout the present specification, description or discussions utilizing terms such as “performing”, “configuring”, “generating”, “determining”, “detecting” or the like, refer to the actions and processes of a computer system, or similar electronic device, that manipulates and transforms data represented as physical quantities within the computer system into other

data similarly represented as physical quantities within the computer system or other information storage, transmission or display devices.

[00025] Various embodiments of what is described here seek to provide a wireless communication method. The method may include communicating with a computing device, by a primary headset connected with the computing device, to obtain parameters for configuring a wireless network of transmitting and receiving audio data. The primary headset may be determined by any of the primary headset and one or more secondary headsets in close proximity before it communicates with the connected computing device. In other words, the primary headset, being an updated primary headset, may be dynamically determined by the headsets (including the primary headset and the one or more secondary headsets in the close proximity), one of which was a (preceding) primary headset before the updated primary headset is determined. The updated primary headset may be / may not be the preceding primary headset. In some embodiments, the primary and secondary headsets may be configured with parameters for configuring a wireless network of transmitting and receiving audio data beforehand and they may be able to form a wireless network without the intervention of a computing device.

[00026] In some embodiments, the updated primary headset may be dynamically determined based on signal strength of received audio data. Each of the headsets (including the primary headset and the one or more secondary headsets in the close proximity) may broadcast test audio data to the other headsets (e.g. except itself) via a (preceding) wireless network (set up by the preceding primary headset), and the preceding primary headset may record signal strength for each test audio data and determine the updated primary headset (i.e. the abovementioned primary headset) from the headsets, the test audio data received by which having highest signal strength. The updated primary headset may communicate (e.g. broadcast) audio data more efficiently and effectively so as to maintain an efficient and effective communication and provide a better user experience.

[00027] In other embodiments, the updated primary headset may be dynamically determined based on locations of the headsets (including the primary headset and the one or more secondary headsets in the close proximity). The headset may occupy a space (i.e. users of the headset may occupy a space), that is, a space defined by the locations of the headsets. The headset located in a center position of the space may be determined as the updated primary headset. The center position of the space may refer to a location where a headset is situated nearest to the center of the space. That is, the center position may be / may not be the center of the space, but may be nearest to the center of the space in comparison with the locations of the

other headsets. Similarly, the updated primary headset may communicate (e.g. broadcast) audio data more efficiently and effectively so as to maintain an efficient and effective communication and provide a better user experience.

[00028] In various embodiments, the present method may include configuring, by the (updated) primary headset, the wireless network; connecting and providing, by the primary headset, the parameters to one or more secondary headsets for joining the wireless network; and communicating audio data between the primary headset and the one or more secondary headsets via the wireless network. The primary headset may control access of the wireless network by providing the parameters (e.g. access code, network name, network password) to selected headsets (i.e. the one or more secondary headsets). The one or more secondary headset may use the parameters provided to join (e.g. access) the wireless network so as to transceive audio data. The present disclosure provides an efficient and effective wireless communication method (e.g. via a local wireless network) which reduces or avoids inherent latency of communication between the headsets/computing devices connected with the headsets and the network server.

[00029] The following examples pertain to various aspects of the present disclosure.

[00030] Example 1 is a wireless communication method, including: communicating with a computing device, by a primary headset connected with the computing device, to obtain parameters for configuring a wireless network of transmitting and receiving audio data; configuring, by the primary headset, the wireless network; connecting and providing, by the primary headset, the parameters to one or more secondary headsets for joining the wireless network; and communicating audio data between the primary headset and the one or more secondary headsets via the wireless network.

[00031] In Example 2, the subject matter of Example 1 may optionally include broadcasting audio data, by the primary headset, to the one or more secondary headsets via the wireless network.

[00032] In Example 3, the subject matter of Example 1 or Example 2 may optionally include broadcasting test audio data by each of the primary headset and the one or more secondary headsets via the wireless network; recording signal strength for each test audio data; determining an updated primary headset from the primary headset and the one or more secondary headsets, the test audio data received by which having highest signal strength.

[00033] In Example 4, the subject matter of any of Examples 1 to 3 may optionally include that the parameters for configuring a wireless network of transmitting and receiving audio data comprise a unique group identifier for the wireless network.

[00034] In Example 5, the subject matter of any of Examples 1 to 4 may optionally include that the primary headset and the one or more secondary headsets are located in close proximity, the method further comprising: determining a location for each of the primary headset and the one or more secondary headsets in close proximity; determining an updated primary headset from the primary headset and the one or more secondary headsets based on the locations of the primary headset and the one or more secondary headsets.

[00035] In Example 6, the subject matter of Example 5 may optionally include that the updated primary headset is in a middle point of a space occupied by the primary headset and the one or more secondary headsets.

[00036] In Example 7, the subject matter of any of Examples 1 to 6 may optionally include combining, by the primary headset, audio data from the one or more secondary headsets via the wireless network; and transmitting the combined audio data to the one or more secondary headsets via the wireless network.

[00037] In Example 8, the subject matter of any of Examples 1 to 7 may optionally include that the wireless network operates as a Wi-Fi network, a Bluetooth network, an Infrared (IR) network, a Near Field Communication (NFC) network, an Ultra-Wideband (UWB) network or a millimeter wave (mmWave) network.

[00038] In Example 9, the subject matter of any of Examples 1 to 8 may optionally include that the wireless network is different from a network where the primary headset communicates with the computing device.

[00039] Example 10 is a wireless headset comprising: at least one memory; and at least one processor communicatively coupled to the at least one memory and configured to: communicate with a computing device connected with the wireless headset, to obtain parameters for configuring a wireless network of transmitting and receiving audio data, the wireless headset being a primary headset; configure the wireless network; connect and provide the parameters to one or more secondary headsets for joining the wireless network; and communicate audio data with the one or more secondary headsets via the wireless network.

[00040] In Example 11, the subject matter of Example 10 may optionally include that the at least one processor is further configured to: broadcast audio data to the one or more secondary headsets via the wireless network.

[00041] In Example 12, the subject matter of Example 10 or Example 11 may optionally include that the at least one processor is further configured to: broadcast test audio data to the one or more secondary headsets via the wireless network; receive test audio data from each of the one or more secondary headsets via the wireless network; record signal strength for each

test audio data; determine an updated primary headset from the primary headset and the one or more secondary headsets, the test audio data received by which having highest signal strength.

[00042] In Example 13, the subject matter of any of Examples 10 to 12 may optionally include that the parameters for configuring a wireless network of transmitting and receiving audio data comprise a unique group identifier for the wireless network.

[00043] In Example 14, the subject matter of any of Examples 10 to 13 may optionally include that the at least one processor is further configured to: determine a location for the primary headset and obtain a location for each of the one or more secondary headsets in close proximity of the primary headset; determine an updated primary headset from the primary headset and the one or more secondary headsets based on the locations of the primary headset and the one or more secondary headsets.

[00044] In Example 15, the subject matter of Example 14 may optionally include that the updated primary headset is in a middle point of a space occupied by the primary headset and the one or more secondary headsets.

[00045] In Example 16, the subject matter of any of Examples 10 to 15 may optionally include that the at least one processor is further configured to: combine audio data from the one or more secondary headsets via the wireless network; and transmit the combined audio data to the one or more secondary headsets via the wireless network.

[00046] In Example 17, the subject matter of any of Examples 10 to 16 may optionally include that the wireless network operates as a Wi-Fi network, a Bluetooth network, an Infrared (IR) network, a Near Field Communication (NFC) network, an Ultra-Wideband (UWB) network or a millimeter wave (mmWave) network.

[00047] In Example 18, the subject matter of any of Examples 10 to 17 may optionally include that the wireless network is different from a network where the primary headset communicates with the computing device.

[00048] Example 19 is a computer program element comprising program instructions, which, when executed by one or more processors, cause the one or more processors to perform the method of any one of Examples 1 to 9.

[00049] Example 20 is a computer-readable medium comprising program instructions, which, when executed by one or more processors, cause the one or more processors to perform the method of any one of Examples 1 to 9.

[00050] FIG. 1 is a flowchart showing a wireless communication method 100 according to various embodiments of the present disclosure.

[00051] According to various non-limiting embodiments, the wireless communication method 100 may include communicating with a computing device, by a primary headset connected with the computing device, to obtain parameters for configuring a wireless network of transmitting and receiving audio data (step 102); configuring, by the primary headset, the wireless network (step 104); connecting and providing, by the primary headset, the parameters to one or more secondary headsets for joining the wireless network (step 106); and communicating audio data between the primary headset and the one or more secondary headsets via the wireless network (step 108).

[00052] According to various non-limiting embodiments, the primary headset may be configured to send a request to the computing device to request parameters for configuring a wireless network of transmitting and receiving audio data, and the computing device may be pre-installed an application configured to provide the parameters for configuring the wireless network of transmitting and receiving audio data to the primary headset upon request. In some embodiments, the primary headset may initiate the request to the computing device to request the parameters for configuring the wireless network of transmitting and receiving audio data after the primary headset detects a secondary headset. In some embodiments, the primary headset may initiate the request to the computing device to request the parameters for configuring the wireless network of transmitting and receiving audio data after the primary headset is determined as an updated primary headset as described below. In some embodiments, the primary headset may initiate the request to the computing device to request the parameters for configuring the wireless network of transmitting and receiving audio data in accordance with a user's instruction (e.g. by pressing a button on the primary headset).

[00053] According to various non-limiting embodiments, the parameters for configuring the wireless network of transmitting and receiving audio data may include a unique group identifier for the wireless network. The primary headset may provide the unique group identifier to the one or more secondary headsets for joining the wireless network. Accordingly, the primary headset and the one or more secondary headsets may form a group (e.g. a chat group) capable of transmitting and receiving audio data via the wireless network and any other headset without the unique group identifier may not communicate with the primary headset and the one or more secondary headsets via the wireless network. The parameters for configuring the wireless network of transmitting and receiving audio data may be implemented as access control and additionally or alternatively include access code, network name and/or passcode to the wireless network, whereby only headset (e.g. in turn a user thereof) which is provided with the parameters may join the wireless network. The primary headset may provide one or more of

the parameters to the one or more secondary headsets for joining the wireless network. In other words, the primary headset may obtain a set of parameters from the computing device for configuring a wireless network of transmitting and receiving audio data, only provide one or more parameters (e.g. the unique group identifier) of the set of parameters to the one or more secondary headsets for joining the wireless network, and the remaining parameter(s) may be used otherwise (e.g. for controlling a number of the secondary headsets).

[00054] According to various non-limiting embodiments, the method 100 may further include broadcasting audio data, by the primary headset, to the one or more secondary headsets via the wireless network.

[00055] According to various non-limiting embodiments, the method 100 may further include combining, by the primary headset, audio data from the one or more secondary headsets via the wireless network; and transmitting the combined audio data to the one or more secondary headsets via the wireless network.

[00056] According to various non-limiting embodiments, the wireless network may operate as a Wi-Fi network, a Bluetooth network, an Infrared (IR) network, a Near Field Communication (NFC) network, an Ultra-Wideband (UWB) network or a millimeter wave (mmWave) network.

[00057] According to various non-limiting embodiments, the wireless network may be different from a network where the primary headset communicates with the computing device.

[00058] According to various non-limiting embodiments, the primary headset and the one or more secondary headsets may be located in close proximity. For example, users of the primary headset and the one or more secondary headsets may be seated in a same room. The method 100 may further include determining a location for each of the primary headset and the one or more secondary headsets in close proximity; determining an updated primary headset from the primary headset and the one or more secondary headsets based on the locations of the primary headset and the one or more secondary headsets. The updated primary headset may be in a middle point of a space (e.g. the same room) occupied by the primary headset and the one or more secondary headsets. The term “middle point” may refer to a center or a substantially center of the space occupied by (the users of) the primary headset and the one or more secondary headsets and it may not refer to the absolute center of the space but a location nearest to the center where a user is seated. Advantageously, the updated primary headset may collectively reach the other headsets in a shortest distance, thereby providing an efficient communication and better user experience. More details will be described with reference to FIGS. 3C and 3D.

[00059] FIG. 2 is a flowchart showing a wireless communication method 200 according to various embodiments of the present disclosure.

[00060] According to various non-limiting embodiments, the wireless communication method 200 may include all the steps of method 1, that is, communicating with a computing device, by a primary headset connected with the computing device, to obtain parameters for configuring a wireless network of transmitting and receiving audio data (step 102); configuring, by the primary headset, the wireless network (step 104); connecting and providing, by the primary headset, the parameters to one or more secondary headsets for joining the wireless network (step 106); and communicating audio data between the primary headset and the one or more secondary headsets via the wireless network (step 108).

[00061] Features that are described in the context of the method 100 may correspondingly be applicable to the same or similar features in the method 200. Furthermore, additions and/or combinations and/or alternatives as described for a feature in the context of the method 100 may correspondingly be applicable to the same or similar feature in the method 200.

[00062] According to various non-limiting embodiments, the method 200 may further include broadcasting test audio data by each of the primary headset and the one or more secondary headsets via the wireless network (at step 202); recording signal strength for each test audio data (at step 204); determining an updated primary headset from the primary headset and the one or more secondary headsets, the test audio data received by which having highest signal strength (at step 206). That may mean that the method 200 includes a process to dynamically determine an updated primary headset based on signal strength. The signal strength may indicate a traffic status of a headset's channel through which audio data is transceived. Accordingly, stronger signal strength may represent a less busy channel. Hence, the updated primary headset having the highest signal strength may have a least busy channel which in turns may provide fast and efficient audio data transmission.

[00063] According to various non-limiting embodiments, the method 200 may repeatedly perform the steps 202, 204, and 206 to determine an updated primary secondary at periodic intervals.

[00064] FIG. 3A is a block diagram depicting an exemplary system 300 using 1 wireless communication method according to various embodiments of the present disclosure and FIG. 3B depicts audio data transmission of the exemplary system 300 of FIG. 3A;

[00065] According to various non-limiting embodiments, the system 300 may include a computing device (not shown), a primary headset 1 connected with the computing device and secondary headsets 2, 3, and 4. The secondary headsets 2, 3, 4, may each respectively connect

with a different computing device. Users of the primary headset 1, and the secondary headsets 2, 3, 4, may play a same computer game on the respective computing device (i.e. the computing device connected to the primary headset 1, and the other three different computing devices each of which respectively connects to the secondary headsets 2, 3, 4) and wish to form a chat group between them.

[00066] According to various non-limiting embodiments, a wireless headset (e.g. the primary headset 1 of FIG. 3A) may at least one memory and at least one processor communicatively coupled to the at least one memory and configured to: communicate with a computing device connected with the wireless headset, to obtain parameters for configuring a wireless network of transmitting and receiving audio data; configure the wireless network; connect and provide the parameters to one or more secondary headsets (e.g. the secondary headsets 2, 3, 4) for joining the wireless network; and communicate audio data with the one or more secondary headsets via the wireless network. The primary headset 1 may be configured to communicate with the computing device to obtain parameters for configuring a wireless network of transmitting and receiving audio data; configure the wireless network; connect and provide the parameters to the secondary headsets 2, 3, 4, for joining the wireless network; and communicate audio data with the secondary headsets 2, 3, 4, via the wireless network.

[00067] According to various non-limiting embodiments, the at least one processor may be further configured to: broadcast audio data to the one or more secondary headsets via the wireless network. The primary headset 1 may be configured to broadcast audio data to the secondary headsets 2, 3, 4, via the wireless network.

[00068] According to various non-limiting embodiments, the at least one processor may be further configured to: broadcast test audio data to the one or more secondary headsets via the wireless network; receive test audio data from each of the one or more secondary headsets via the wireless network; record signal strength for each test audio data; determine an updated primary headset from the primary headset and the one or more secondary headsets, the test audio data received by which having highest minimum signal strength. The test audio may be broadcasted to locate a headset which is located in a middle of the space occupied by all the headsets. The minimum signal strength received by each headset may be compared to determine the updated primary headset, the test audio data received by which having the highest minimum signal strength. In other words, the primary headset may change and be dynamically decided based on signal strength. For example, if the minimum signal strength of the test audio data received by the secondary headset 3 is recorded as the highest (i.e. the highest minimum signal strength), the secondary headset 3 may be determined as the updated primary headset

and perform the steps as the primary headset 1 does; and the primary headset 1 is now as a new secondary headset.

[00069] According to various non-limiting embodiments, the at least one processor may be configured to: combine audio data from the one or more secondary headsets via the wireless network, and transmit the combined audio data to the one or more secondary headsets via the wireless network. The primary headset 1 may be further configured to combine audio data (i.e. Voice 2, Voice 3, Voice 4) from the secondary headsets 2, 3, 4, via the wireless network (i.e. uplink), and transmit the combined audio data (i.e. Mixed voice) to the secondary headsets 2, 3, 4, via the wireless network (i.e. downlink) as shown in FIG. 3A. It should be appreciated that the audio data is not limited to voice as shown in FIG. 3A and shall include any sound signal. It also should be appreciated that the number of secondary headsets is not limited to three and shall include any capable number (e.g. n).

[00070] According to various non-limiting embodiments, the at least one processor may be further configured to: determine a location for the primary headset and obtain a location for each of the one or more secondary headsets in close proximity of the primary headset; determine an updated primary headset from the primary headset and the one or more secondary headsets based on the locations of the primary headset and the one or more secondary headsets. The at least one processor of the primary headset may determine the location for each of the one or more secondary headsets in close proximity of the primary headset (e.g. a relative location between the primary headset and the respective secondary headset) or receive the location for each of the one or more secondary headsets in close proximity of the primary headset (e.g. from each of the one or more secondary headsets). The updated primary headset may be in a middle point of a space occupied by the primary headset and the one or more secondary headsets. Similarly as above, the primary headset may change and be dynamically decided based on locations. An example is shown in FIGS. 3C and 3D.

[00071] FIG. 3B depicts audio data transmission of the system 300 of FIG. 3A. The audio data transmission may be sequential/consecutive for each of the secondary headsets 2, 3, 4, ... n. For example, in each connection interval, a first secondary headset (e.g. the secondary headset 2) may transmit audio data to the primary headset 1 (i.e. uplink) and receive audio data from the primary headset 1 (i.e. downlink); a second secondary headset (e.g. the secondary headset 3) may subsequently transmit audio data to the primary headset 1 (i.e. uplink) and receive audio data from the primary headset 1 (i.e. downlink); ...; and so forth. Each of the secondary headsets may be allocated an equal segment (e.g. for uplink and down link) of the connection interval.

[00072] FIGS. 3C and 3D shows the exemplary system 300 using a wireless communication method according to various embodiments of the present disclosure. As shown in FIG. 3C, the primary headset 1 and the secondary headsets 2, 3, 4, may be situated within a short distance (e.g. along a straight line) and communicate via a wireless network 301 set up by the primary headset 1 (e.g. as described hereinbefore). A further secondary headset 5 (e.g. physically situated at a further end of the straight line from the primary headset 1) may be provided with parameters of the wireless network 301 by the primary headset 1 and join the wireless network 301. This may initiate a change of primary headset (e.g. by a request from the secondary headset 5), and an updated primary headset (e.g. the secondary headset 3) may be determined by the primary headset 1 based on the locations (e.g. at a new middle point of the straight line). The updated primary headset may proceed to configure a wireless network 301' in accordance with the method (e.g. the method 100) as described hereinbefore.

[00073] FIG. 4A shows a schematic diagram depicting a wireless headset 400 according to various embodiments of the present disclosure. Features that are described in the context of the primary headset 1 may correspondingly be applicable to the same or similar features in the headset 400 and *vice versa*. Furthermore, additions and/or combinations and/or alternatives as described for a feature in the context of the primary headset 1 may correspondingly be applicable to the same or similar feature in the headset 400 and *vice versa*.

[00074] According to various non-limiting embodiments, the headset 400, being a primary headset, may be configured to communicate with a computing device 403 to obtain parameters for configuring a second wireless network 402 of transmitting and receiving audio data via a first network 401; configure the second wireless network 402; connect and provide the parameters to the secondary headset(s) 404, for joining the second wireless network 402; and communicate audio data with the secondary headset(s) 404, via the second wireless network 402. The first wireless network 401 and the second wireless network 402 may be different.

[00075] According to various non-limiting embodiments, the wireless networks 401, 402, may separately operate as a Wi-Fi network, a Bluetooth network, an Infrared (IR) network, a Near Field Communication (NFC) network, an Ultra-Wideband (UWB) network or a millimeter wave (mmWave) network.

[00076] According to various non-limiting embodiments, the headset 400 may include a single radio frequency (RF) system-on-chip (SoC) 410 handling both connection with the computing device 403 and connection with the secondary headsets 404. The RF bandwidth may be shared between the two connections using a time division method as shown in FIG.

4B. That is, the two connections may be sequentially transceived via the first wireless network 401 and the second wireless network 402 as shown in FIG. 4B.

[00077] FIG. 5A shows a schematic diagram depicting a wireless headset 500 according to various embodiments of the present disclosure. Features that are described in the context of the primary headset 1, the headset 400 may correspondingly be applicable to the same or similar features in the headset 500 and *vice versa*. Furthermore, additions and/or combinations and/or alternatives as described for a feature in the context of the primary headset 1, the headset 400 may correspondingly be applicable to the same or similar feature in the headset 500 and *vice versa*.

[00078] According to various non-limiting embodiments, the headset 500, being a primary headset, may be configured to communicate with a computing device 503 to obtain parameters for configuring a second wireless network 502 of transmitting and receiving audio data via a first network 501; configure the second wireless network 502; connect and provide the parameters to the secondary headset(s) 504, for joining the second wireless network 502; and communicate audio data with the secondary headset(s) 504, via the second wireless network 502. The first wireless network 501 and the second wireless network 502 may be different.

[00079] According to various non-limiting embodiments, the wireless networks 501, 502, may separately operate as a Wi-Fi network, a Bluetooth network, an Infrared (IR) network, a Near Field Communication (NFC) network, an Ultra-Wideband (UWB) network or a millimeter wave (mmWave) network.

[00080] According to various non-limiting embodiments, the headset 500 may include a first radio frequency (RF) system-on-chip (SoC) 510 handling connection with the computing device 503 and a second RF SoC 520 connection with the secondary headsets 504. The two connections may operate concurrently as shown in FIG. 5B. That is, the two connections may be parallelly transceived via the first wireless network 501 and the second wireless network 502 as shown in FIG. 5B.

[00081] FIG. 6 is a block diagram showing an example computing device 600, according to various embodiments of the present disclosure. The computing device 600 may be a laptop computer, a desktop computer, a tablet computer, an automobile computer, a gaming device, a smart phone, a personal digital assistant, a server or other computing devices capable of running computer applications. In some embodiments, the computing device 600 includes a processor 602, an input/output (I/O) module 604, memory 606, a power unit 608, and one or more network interfaces 610. The computing device 600 can include additional components. In some embodiments, the processor 602, input/output (I/O) module 604, memory 606, power

unit 608, and the network interface(s) 610 are housed together in a common housing or other assembly.

[00082] The example processor 602 can execute instructions, for example, to generate output data based on data inputs. The instructions can include programs, codes, scripts, modules, or other types of data stored in memory (e.g., memory 606). Additionally or alternatively, the instructions can be encoded as pre-programmed or re-programmable logic circuits, logic gates, or other types of hardware or firmware components or modules. The processor 602 may be, or may include, a multicore processor having a plurality of cores, and each such core may have an independent power domain and can be configured to enter and exit different operating or performance states based on workload. Additionally or alternatively, the processor 602 may be, or may include, a general-purpose microprocessor, as a specialized co-processor or another type of data processing apparatus. In some cases, the processor 602 performs high-level operation of the computing device 600. For example, the processor 602 may be configured to execute or interpret software, scripts, programs, functions, executables, or other instructions stored in the memory 606. In the context of various embodiments, the computing device 600 may include the example processor 602 configured to execute instructions to provide parameters for configuring a wireless network of transmitting and receiving audio data to a primary headset. The instructions may be stored in the memory 606 as an application 614 (an App).

[00083] The example I/O module 604 may include a mouse, keypad, touch screen, scanner, optical reader, and/or stylus (or other input device(s)) through which a user of the computing device 600 may provide input to the computing device 600, and may also include one or more speakers for providing audio output and a video display device for providing textual, audiovisual, and/or graphical output.

[00084] The example memory 606 may include computer-readable storage media, for example, a volatile memory device, a non-volatile memory device, or both. The memory 606 may include one or more read-only memory devices, random-access memory devices, buffer memory devices, or a combination of these and other types of memory devices. In some instances, one or more components of the memory can be integrated or otherwise associated with another component of the computing device 600. The memory 606 may store instructions that are executable by the processor 602. In some examples, the memory 606 may store instructions for an operating system 612 and for application programs 614. The memory 606 may also store a database 616.

[00085] The example power unit 608 provides power to the other components of the computing device 600. For example, the other components may operate based on electrical power provided by the power unit 608 through a voltage bus or other connection. In some embodiments, the power unit 608 includes a battery or a battery system, for example, a rechargeable battery. In some embodiments, the power unit 608 includes an adapter (e.g., an AC adapter) that receives an external power signal (from an external source) and converts the external power signal to an internal power signal conditioned for a component of the computing device 600. The power unit 608 may include other components or operate in another manner.

[00086] The computing device 600 may be configured to operate in a wireless, wired, or cloud network environment (or a combination thereof). In some embodiments, the computing device 600 can access the network using the network interface(s) 610. The network interface(s) 610 can include one or more adapters, modems, connectors, sockets, terminals, ports, slots, and the like. The wireless network that the computing device 600 accesses may operate, for example, according to a wireless network standard or another type of wireless communication protocol. For example, the wireless network may be configured to operate as a Wireless Local Area Network (WLAN), a Personal Area Network (PAN), a metropolitan area network (MAN), or another type of wireless network. Examples of WLANs include networks configured to operate according to one or more of the 802.11 family of standards developed by IEEE (e.g., Wi-Fi networks), and others. Examples of PANs include networks that operate according to short-range communication standards (e.g., BLUETOOTH®, Near Field Communication (NFC), ZigBee), millimeter wave communications, and others. The wired network that the computing device 600 accesses may, for example, include Ethernet, SONET, circuit-switched networks (e.g., using components such as SS7, cable, and the like), and others.

[00087] While this specification contains many details, these should not be understood as limitations on the scope of what may be claimed, but rather as descriptions of features specific to particular examples. Certain features that are described in this specification or shown in the drawings in the context of separate embodiments can also be combined. Conversely, various features that are described or shown in the context of a single embodiment can also be implemented in multiple embodiments separately or in any suitable sub-combination.

[00088] Similarly, while steps/operations of the methods as described above are depicted in a particular order (e.g. as shown in the drawings), this should not be understood as requiring that such operations/steps be performed in the particular order shown or in sequential order, or that all illustrated operations be performed, to achieve desirable results. In certain circumstances, multitasking and parallel processing may be advantageous. For example, some

operations/steps may occur in different orders and/or concurrently with other operations/steps apart from those illustrated and/or described herein. In addition, not all illustrated operations/steps may be required to implement one or more aspects or embodiments described herein. Also, one or more of the steps depicted herein may be carried out in one or more separate acts and/or phases.

[00089] Moreover, the separation/integration of various system components in the embodiments described above should not be understood as requiring such separation/integration in all embodiments, and it should be understood that the described program components and systems can generally be integrated together in a single product or separated into multiple products.

[00090] A number of embodiments have been described. Nevertheless, it will be understood that various modifications can be made. Accordingly, other embodiments are within the scope of the following claims.

CLAIMS

1. A wireless communication method comprising:
communicating with a computing device, by a primary headset connected with the computing device, to obtain parameters for configuring a wireless network of transmitting and receiving audio data;
configuring, by the primary headset, the wireless network;
connecting and providing, by the primary headset, the parameters to one or more secondary headsets for joining the wireless network; and
communicating audio data between the primary headset and the one or more secondary headsets via the wireless network.
2. The wireless communication method of claim 1, further comprising:
broadcasting audio data, by the primary headset, to the one or more secondary headsets via the wireless network.
3. The wireless communication method of claim 1 or claim 2, further comprising:
broadcasting test audio data by each of the primary headset and the one or more secondary headsets via the wireless network;
recording signal strength for each test audio data;
determining an updated primary headset from the primary headset and the one or more secondary headsets, the test audio data received by which having highest signal strength.
4. The wireless communication method of any of claims 1 to 3, wherein the parameters for configuring a wireless network of transmitting and receiving audio data comprise a unique group identifier for the wireless network.
5. The wireless communication method of any of claims 1 to 4, wherein the primary headset and the one or more secondary headsets are located in close proximity,
the method further comprising:
determining a location for each of the primary headset and the one or more secondary headsets in close proximity;

determining an updated primary headset from the primary headset and the one or more secondary headsets based on the locations of the primary headset and the one or more secondary headsets.

6. The wireless communication method of claim 5, wherein the updated primary headset is in a middle point of a space occupied by the primary headset and the one or more secondary headsets.

7. The wireless communication method of any of claims 1 to 6, further comprising:
combining, by the primary headset, audio data from the one or more secondary headsets via the wireless network; and
transmitting the combined audio data to the one or more secondary headsets via the wireless network.

8. The wireless communication method of any of claims 1 to 7, wherein the wireless network operates as a Wi-Fi network, a Bluetooth network, an Infrared (IR) network, a Near Field Communication (NFC) network, an Ultra-Wideband (UWB) network or a millimeter wave (mmWave) network.

9. The wireless communication method of any of claims 1 to 8, wherein the wireless network is different from a network where the primary headset communicates with the computing device.

10. A wireless headset comprising:
at least one memory; and
at least one processor communicatively coupled to the at least one memory
and configured to:
communicate with a computing device connected with the
wireless headset, to obtain parameters for configuring a wireless network of
transmitting and receiving audio data, the wireless headset being a primary
headset;
configure the wireless network;

connect and provide the parameters to one or more secondary headsets for joining the wireless network; and
communicate audio data with the one or more secondary headsets via the wireless network.

11. The wireless headset of claim 10, wherein the at least one processor is further configured to:

broadcast audio data to the one or more secondary headsets via the wireless network.

12. The wireless headset of claim 10 or claim 11, wherein the at least one processor is further configured to:

broadcast test audio data to the one or more secondary headsets via the wireless network;

receive test audio data from each of the one or more secondary headsets via the wireless network;

record signal strength for each test audio data;

determine an updated primary headset from the primary headset and the one or more secondary headsets, the test audio data received by which having highest signal strength.

13. The wireless headset of any of claims 10 to 12, wherein the parameters for configuring a wireless network of transmitting and receiving audio data comprise a unique group identifier for the wireless network.

14. The wireless headset of any of claims 10 to 13, wherein the at least one processor is further configured to:

determine a location for the primary headset and

obtain a location for each of the one or more secondary headsets in close proximity of the primary headset;

determine an updated primary headset from the primary headset and the one or more secondary headsets based on the locations of the primary headset and the one or more secondary headsets.

15. The wireless headset of claim 14, wherein the updated primary headset is in a middle point of a space occupied by the primary headset and the one or more secondary headsets.

16. The wireless headset of any of claims 10 to 15, wherein the at least one processor is further configured to:
combine audio data from the one or more secondary headsets via the wireless network; and
transmit the combined audio data to the one or more secondary headsets via the wireless network.

17. The wireless headset of any of claims 10 to 16, wherein the wireless network operates as a Wi-Fi network, a Bluetooth network, an Infrared (IR) network, a Near Field Communication (NFC) network, an Ultra-Wideband (UWB) network or a millimeter wave (mmWave) network.

18. The wireless headset of any of claims 10 to 17, wherein the wireless network is different from a network where the primary headset communicates with the computing device.

19. A computer program element comprising program instructions, which, when executed by one or more processors, cause the one or more processors to perform the method of any one of claims 1 to 9.

20. A computer-readable medium comprising program instructions, which, when executed by one or more processors, cause the one or more processors to perform the method of any one of claims 1 to 9.