United States Patent	12395814
Kind Code	B2
Date of Patent	August 19, 2025
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Electronic device, and method for grouping external devices by space in electronic device

Abstract

An electronic device includes a first communication module, a depth camera module, and a processor. The processor may be configured to: obtain distance information and direction information of a first external device by using the first communication module; and obtain first distance information between the electronic device and an object in a first space that distinguishes the first space from other spaces, by using the depth camera module, When it is identified that the first external device is located within a distance range indicating the first distance information, on the basis of the distance information and direction information of the first external device and the first distance information, the electronic device can identify that the first external device is located in the first space; and group the first external device as a device in the first space. Various other embodiments may be provided.

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Appl. No.:	**18/213467**
Filed:	**June 23, 2023**

Prior Publication Data

Document Identifier	Publication Date
US 20230336945 A1	Oct. 19, 2023

Foreign Application Priority Data

KR	10-2020-0181506	Dec. 23, 2020

Related U.S. Application Data

continuation parent-doc WO PCT/KR2021/015857 20211104 PENDING child-doc US 18213467

Publication Classification

Int. Cl.: **H04W4/33** (20180101); **G06T7/521** (20170101); **H04W4/02** (20180101)

U.S. Cl.:

CPC **H04W4/026** (20130101); **G06T7/521** (20170101); **H04W4/33** (20180201); G06T2207/10028 (20130101)

Field of Classification Search

USPC: None

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATION(S) (1) This application is a continuation application, claiming priority under § 365(c), of an International application No. PCT/KR2021/015857, filed on Nov. 4, 2021, which is based on and claims the benefit of a Korean patent application number 10-2020-0181506, filed on Dec. 23, 2020, in the Korean Intellectual Property Office, the disclosure of which is incorporated by reference herein in its entirety.

TECHNICAL FIELD
(1) Various embodiments relate to an electronic device for grouping a plurality of external devices located in a home by space and a method of grouping external devices by space in the electronic device.
BACKGROUND ART
(2) Internet of Things (IoT), which refers to a technology of connecting various external devices equipped with sensors and communication functions to the Internet, may provide monitoring and control functions for each of the external devices connected through the Internet.
DETAILED DESCRIPTION OF THE INVENTION
Technical Problem
(3) Since an electronic device provides location information and control information about a plurality of external devices located in a closed area, home, building, spaces (e.g., rooms) in which the plurality of external devices are located in the closed area (e.g., home) may not be known intuitively.
Technical Solution
(4) Various embodiments relate to an electronic device which may provide a home UI to a user by grouping a plurality of external devices located in a closed area (e.g., home) by space, and a method performed by the electronic device to group external devices in a home by space.
(5) An electronic device according to various embodiments may include a first communication module, a depth camera module, and a processor. The processor may be configured to obtain distance information and direction information about a first external device using the first communication module, obtain first distance information between an object of a first space, which divides the first space from another space, and the electronic device using the depth camera module, and when identifying that the first external device is located within a distance range representing the first distance information based on the distance information and the direction information about the first external device and the first distance information, determine that the first external device is located in the first space, and group the first external device as a device in the first space.
(6) According to various embodiments, a method of grouping external devices by space in an

electronic device may include obtaining distance information and direction information about a first external device using a first communication module of the electronic device, obtaining first distance information between an object of a first space, which divides the first space from another space, and the electronic device using the depth camera module, and when it is identified that the first external device is located within a distance range representing the first distance information based on the distance information and the direction information about the first external device and the first distance information, determining that the first external device is located in the first space, and grouping the first external device as a device in the first space.

Advantageous Effects

(7) According to various embodiments, as an electronic device provides a home UI on which a plurality of external devices located in a home are grouped by space, spaces (e.g., moms) in which the plurality of external devices are located in a home may be known intuitively.

Description

BRIEF DESCRIPTION OF DRAWINGS

(1) FIG. **1** is a block diagram illustrating an electronic device in a network environment according to various embodiments.

(2) FIG. **2** is a block diagram illustrating an electronic device according to various embodiments.

(3) FIGS. **3***a* and **3***b* are diagrams referred to for describing an operation of grouping external devices by space in an electronic device according to various embodiments.

(4) FIGS. **4***a* and **4***b* are diagrams referred to for describing provision of a home UI on which external devices are grouped by space in an electronic device according to various embodiments.

(5) FIG. **5** is a flowchart illustrating an operation of grouping external devices by space in an electronic device according to various embodiments.

(6) FIG. **6** is a flowchart illustrating an operation of grouping external devices by space in an electronic device according to various embodiments.

(7) FIG. **7** is a flowchart illustrating an operation of grouping external devices by space in an electronic device according to various embodiments.

(8) FIG. **8** is a diagram referred to for describing an operation of asking for consent from a user, when external devices are grouped by space in an electronic device according to various embodiments.

(9) FIG. **9** is a flowchart illustrating an operation of grouping external devices by space in an electronic device according to various embodiments.

(10) FIGS. **10***a*, **10***b*, and **10***c* are diagrams referred to for describing an operation of determining whether to group a first external device detected using a first communication module, when external devices are grouped by space in an electronic device according to various embodiments.

MODE FOR CARRYING OUT THE INVENTION

(11) FIG. **1** is a block diagram illustrating an electronic device **101** in a network environment **100** according to various embodiments. Referring to FIG. **1**, the electronic device **101** in the network environment **100** may communicate with an electronic device **102** via a first network **198** (e.g., a short-range wireless communication network), or an electronic device **104** or a server **108** via a second network **199** (e.g., a long-range wireless communication network). According to an embodiment, the electronic device **101** may communicate with the electronic device **104** via the server **108**. According to an embodiment, the electronic device **101** may include a processor **120**, memory **130**, an input module **150**, a sound output module **155**, a display module **160**, an audio module **170**, a sensor module **176**, an interface **177**, a connecting terminal **178**, a haptic module **179**, a camera module **180**, a power management module **188**, a battery **189**, a communication module **190**, a subscriber identification module(SIM) **196**, or an antenna module **197**. In some

embodiments, at least one of the components (e.g., the connecting terminal **178**) may be omitted from the electronic device **101**, or one or more other components may be added in the electronic device **101**. In some embodiments, some of the components (e.g., the sensor module **176**, the camera module **180**, or the antenna module **197**) may be implemented as a single component (e.g., the display module **160**).

(12) The processor **120** may execute, for example, software (e.g., a program **140**) to control at least one other component (e.g., a hardware or software component) of the electronic device **101** coupled with the processor **120**, and may perform various data processing or computation. According to an embodiment, as at least part of the data processing or computation, the processor **120** may store a command or data received from another component (e.g., the sensor module **176** or the communication module **190**) in volatile memory **132**, process the command or the data stored in the volatile memory **132**, and store resulting data in non-volatile memory **134**. According to an embodiment, the processor **120** may include a main processor **121** (e.g., a central processing unit (CPU) or an application processor (AP)), or an auxiliary processor **123** (e.g., a graphics processing unit (GPU), a neural processing unit (NPU), an image signal processor (ISP), a sensor hub processor, or a communication processor (CP)) that is operable independently from, or in conjunction with, the main processor **121**. For example, when the electronic device **101** includes the main processor **121** and the auxiliary processor **123**, the auxiliary processor **123** may be adapted to consume less power than the main processor **121**, or to be specific to a specified function. The auxiliary processor **123** may be implemented as separate from, or as part of the main processor **121**.

(13) The auxiliary processor **123** may control at least some of functions or states related to at least one component (e.g., the display module **160**, the sensor module **176**, or the communication module **190**) among the components of the electronic device **101**, instead of the main processor **121** while the main processor **121** is in an inactive (e.g., sleep) state, or together with the main processor **121** while the main processor **121** is in an active state (e.g., executing an application). According to an embodiment, the auxiliary processor **123** (e.g., an image signal processor or a communication processor) may be implemented as part of another component (e.g., the camera module **180** or the communication module **190**) functionally related to the auxiliary processor **123**. According to an embodiment, the auxiliary processor **123** (e.g., the neural processing unit) may include a hardware structure specified for artificial intelligence model processing. An artificial intelligence model may be generated by machine learning. Such learning may be performed, e.g., by the electronic device **101** where the artificial intelligence is performed or via a separate server (e.g., the server **108**). Learning algorithms may include, but are not limited to, e.g., supervised learning, unsupervised learning, semi-supervised learning, or reinforcement learning. The artificial intelligence model may include a plurality of artificial neural network layers. The artificial neural network may be a deep neural network (DNN), a convolutional neural network (CNN), a recurrent neural network (RNN), a restricted boltzmann machine (RBM), a deep belief network (DBN), a bidirectional recurrent deep neural network (BRDNN), deep Q-network or a combination of two or more thereof but is not limited thereto. The artificial intelligence model may, additionally or alternatively, include a software structure other than the hardware structure.

(14) The memory **130** may store various data used by at least one component (e.g., the processor **120** or the sensor module **176**) of the electronic device **101**. The various data may include, for example, software (e.g., the program **140**) and input data or output data for a command related thererto. The memory **130** may include the volatile memory **132** or the non-volatile memory **134**.

(15) The program **140** may be stored in the memory **130** as software, and may include, for example, an operating system (OS) **142**, middleware **144**, or an application **146**.

(16) The input module **150** may receive a command or data to be used by another component (e.g., the processor **120**) of the electronic device **101**, from the outside (e.g., a user) of the electronic device **101**. The input module **150** may include, for example, a microphone, a mouse, a keyboard, a

key (e.g., a button), or a digital pen (e.g., a stylus pen).

(17) The sound output module **155** may output sound signals to the outside of the electronic device **101**. The sound output module **155** may include, for example, a speaker or a receiver. The speaker may be used for general purposes, such as playing multimedia or playing record. The receiver may be used for receiving incoming calls. According to an embodiment, the receiver may be implemented as separate from, or as part of the speaker.

(18) The display module **160** may visually provide information to the outside (e.g., a user) of the electronic device **101**. The display module **160** may include, for example, a display, a hologram device, or a projector and control circuitry to control a corresponding one of the display, hologram device, and projector. According to an embodiment, the display module **160** may include a touch sensor adapted to detect a touch, or a pressure sensor adapted to measure the intensity of force incurred by the touch.

(19) The audio module **170** may convert a sound into an electrical signal and vice versa. According to an embodiment, the audio module **170** may obtain the sound via the input module **150**, or output the sound via the sound output module **155** or a headphone of an external electronic device (e.g., an electronic device **102**) directly (e.g., wiredly) or wirelessly coupled with the electronic device **101**.

(20) The sensor module **176** may detect an operational state (e.g., power or temperature) of the electronic device **101** or an environmental state (e.g., a state of a user) external to the electronic device **101**, and then generate an electrical signal or data value corresponding to the detected state. According to an embodiment, the sensor module **176** may include, for example, a gesture sensor, a gyro sensor, an atmospheric pressure sensor, a magnetic sensor, an acceleration sensor, a grip sensor, a proximity sensor, a color sensor, an infrared (IR) sensor, a biometric sensor, a temperature sensor, a humidity sensor, or an illuminance sensor.

(21) The interface **177** may support one or more specified protocols to be used for the electronic device **101** to be coupled with the external electronic device (e.g., the electronic device **102**) directly (e.g., wiredly) or wirelessly. According to an embodiment, the interface **177** may include, for example, a high definition multimedia interface (HDMI), a universal serial bus (USB) interface, a secure digital (SD) card interface, or an audio interface.

(22) A connecting terminal **178** may include a connector via which the electronic device **101** may be physically connected with the external electronic device (e.g., the electronic device **102**). According to an embodiment, the connecting terminal **178** may include, for example, a HDMI connector, a USB connector, a SD card connector, or an audio connector (e.g., a headphone connector).

(23) The haptic module **179** may convert an electrical signal into a mechanical stimulus (e.g., a vibration or a movement) or electrical stimulus which may be recognized by a user via his tactile sensation or kinesthetic sensation. According to an embodiment, the haptic module **179** may include, for example, a motor, a piezoelectric element, or an electric stimulator.

(24) The camera module **180** may capture a still image or moving images. According to an embodiment, the camera module **180** may include one or more lenses, image sensors, image signal processors, or flashes.

(25) The power management module **188** may manage power supplied to the electronic device **101**. According to an embodiment, the power management module **188** may be implemented as at least part of, for example, a power management integrated circuit (PMIC).

(26) The battery **189** may supply power to at least one component of the electronic device **101**. According to an embodiment, the battery **189** may include, for example, a primary cell which is not rechargeable, a secondary cell which is rechargeable, or a fuel cell.

(27) The communication module **190** may support establishing a direct (e.g., wired) communication channel or a wireless communication channel between the electronic device **101** and the external electronic device (e.g., the electronic device **102**, the electronic device **104**, or the server **108**) and performing communication via the established communication channel. The

communication module **190** may include one or more communication processors that are operable independently from the processor **120** (e.g., the application processor (AP)) and supports a direct (e.g., wired) communication or a wireless communication. According to an embodiment, the communication module **190** may include a wireless communication module **192** (e.g., a cellular communication module, a short-range wireless communication module, or a global navigation satellite system (GNSS) communication module) or a wired communication module **194** (e.g., a local area network (LAN) communication module or a power line communication (PLC) module). A corresponding one of these communication modules may communicate with the external electronic device via the first network **198** (e.g., a short-range communication network, such as Bluetooth™, wireless-fidelity (Wi-Fi) direct, or infrared data association (IrDA)) or the second network **199** (e.g., a long-range communication network, such as a legacy cellular network, a 5G network, a next-generation communication network, the Internet, or a computer network (e.g., LAN or wide area network (WAN)). These various types of communication modules may be implemented as a single component (e.g., a single chip), or may be implemented as multi components (e.g., multi chips) separate from each other. The wireless communication module **192** may identify and authenticate the electronic device **101** in a communication network, such as the first network **198** or the second network **199**, using subscriber information (e.g., international mobile subscriber identity (IMSI)) stored in the subscriber identification module **196**.

(28) The wireless communication module **192** may support a 50 network, after a 4G network, and next-generation communication technology, e.g., new radio (NR) access technology. The NR access technology may support enhanced mobile broadband (eMBB), massive machine type communications (mMTC), or ultra-reliable and low-latency communications (URLLC). The wireless communication module **192** may support a high-frequency band (e.g., the mmWave band) to achieve, e.g., a high data transmission rate. The wireless communication module **192** may support various technologies for securing performance on a high-frequency band, such as, e.g., beamforming, massive multiple-input and multiple-output (massive MIMO), full dimensional MIMO (FD-MIMO), array antenna, analog beam-forming, or large scale antenna. The wireless communication module **192** may support various requirements specified in the electronic device **101**, an external electronic device (e.g., the electronic device **104**), or a network system (e.g., the second network **199**). According to an embodiment, the wireless communication module **192** may support a peak data rate (e.g., 20 Gbps or more) for implementing eMBB, loss coverage (e.g., 164 dB or less) for implementing mMTC, or U-plane latency (e.g., 0.5 ms or less for each of downlink (DL) and uplink (UL), or a round trip of 1 ms or less) for implementing URLLC.

(29) The antenna module **197** may transmit or receive a signal or power to or from the outside (e.g., the external electronic device) of the electronic device **101**. According to an embodiment, the antenna module **197** may include an antenna including a radiating element composed of a conductive material or a conductive pattern formed in or on a substrate (e.g., a printed circuit board (PCB)). According to an embodiment, the antenna module **197** may include a plurality of antennas (e.g., array antennas). In such a case, at least one antenna appropriate for a communication scheme used in the communication network, such as the first network **198** or the second network **199**, may be selected, for example, by the communication module **190** (e.g., the wireless communication module **192**) from the plurality of antennas. The signal or the power may then be transmitted or received between the communication module **190** and the external electronic device via the selected at least one antenna. According to an embodiment, another component (e.g., a radio frequency integrated circuit (RFIC)) other than the radiating element may be additionally formed as part of the antenna module **197**.

(30) According to various embodiments, the antenna module **197** may form an mmWave antenna module. According to an embodiment, the mmWave antenna module may include a printed circuit board, a RFIC disposed on a first surface (e.g., the bottom surface) of the printed circuit board, or adjacent to the first surface and capable of supporting a designated high-frequency band (e.g., the

mmWave band), and a plurality of antennas (e.g., array antennas) disposed on a second surface (e.g., the top or a side surface) of the printed circuit board, or adjacent to the second surface and capable of transmitting or receiving signals of the designated high-frequency band.

(31) At least some of the above-described components may be coupled mutually and communicate signals (e.g., commands or data) therebetween via an inter-peripheral communication scheme (e.g., a bus, general purpose input and output (GPIO), serial peripheral interface (SPI), or mobile industry processor interface (MIPI)).

(32) According to an embodiment, commands or data may be transmitted or received between the electronic device **101** and the external electronic device **104** via the server **108** coupled with the second network **199**. Each of the electronic devices **102** or **104** may be a device of a same type as, or a different type, from the electronic device **101**. According to an embodiment, all or some of operations to be executed at the electronic device **101** may be executed at one or more of the external electronic devices **102**, **104**, or **108**. For example, if the electronic device **101** should perform a function or a service automatically, or in response to a request from a user or another device, the electronic device **101**, instead of, or in addition to, executing the function or the service, may request the one or more external electronic devices to perform at least part of the function or the service. The one or more external electronic devices receiving the request may perform the at least part of the function or the service requested, or an additional function or an additional service related to the request, and transfer an outcome of the performing to the electronic device **101**. The electronic device **101** may provide the outcome, with or without further processing of the outcome, as at least part of a reply to the request. To that end, a cloud computing, distributed computing, mobile edge computing (MEC), or client-server computing technology may be used, for example. The electronic device **101** may provide ultra low-latency services using, e.g., distributed computing or mobile edge computing. In another embodiment, the external electronic device **104** may include an internet-of-things (IoT) device. The server **108** may be an intelligent server using machine learning and/or a neural network. According to an embodiment, the external electronic device **104** or the server **108** may be included in the second network **199**. The electronic device **101** may be applied to intelligent services (e.g., smart home, smart city, smart car, or healthcare) based on 50 communication technology or IoT-related technology.

(33) FIG. **2** is a block diagram **200** illustrating an electronic device according to various embodiments.

(34) Referring to FIG. **2**, an electronic device **201** (e.g., the electronic device **101** of FIG. **1**) may include a processor **220**, memory **230**, a display **260**, a sensor module **276**, a depth camera module **280**, and/or a communication module **290**.

(35) According to various embodiments, the processor **220** may provide overall control to operations of the electronic device **201**, and may be the same as the processor **120** of FIG. **1** or perform at least one function or operation performed by the processor **120**.

(36) According to various embodiments, the processor **220** may obtain location information about a first external device using a first communication module **291**, identify first distance information between an object of a first space which divides the first space from another space and the electronic device **201** using the depth camera module **280**, and when identifying that the first external device is located within a distance range representing the first distance information based on location information about the first external device and the first distance information, group the first external device as a device in the first space. The first space and one or more other spaces are described herein as being located in a closed area such as, for example, a home. It should be appreciated, however, that the spaces described herein can be located in other types of closed areas or dwellings such as a commercial building or a floor of a building without departing from the scope of the invention.

(37) According to an embodiment, the processor **220** may obtain distance information and direction information about the first external device by calculating them based on ultra wideband (UWB)

signals transmitted to and received from the first external device through the first communication module **291**. The processor **220** may determine the distance information (e.g., ranging information) between the electronic device **201** and the first external device by calculating a time taken to transmit and receive UWB signals (e.g., a ranging request message and a ranging response message) between the electronic device **201** and the first external device using a UWB communication module which is the first communication module **291**.

(38) The processor **220** may receive ranging response signals from the first external device through a plurality of antennas for transmitting and receiving UWB signals, and determine the direction information (e.g., an arrival of angle (AOA)) about the first external device using the difference of a first reception time of a ranging response signal received through a first antenna among the plurality of antennas and a second reception time of a ranging response signal received through a second antenna among the plurality of antennas.

(39) According to an embodiment, when the depth camera module **280** captures the object (e.g., wall) of the first space that divides the first space from another space, the processor **220** may obtain the first distance information between the object (e.g., wall) of the first space and the electronic device **201** using, for example, a time of flight (ToF) method or a light detection and ranging (LiDar) method.

(40) The processor **220** may obtain the first distance information between the object (e.g., wall) of the first space and the electronic device **201** using the depth camera module **280** that captures the first space, and calculate a current position of the object (e.g., wall) of the first space spaced apart from a current position of the electronic device **201** by the first distance information based on the obtained first distance information. The processor **220** may obtain size information about the object (e.g., wall) of the first space using the depth camera module **280** that captures the first space.

(41) The processor **220** may identify whether the first external device is located within the distance range representing the first distance information from the position of the electronic device **201** to the position of the object (e.g., wall) of the first space based on the distance information and direction information about the first external device.

(42) According to an embodiment, when identifying that the first external device is not located within the distance range representing the first distance information based on the distance information and direction information about the first external device and the first distance information between the object (e.g., wall) of the first space and the electronic device **201**, the processor **220** may not group the first external device as a device in the first space, determining that the first external device is located outside the first space.

(43) According to various embodiments, when identifying that the first external device is located in the first space based on location information about an external device obtained using the depth camera module **280** that captures the first space and location information about the first external device obtained using the first communication module **291**, the processor **220** may group the first external device as a device in the first space.

(44) According to an embodiment, when the location information about the external device obtained using the depth camera module **280** is identical to the location information about the first external device, the processor **220** may identify that the first external device is located in the first space and group the first external device as a device in the first space.

(45) According to an embodiment, the processor may obtain the location information about the external device obtained using the depth camera module **280** in a second coordinate system (e.g., a spherical coordinate system (r, θ, Φ). In the at least one second coordinate system, a distance may be obtained using the depth camera module **280**, an azimuth angle θ may be obtained using a gyro sensor included in the sensor module **276**, and a zenith angle Φ may be obtained using an acceleration sensor included in the sensor module **276**.

(46) According to an embodiment, the processor **220** may obtain the location information about the first external device into a first coordinate system (e.g., a Cartesian coordinate system (x, y, z))

using a scanning operation of the first communication module **291**. The processor **220** may convert the first coordinate system (e.g., the Cartesian coordinate system (x, y, z)) representing the location information about the first external device to the second coordinate system (e.g., the spherical coordinate system (r, θ, Φ)) by <Equation 1> below and compare the location information about the first external device with the location information about the external device obtained using the depth camera module **280**.

(47) $r = \sqrt{x^2 + y^2 + z^2}, \quad = \tan^{-1}\frac{\sqrt{x^2+y^2}}{z}, \quad = \tan^{-1}\frac{y}{z}$ [Equation1]

(48) According to various embodiments, when the processor **220** has detected the external device using the depth camera module **280** that captures the first space and has failed in detecting the first external device using the first communication module **291** (e.g., the first communication module is not included in the electronic device or the first communication module is inactive), the processor **220** may group the external device obtained using the depth camera module **280** as a device in the first space according to a user selection.

(49) According to an embodiment, the processor **220** may inquire whether to group the external device as a device in the first space, while providing an image of the external device obtained using the depth camera module **280**. When the user agrees to group the external device as a device in the first space, the processor **220** may group the external device as a device in the first space.

(50) According to various embodiments, in the case where the processor **220** has detected the first external device using the first communication module **291** and has failed in detecting the external device using the depth camera module **280** that captures the first space, when identifying that the first external device is located within the azimuth angle range associated with the first space and the first distance information between the object of the first space and the electronic device **201**, the processor **220** may group the first external device as a device in the first space, determining that the first external device is located in the first space.

(51) According to an embodiment, while the processor **220** captures the first space using the depth camera module **280**, the processor **220** may obtain an azimuth angle azimuth angle (e.g., 0 θ-150 θ) of the first space including a capturing direction of the electronic device toward the first space from the direction of magnetic north using the sensor **276**. The processor **220** may obtain an azimuth angle θ of the first external device by converting the first coordinate system (e.g., the Cartesian coordinate system (x, y, z)) representing the location information about the first external device to the second coordinate system (e.g., the spherical coordinate system (r, θ, Φ)) by <Equation 1'>. The processor **220** may identify whether the azimuth angle θ of the first external device is included in the azimuth angle range (e.g., 0 θ to 150 θ) of the first external device by comparing the azimuth angle θ of the first external device with the azimuth angle range (e.g., 0 θ to 150 θ) of the first space.

(52) According to an embodiment, the processor **220** may obtain the first distance information (e.g., r=100) between the object (e.g., the wall) of the first space and the electronic device **201** using the depth camera module **280** that captures the first space.

(53) When a plurality of objects (e.g., walls) exist within the azimuth angle range (e.g., 0 θ to 150 θ) of the first space, the processor **220** may obtain a plurality of pieces of first distance information representing distance ranges between the respective objects and the electronic device **201** based on capturing of the first space using the depth camera module **280**. For example, in the case where three walls dividing the first space from other spaces are captured using the depth camera module, when the processor **220** is capable of obtaining three pieces of first distance information representing distance ranges between the respective walls and the electronic device **210**, the azimuth angle of the first space may be divided into three azimuth angles according to the three distance ranges.

(54) The processor **220** may identify whether the first external device is located within the first distance information (e.g. r=100) between the object of the first space and the electronic device **201**

based on the distance information about the first external device obtained through the first communication module.

(55) According to an embodiment, when the azimuth angle of the first external device is not included in the azimuth angle of the first space, the processor **220** may not group the first external device as a device in the first space, identifying that the first external device is located outside the first space.

(56) According to an embodiment, when identifying that the first external device is not located within the first distance information between the object of the first space and the electronic device **201** based on the distance information about the first external device, the processor **220** may not group the first external device as a device in the first space, determining that the first external device is located outside the first space.

(57) According to various embodiments, the processor **220** may generate <Table 1> below as a device table including location information about an external device obtained using the depth camera module **280** that captures the first space, location information about a first external device obtained using the first communication module **290**, device type information, azimuth angle information, and distance information, and store <Table 1> in the memory **230**.

(58) TABLE-US-00001

TABLE 1

	Location information obtained by first communication module	Location information obtained by depth camera module	Type of electronic device Device type	Azimuth angle (θ)	Distance (r)
1	(X_1, Y_1, Z_1)	(r_1, θ_1, Φ_1)	Cam	12	50
2	(X_2, Y_2, Z_2)	(r_2, θ_2, Φ_2)	TV	78	95
3	(X_3, Y_3, Z_3)	(r_3, θ_3, Φ_3)	Air-conditioner	89	85
4	(X_4, Y_4, Z_4)	(r_4, θ_4, Φ_4)	Bulb	104	95
5	(X_5, Y_5, Z_5)		Speaker	80	50
6		(r_6, θ_6, Φ_6)	Bulb Stand		
7	(X_7, Y_7, Z_7)		F-Hub	230	90
8	(X_8, Y_8, Z_8)		Multi-purpose sensor	140	150

(59) According to an example, the location information obtained by the first communication module **291** and location information obtained by the depth camera module **280** are identical for each of external device **1** to external device **4** based on <Table 1> above. Accordingly, the processor **220** may identify that external device **1** to external device **4** are located in the first space and group external device **1** to external device **4** as devices in the first space. According to an example, external device **5** may be a device that is not detected when the first space is captured using the depth camera module **280**, because it is hidden by another object in the first space. As a result, the processor **220** identifies for external device **5** that only location information obtained by the first communication module **291** exist without location information obtained by the depth camera module **280**, for external device **5**. However, the processor determiners for external device **5** that its azimuth angle range (e.g., 104 θ) is included in the azimuth angle range (e.g., 0 θ to 150 θ) of the first space, and distance information (e.g., r=50) about external device **5** is included in the first distance information (e.g., r=100) between the object of the first space and the electronic device **201** based on <Table 1> above. Accordingly, the processor **220** may identify that external device **5** is located in the first space and group external device **5** as a device in the first space.

(60) According to an example, external device **6** may be detected during capturing of the first space using the depth camera module **280**, when the electronic device **201** does not include the first communication module **291** or the first communication module **291** is inactive. Accordingly, when only location information obtained by the depth camera module **280** exists without location information obtained by the first communication module **291**, for external device **6** based on <able 1> above, the processor **220** may group external device **6** as a device in the first space according to a user selection.

(61) According to an example, external device **7** may be an external device located outside the first space, for example, in a right space. As location information obtained by the first communication module **291** exists without location information obtained using capturing of the depth camera module **280**, for external device **7**, distance information (e.g., r=90) about external device **7** is

identified as included in second distance information (e.g., r=100) between the object of the first space and the electronic device **201**, and the azimuth angle (e.g., 230 θ) of external device **7** is not included in the azimuth angle range (e.g., 0 θ to 150 θ) of the first space based on <Table 1> above, the processor **220** may not group external device **7** as a device in the first space, identifying that external device **7** is located outside the first space.

(62) According to an example, external device **8** may be an external device located outside the first space, for example, in a rear space. As location information obtained by the first communication module **291** exists without location information obtained using capturing of the depth camera module **280**, for external device **8**, the azimuth angle (e.g., 140 θ) of external device **8** is included in the azimuth angle range (e.g., 0 θ to 150 θ) of the first space, and distance information (e.g., r=150) about external device **8** is identified as not included in the first distance information (e.g., r=100) between the object of the first space and the electronic device **201**, the processor **220** may not group external device **8** as a device in the first space, identifying that external device **8** is located outside the first space.

(63) According to various embodiments, the memory **230** may be implemented substantially the same as or similar to the memory **130** of FIG. **1**.

(64) According to an embodiment, the memory **230** may store a device table including location information about at least one external device obtained using the depth camera module **280** that captures the first space, location information about each of first external devices obtained using the first communication module **290**, device type information, azimuth angle information, and distance information.

(65) According to various embodiments, the display **260** may be implemented substantially the same as or similar to the display module **160** of FIG. **1**.

(66) According to an embodiment, the display **260** may display a user interface (UI) on which a plurality of devices are grouped by space in a closed area such as, for example, a home.

(67) According to various embodiments, the depth camera module **280** may be implemented substantially the same as or similar to the camera module **180** of FIG. **1**, and include at least one camera located on a front surface and at least one camera located on a rear surface.

(68) According to an embodiment, the depth camera module **280** may include a ToF camera module or a depth vision LiDar camera module.

(69) According to various embodiments, the communication module **290** may be implemented substantially the same as or similar to the communication module **190** of FIG. **1**, and include a plurality of communication circuits using different communication technologies, including the communication module **290**.

(70) According to an embodiment, the communication module **290** may include the first communication module **291** and a second communication module **293**.

(71) According to an embodiment, the first communication module (communication module **291**) may include a UWB communication module capable of transmitting and receiving UWB signals to and from an external device using a plurality of antennas for UWB communication.

(72) According to an embodiment, the second communication module **293** may include at least one of a wireless LAN module (not shown) or a short-range communication module (not shown), and the short-range communication module (not shown) may include a Wi-Fi module, an NFC communication module, a Bluetooth legacy communication module, and/or a BLE communication module.

(73) FIGS. **3***a* and **3***b* are diagrams **300***a* and **300***b* referred to for describing an operation of grouping external devices by space in an electronic device according to various embodiments.

(74) Referring to FIG. **3***a*, an electronic device **301** (e.g., the electronic device **101** of FIG. **1** or the electronic device **201** of FIG. **2**) may obtain first distance information r.sub.b between the electronic device **301** and an object (e.g., wall) **313** in a first space (e.g., room), while capturing the object **313** in the first space using a depth camera module (e.g., the depth camera module **280**).

(75) The electronic device **301** may obtain the first distance information r.sub.b between the object (e.g., wall) of the first space captured by the depth camera module and the electronic device **301**, and calculate a current position of the object **313** spaced apart from a current position of the electronic device **301** by the first distance information based on the first distance information r.sub.b. The electronic device **301** may obtain size information about the object (e.g., wall) of the first space using the depth camera module that captures the first space. The electronic device **301** may identify whether a first external device **351** is located within a distance range representing the first distance information r.sub.b between the position of the electronic device **301** and the object (e.g., wall) located in the first space.

(76) The electronic device **301** may obtain distance information and direction information about a first external device **351** and distance information and direction information about a second external device **371**, using UWB signals transmitted and received through a UWB communication module that is a first communication module (e.g., the first communication module **291** of FIG. **2**).

(77) When identifying that the external device **351** is located within the distance range representing the first distance information between the object **313** of the first space and the electronic device **301** based on the distance information and direction information about the external device **351**, the electronic device **301** may group the external device **351** as a device in the first space.

(78) When identifying that the external device **371** is not located within the distance range representing the first distance information between the object **313** of the first space and the electronic device **301** based on the distance information and direction information about the external device **371**, the electronic device **301** may not group the external device **371** as a device in the first space.

(79) Referring to FIG. **3***b*, the electronic device **301** (e.g., the electronic device **101** of FIG. **1** or the electronic device **201** of FIG. **2**) may obtain first distance information r.sub.a, r.sub.b, and r.sub.c between the electronic device **301** and a plurality of objects (e.g., walls) **311** to **315** of a first space (e.g., room), while capturing the plurality of objects (e.g., walls) **311** to **315** of the first space using a depth camera module (e.g., the depth camera module **280**).

(80) The electronic device **301** may obtain the azimuth angle range (e.g., 0 θ to 150 θ) of the first space based on sensor information received from a sensor module (e.g., the sensor module **276** of FIG. **2**), while capturing the plurality of objects (e.g., walls) **311** to **315** of the first space using the depth camera module.

(81) The electronic device **301** may obtain first distance information r.sub.a between a first object (e.g., wall) **311** of the first space and the electronic device **301**, first distance information r.sub.b between a second object (e.g., wall) **313** and the electronic device **301**, and first distance information r.sub.c between a third object (e.g., wall) **315** and the electronic device **301**, using the depth camera module, and divide the azimuth angle of the first space into three azimuth angles based on the three pieces of first distance information r.sub.a, r.sub.b, and r.sub.c.

(82) The electronic device **3.01** may generate <Table 1> described above, including location information about each of a plurality of external devices **351**, **353**, **371**, and **373**, device type information, azimuth angle information, and distance information, using a first communication module (e.g., the first communication module **291** of FIG. **2**) and capturing of the depth camera module.

(83) When identifying that the plurality of external devices **351** to **353** are located within a azimuth angle range (e.g., 0 θ to 150 θ) of the first space and distance ranges representing the first distance information r.sub.a, r.sub.b, and r.sub.c between the plurality of objects **311** to **315** in the first space and the electronic device **301** based on the location information, azimuth angle information, and distance information about the plurality of external devices **351** to **353**, the electronic device **301** may group the plurality of external devices **351** to **353** as devices in the first space.

(84) When identifying that the plurality of external devices **351** to **353** are not located within the azimuth angle range (e.g., 0 θ to 150 θ) of the first space and distance ranges representing the first

distance information r.sub.a, r.sub.b, and r.sub.c between the plurality of objects **311** to **315** in the first space and the electronic device **301** based on the location information, azimuth angle information, and distance information about the plurality of external devices **351** to **353**, the electronic device **301** may not group the plurality of external devices **351** to **353** as devices in the first space.

(85) FIGS. **4***a* and **4***b* are diagrams **400***a* and **400***b* referred to for describing provision of a home UI display by an electronic device, which external devices are grouped by space according to various embodiments. Although the spaces are described as being located in a home, it should be appreciated that the spaces can be included in other types of closed area (e.g., a commercial building) without departing from the scope of the invention.

(86) As illustrated in FIG. **4***a*, in a state where a home is divided into a first space A, a second space B, and a third space C by objects (e.g., walls), an electronic device (e.g., the electronic device **101** of FIG. **1**, the electronic device **201** of FIG. **2**, or the electronic device **301** of FIGS. **3***a* and **3***b*) may group a plurality of external devices located in the home by space (e.g., room) using a depth camera module (e.g., the depth camera module **280** of FIG. **2**) and a first communication module (e.g., the first communication module **291** of FIG. **1**) and provide a home UI on which the plurality of external devices are grouped by space in the home. When an external device located in a specific space is selected while the home UI is provided through a display (e.g., the display **260** of FIG. **2**) of the electronic device, information about the selected external device and information for controlling the selected external device may be output. For example, when a TV device **411** in the space A is selected, information about the TV device **411** and information for controlling the TV device may be output.

(87) While the home UI is provided through the display (e.g., the display **260** of FIG. **2**) of the electronic device, external devices grouped into the specific space may be moved to another space and groups accordingly according to a user selection. For example, the electronic device may move the TV device **411** in the space A to the space C according to a user selection and group it accordingly.

(88) As illustrated in FIG. **4***b*, when a specific space is selected (e.g., via touchscreen input) while the electronic device provides a home UI indicating a plurality of external devices grouped by space in a home through the display (e.g., the display **260** of FIG. **2**) of the electronic device, the electronic device may output information about a plurality of external devices grouped into the selected specific space. For example, upon selection of a space C, the electronic device may display a plurality of external devices grouped into the space C, such as an air conditioner **431**, a refrigerator **435**, and an oven **437** in a pop-up window **430**. Upon selection (e.g., via touchscreen input) of one of the plurality of external devices included in the pop-up window, the electronic device may output detailed information about the selected external device.

(89) According to various embodiments, an electronic device (e.g., the electronic device **101** of FIG. **1**, the electronic device **201** of FIG. **2**, or the electronic device **301** of FIGS. **3***a* and **3***b*) may include a first communication module (e.g., the communication module **291** of FIG. **2**), a depth camera module (e.g., the depth camera module **280** of FIG. **2**), and a processor (e.g., the processor **120** of FIG. **1** or the processor **220** of FIG. **2**). The processor may be configured to obtain distance information and direction information about a first external device using the first communication module, obtain first distance information between an object of a first space, which divides the first space from another space, and the electronic device using the depth camera module, and when identifying that the first external device is located within a distance range representing the first distance information based on the distance information and the direction information about the first external device and the first distance information, identify that the first external device is located in the first space, and group the first external device as a device in the first space.

(90) According to various embodiments, the processor may be configured to, when identifying that the first external device is not located within the distance range representing the first distance

information based on the distance information and the direction information about the first external device and the first distance information, to identify that the first external device is located outside the first space and not group the first external device as a device in the first space.

(91) According to various embodiments, the processor may be configured to calculate the distance information and the direction information about the first external device based on a signal transmitted to and received from the first external device through the first communication module.

(92) According to various embodiments, the processor may be configured to, when location information about an external device obtained using the depth camera module capturing the first space is identical to location information about the first external device obtained using the first communication module, identify that the first external device is located in the first space, and group the first external device as a device in the first space.

(93) According to various embodiments, the processor may be configured to obtain the location information about the external device in a second coordinate system using the depth camera module, obtain the location information about the first external device in a first coordinate system using the first communication module, and identify whether the location information about the external device is identical to the location information about the first external device by converting the location information about the first external device obtained in the first coordinate system into the second coordinate system.

(94) According to various embodiments, the processor may be configured to, when an external device is detected using the depth camera module capturing the first space, and the first external device is not detected using the first communication module, identify that the external device detected using the depth camera module is located in the first space and group the first electronic device as a device in the first space, according to a user selection.

(95) According to various embodiments, the processor may be configured to, when the first external device is detected using the first communication module, and an external device is not detected using the depth camera module capturing the first space, if identifying that the first external device is located within an azimuth angle range of the first space and the distance range representing the first distance information, identify that the first external device is located in the first space, and group the first external device as a device in the first space.

(96) According to various embodiments, the processor may be configured to obtain an azimuth angle of the first space using a sensor module (e.g., the sensor module **176** of FIG. **1** or the sensor module **276** of FIG. **2**) included in the electronic device.

(97) According to various embodiments, the processor may be configured to obtain location information about the external device in a second coordinate system using the depth camera module, obtain location information about the first external device in a first coordinate system using the first communication module, convert the location information about the first external device obtained in the first coordinate system into the second coordinate system, obtain an azimuth angle of the first external device from the location information about the first external device converted into the second coordinate system, and identify whether the first external device is located within an azimuth angle range of the first space based on the azimuth angle of the first external device and the azimuth angle range of the first space.

(98) According to various embodiments, the processor may be configured to, when identifying that the first external device is not included within the azimuth angle range of the first space or not located within the distance range representing the first distance information, identify that the first external device is located outside the first space.

(99) FIG. **5** is a flowchart **500** illustrating an operation of grouping external devices by space in an electronic device according to various embodiments. The operation of grouping external devices by space may include operations **501** to **507**. According to an embodiment, at least one of operations **501** to **507** may be omitted, the order of some operations may be changed, or another operation may be added.

(100) In operation **501**, the electronic device (e.g., the electronic device **101** of FIG. **1**, the electronic device **201** of FIG. **2**, or the electronic device **301** of FIGS. **3***a* and **3***b*), may obtain distance information and direction information about a first external device using a first communication module (e.g., the first communication module **291** of FIG. **2**).

(101) According to an embodiment, the electronic device may calculate the distance information and direction information about the first external device using UWB signals transmitted and received to and from the first external device, using a UWB communication module that is the first communication module.

(102) In operation **503**, the electronic device (e.g., the electronic device **101** of FIG. **1**, the electronic device **201** of FIG. **2**, or the electronic device **301** of FIGS. **3***a* and **3***b*) may obtain first distance information between an object of a first space and the electronic device using a depth camera module (e.g., the depth camera module **280** of **2**).

(103) According to an embodiment, when the electronic device captures an object (e.g., wall) of the first space, which divides the first space from other spaces, the electronic device may obtain first distance information between the object (e.g., wall) of the first space and the electronic device using a ToF method or a LiDar method.

(104) According to an embodiment, the electronic device may obtain the first distance information between the object (e.g., wall) of the first space and the electronic device using the depth camera module that captures the first space, and calculate a current position of the object (e.g., wall) spaced apart from a current position of the electronic device by the first distance information based on the obtained first distance information. The electronic device may obtain a distance range representing the first distance information from the position of the electronic device to the position of the object (e.g., wall) of the first space.

(105) In operation **505**, the electronic device (e.g., the electronic device **101** of FIG. **1**, the electronic device **201** of FIG. **2**, or the electronic device **301** of FIGS. **3***a* and **3***b*) may identify that the first external device is located within the distance range representing the first distance information based on the distance information and direction information about the first external device and the first distance information.

(106) In operation **507**, the electronic device (e.g., the electronic device **101** of FIG. **1**, the electronic device **201** of FIG. **2**, or the electronic device **301** of FIGS. **3***a* and **3***b*) may determine that the first external device is located in the first space, and group the first external device as a device in the first space.

(107) According to an embodiment, when identifying that the first external device is not located within the distance range representing the first distance information based on the distance information and direction information about the first external device and the first distance information, the electronic device may not group the first external device as a device in the first space.

(108) FIG. **6** is a flowchart **600** illustrating an operation of grouping external devices by space in an electronic device according to various embodiments. The operation of grouping the external devices by space may include operations **601** and **603**. According to an embodiment, at least one of operation **601** or operation **603** may be omitted, the order of some operations may be changed, or another operation may be added.

(109) In operation **601**, the electronic device (e.g., the electronic device **101** of FIG. **1**, the electronic device **201** of FIG. **2**, or the electronic device **301** of FIGS. **3***a* and **3***b*) may identify that location information about an external device obtained using a depth camera module (e.g., the depth camera module **280** of FIG. **2**) is identical to location information about a first external device obtained using a first communication module (e.g., the first communication module **293** of FIG. **1**).

(110) According to an embodiment, the electronic device may capture a first space using the depth camera module, obtain location information about an external device located in the first space

based on capturing of the external device, and obtain the obtained location information about the external device in a second coordinate system (e.g., a spherical coordinate system (r, θ, Φ)).

(111) According to an embodiment, the electronic device may obtain location information about the first external device in a first coordinate system (e.g., a Cartesian coordinate system (x, y, z)) based on a scan operation of the first communication module. The electronic device may convert the first coordinate system (e.g., the Cartesian coordinate system (x, y, z)) representing the location information about the first external device to a second coordinate system (e.g., a spherical coordinate system surface (r, θ, Φ)) by <Equation 1> and compare the location information about the first external device with the location information about the external device obtained using the depth camera module **280**.

(112) In operation **603**, the electronic device (e.g., the electronic device **101** of FIG. **1**, the electronic device **201** of FIG. **2**, or the electronic device **301** of FIGS. **3***a* and **3***b*) may determine that the first external device is located in the first space, and group the first external device as a device in the first space.

(113) According to an embodiment, the electronic device may group a first external device (e.g., external device **1** to external device **4**) for which location information obtained using the depth camera module and location information obtained using the first communication module are identical among a plurality of external devices included in a device table as a device in the first device based on the device table stored in the memory (e.g., the memory **230** of FIG. **2**).

(114) According to an embodiment, when the location information about the external device obtained using the depth camera module and the location information about the first external device obtained using the first communication module are not identical, the electronic device may identify that the first external device is located outside the first space, and may not group the first external device as a device in the first space.

(115) FIG. **7** is a flowchart **700** illustrating an operation of grouping external devices by space in an electronic device according to various embodiments. The operation of grouping external devices by space may include operations **701** to **705**. According to an embodiment, at least one of operations **701** to **705** may be omitted, the order of some operations may be changed, or another operation may be added.

(116) In operation **701**, the electronic device (e.g., the electronic device **101** of FIG. **1**, the electronic device **201** of FIG. **2**, or the electronic device **301** of FIGS. **3***a* and **3***b*) may identify that an external device has been detected using capturing of a depth camera module (e.g., the depth camera module **280** of **2**), and a first external device has not been detected using a first communication module (e.g., the first communication module **293** of FIG. **1**).

(117) According to an embodiment, the electronic device may capture a first space using the depth camera module, and an external device located in the first space may be detected based on capturing of the external device.

(118) According to an embodiment, when the electronic device does not include a UWB communication module, which is the first communication module, or the UWB communication module is inactive, the first external device may not be detected using the UWB communication module.

(119) In operation **703**, the electronic device (e.g., the electronic device **101** of FIG. **1**, the electronic device **201** of FIG. **2**, or the electronic device **301** of FIGS. **3***a* and **3***b*) may ask a user whether to group the external device detected using the depth camera module (e.g., the depth camera module **280** of FIG. **2**) as a device in the first space.

(120) According to an embodiment, the electronic device may ask the user whether to group the external device as a device of the first space, together with an image and information about the external device detected using capturing of the depth camera module.

(121) In operation **705**, upon receipt of consent to grouping the external device as a device in the first space from the user, the electronic device (e.g., the electronic device **101** of FIG. **1**, the

electronic device **201** of FIG. **2**, or the electronic device **301** of FIGS. **3**a and **3**b) may group the external device detected using capturing of the depth camera module (e.g., the depth camera module **280** of FIG. **2**) as a device in the first space.

(122) According to an embodiment, the electronic device may group an external device (e.g., external device **6**) that has been detected using capturing of the depth camera module although not detected using the first communication module among the plurality of external devices included in the device table stored in the memory (e.g., the memory **230** of FIG. **2**), as a device in the first space based on the device table according to a user selection.

(123) According to an embodiment, when receiving non-consent from the user for grouping as a device in the first space, the electronic device may not group the external device detected using capturing of the depth camera module as a device in the first space.

(124) FIG. **8** is a diagram **800** referred to for describing an operation of asking for consent from a user, when external devices are grouped by space in an electronic device according to various embodiments.

(125) As illustrated in FIG. **8**, when an external device has been detected using capturing of a depth camera module (e.g., the depth camera module **280** of FIG. **2**), and a first external device has not been detected using a first communication module (e.g., the first communication module **293** of FIG. **1**), the electronic device (e.g., the electronic device **101** of FIG. **1**, the electronic device **201** of FIG. **2**, or the electronic device **201** of FIGS. **3**a and **3**b) may ask for consent to grouping the external device into the first space, together with an image **811**a and information **811**b about the detected external device based on the capturing of the depth camera module.

(126) FIG. **9** is a flowchart **900** illustrating an operation of grouping external devices by space in an electronic device according to various embodiments. The operation of grouping external devices by space may include operations **901** to **911**. According to an embodiment, at least one of operations **901** to **911** may be omitted, the order of some operations may be changed, or another operation may be added.

(127) In operation **901**, the electronic device (e.g., the electronic device **101** of FIG. **1**, the electronic device **201** of FIG. **2**, or the electronic device **301** of FIGS. **3**a and **3**b) may identify that an external device has not been detected using capturing of a depth camera module (e.g., the depth camera module **280** of FIG. **2**), and a first external device has been detected using a first communication module (e.g., the first communication module **293** of FIG. **1**).

(128) According to an embodiment, the electronic device may identify that although a first space has been captured using the depth camera module, an external device located in the first space has not been detected based on capturing of the external device.

(129) According to an embodiment, the electronic device may obtain distance information and direction information about the first external device based on a scan operation using the first communication module.

(130) In operation **903**, the electronic device (e.g., the electronic device **101** of FIG. **1**, the electronic device **201** of FIG. **2**, or the electronic device **301** of FIGS. **3**a and **3**b) may identify whether the first external device is included within the azimuth angle range of the first space.

(131) According to an embodiment, while capturing the first space using the depth camera module, the electronic device may obtain the azimuth angle range (e.g., 0 θ to 150 θ) of the first space, including a capturing direction of the electronic device toward the first space from the direction of magnetic north to using a sensor module (e.g., the sensor module **276** of FIG. **2**). The electronic device may obtain the azimuth angle θ of the first external device by converting a first coordinate system (e.g., a Cartesian coordinate system (x, y, z)) representing location information about the first external device to a second coordinate system (e.g., a spherical coordinate system (r, θ, Φ)) by <Equation 1> described above. The electronic device may identify whether the azimuth angle θ of the first external device is included in the azimuth angle range (e.g. 0 θ to 150 θ) of the first space by comparing the azimuth angle θ of the first external device with the azimuth angle range (e.g., 0

θ to 150 θ) of the first space.

(132) When identifying that the first external device is included within the azimuth angle range of the first space in operation **903**, the electronic device (e.g., the electronic device **101** of FIG. **1**, the electronic device **201** of FIG. **2**, or the electronic device **301** of FIGS. **3***a* and **3***b*) may identify whether the first external device is located within a distance range representing first distance information between an object (e.g., wall) of the first space and the electronic device in operation **905**.

(133) According to an embodiment, the electronic device may obtain the first distance information (e.g., r=100) between the object (e.g., wall) of the first space and the electronic device, using a depth camera module that captures the first space.

(134) According to an embodiment, the electronic device may identify whether the first external device is located within the distance range representing the first distance information based on the first distance information and distance information about the first external device obtained using the first communication module.

(135) When identifying that the electronic device is located within the distance range representing the first distance information between the object of the first space and the electronic device in operation **905**, the electronic device (e.g., the electronic device **101** of FIG. **1**, the electronic device **201** of FIG. **2**, or the electronic device **301** of FIGS. **3***a* and **3***b*) may determine that the first external device is located in the first space, and group the first external device as a device in the first space in operation **907**.

(136) According to an embodiment, the electronic device may recognize the first external device located within the azimuth angle range of the first space and the distance range representing the first distance information as an external device which is hidden by another object and thus not detected through capturing of the depth camera module, although it is located in the first space.

(137) According to an embodiment, the electronic device may group a first external device (e.g., external device **5**), which is detected using the first communication module, is hidden by another object, and thus not captured by the depth camera module among a plurality of external devices included in the device table, although it is located in the first space, as a device of the first space based on the device table stored in the memory (e.g., the memory **230** of FIG. **2**).

(138) When identifying that the first external device is not included within the azimuth angle range of the first space in operation **903**, the electronic device (e.g., the electronic device **101** of FIG. **1**, the electronic device **201** of FIG. **2**, or the electronic device **301** of FIGS. **3***a* and **3***b*) may not group the first external device as a device in the first space, determining that the first external device is located outside the first space in operation **909**.

(139) According to an embodiment, the electronic device may recognize the first external device detected using the first communication module, which is not located within the azimuth angle range of the first space, as an external device in a left or right space divided from the first space by the object (e.g., wall).

(140) According to an embodiment, the electronic device may not group a first external device (e.g., external device **7**) located in a right space divided from the first space by a wall, which has been detected using the first communication module among the plurality of external devices included in the device table stored in the memory (e.g., the memory **230** of FIG. **2**), as a device in the first space based on the device table.

(141) When identifying that the first external device is not located within the distance range representing the first distance information between the object of the space and the electronic device in operation **905**, the electronic device (e.g., the electronic device **101** of FIG. **1**, the electronic device **201** of FIG. **2**, or the electronic device **301** of FIGS. **3***a* and **3***b*) may not group the first external device as a device in the first space, determining that the first external device is located outside the first space in operation **911**.

(142) According to an embodiment, the electronic device may recognize the first external device

not located within the distance range representing the first distance information between the object of the first space and the electronic device, which has been detected using the first communication module, as an external device located in a rear space divided from the first space by the object (e.g. wall).

(143) According to an embodiment, the electronic device may not group the first external device (e.g., external device **8**) detected using the first communication module, which is located in the rear space divided from the first space by the object (e.g. wall) among the plurality of external devices included in the device table stored in the memory (e.g., the memory **230** of FIG. **2**), as a device in the first space based on the device table.

(144) FIGS. **10***a*, **10***b*, and **10***c* are diagrams **1000***a*, **1000***b*, and **1000***c* referred to for describing an operation of determining whether to group a first external device detected using a first communication module, when external devices are grouped by space in an electronic device according to various embodiments.

(145) As illustrated in FIG. **10***a*, although a plurality of external devices **1011**, **1013**, and **1015** are located in a first space A, the external device **1013** is hidden by another external device **1011** and thus may not be captured using a depth camera module (e.g., the depth camera module **280** of FIG. **2**) that captures the first space A.

(146) When identifying that a first external device detected using a first communication module (e.g., the first communication module **291** of FIG. **2**) is located within the azimuth angle range of the first space A and a distance range representing first distance information between an object (e.g., wall) **1070** of the first space A1 and an electronic device (e.g., the electronic device **101** of FIG. **1**, the electronic device **201** of FIG. **2**, or the electronic device **301** of FIGS. **3***a* and **3***b*), the electronic device may recognize the first external device as the external device **1013** which is hidden by another object and thus has not been captured using the depth camera module, although it is located in the first space A1, and group the external device **1013** as a device in the first space A1.

(147) As illustrated in FIG. **10***b*, when a first external device which has been detected using a first communication module (e.g., the first communication module **291** of FIG. **2**) without being captured using a depth camera module **280** (e.g., the depth camera module **280** of FIG. **2**) that captures a first space A is located outside the azimuth angle range of the first space A, an electronic device (e.g., the electronic device **101** of FIG. **1**, the electronic device **201** of FIG. **2**, or the electronic device **301** of FIGS. **3***a* and **3***b*) may recognize the first external device as an external device **1031** located in a right space B divided from the first space A by an object (e.g., wall). The electronic device may group the external device **1031** as a device in the space B.

(148) As illustrated in FIG. **10***c*, when a first external device which has been detected using a first communication module (e.g., the first communication module **291** of FIG. **2**) without being captured using a depth camera module (e.g., the depth camera module **280** of FIG. **2**) that captures a first space A is not identified within a distance range representing first distance information between an object **1070** of the first space A and an electronic device (e.g., the electronic device **101** of FIG. **1**, the electronic device **201** of FIG. **2**, or the electronic device **301** of FIGS. **3***a* and **3***b*), the electronic device may recognize the first external device as an external device **1051** located in a rear space divided from the first space A by the object (e.g., wall).

(149) According to various embodiments, a method of grouping external devices by space in an electronic device may include obtaining distance information and direction information about a first external device using a first communication module of the electronic device, obtaining first distance information between an object of a first space, which divides the first space from another space, and the electronic device using the depth camera module, and when it is identified that the first external device is located within a distance range representing the first distance information based on the distance information and the direction information about the first external device and the first distance information, identifying that the first external device is located in the first space,

and grouping the first external device as a device in the first space.

(150) According to various embodiments, the method may further include, when it is identified that the first external device is not located within the distance range representing the first distance information based on the distance information and the direction information about the first external device and the first distance information, identifying that the first external device is located outside the first space and not grouping the first external device as a device in the first space.

(151) According to various embodiments, the method may further include calculating the distance information and the direction information about the first external device based on a signal transmitted to and received from the first external device through the first communication module.

(152) According to various embodiments, the method may further include, when location information about an external device obtained using the depth camera module capturing the first space is identical to location information about the first external device obtained using the first communication module, identifying that the first external device is located in the first space, and grouping the first external device as a device in the first space.

(153) According to various embodiments, the method may further include obtaining the location information about the external device in a second coordinate system using the depth camera module, obtaining the location information about the first external device in a first coordinate system using the first communication module, and identifying whether the location information about the external device is identical to the location information about the first external device by converting the location information about the first external device obtained in the first coordinate system into the second coordinate system.

(154) According to various embodiments, the method may further include, when an external device is detected using the depth camera module capturing the first space, and the first external device is not detected using the first communication module, identifying that the external device detected using the depth camera module is located in the first space, and grouping the first electronic device as a device in the first space, according to a user selection.

(155) According to various embodiments, the method may further include, when the first external device is detected using the first communication module, and an external device is not detected using the depth camera module capturing the first space, if it is identified that the first external device is located within an azimuth angle range of the first space and the distance range representing the first distance information, identifying that the first external device is located in the first space, and grouping the first external device as a device in the first space.

(156) According to various embodiments, the method may further include obtaining an azimuth angle range of the first space using a sensor module of the electronic device.

(157) According to various embodiments, the method may further include obtaining location information about the external device in a second coordinate system using the depth camera module, obtaining location information about the first external device in a first coordinate system using the first communication module, converting the location information about the first external device obtained in the first coordinate system into the second coordinate system, obtaining an azimuth angle of the first external device from the location information about the first external device converted into the second coordinate system, and identifying whether the first external device is located within an azimuth angle range of the first space based on the azimuth angle of the first external device and the azimuth angle range of the first space.

(158) According to various embodiments, the method may further include, when it is identified that the first external device is not included within the azimuth angle range of the first space or not located within the distance range representing the first distance information, identifying that the first external device is located outside the first space.

(159) The electronic device according to various embodiments may be one of various types of electronic devices. The electronic devices may include, for example, a portable communication device (e.g., a smartphone), a computer device, a portable multimedia device, a portable medical

device, a camera, a wearable device, a movable device such as a robot cleaner, or a home appliance. According to an embodiment of the disclosure, the electronic devices are not limited to those described above.

(160) It should be appreciated that various embodiments of the disclosure and the terms used therein are not intended to limit the technological features set forth herein to particular embodiments and include various changes, equivalents, or replacements for a corresponding embodiment. With regard to the description of the drawings, similar reference numerals may be used to refer to similar or related elements. It is to be understood that a singular form of a noun corresponding to an item may include one or more of the things, unless the relevant context clearly indicates otherwise. As used herein, each of such phrases as "A or B", "at least one of A and B", "at least one of A or B", "A, B. or C", "at least one of A, B, and C", and "at least one of A, B, or C", may include any one of, or all possible combinations of the items enumerated together in a corresponding one of the phrases. As used herein, such terms as "1st" and "2nd", or "first" and "second" may be used to simply distinguish a corresponding component from another, and does not limit the components in other aspect (e.g., importance or order). It is to be understood that if an element (e.g., a first element) is referred to, with or without the term "operatively" or "communicatively", as "coupled with", "coupled to", "connected with", or "connected to" another element (e.g., a second element), it means that the element may be coupled with the other element directly (e.g., wiredly), wirelessly, or via a third element.

(161) As used in connection with various embodiments of the disclosure, the term "module" may include a unit implemented in hardware, software, or firmware, and may interchangeably be used with other terms, for example, logic, logic block, part, or circuitry. A module may be a single integral component, or a minimum unit or part thereof, adapted to perform one or more functions. For example, according to an embodiment, the module may be implemented in a form of an application-specific integrated circuit (ASIC).

(162) Various embodiments as set forth herein may be implemented as software (e.g., the program **140**) including one or more instructions that are stored in a storage medium (e.g., internal memory **136** or external memory **138**) that is readable by a machine (e.g., the electronic device **101**). For example, a processor (e.g., the processor **120**) of the machine (e.g., the electronic device **101**) may invoke at least one of the one or more instructions stored in the storage medium, and execute it, with or without using one or more other components under the control of the processor. This allows the machine to be operated to perform at least one function according to the at least one instruction invoked. The one or more instructions may include a code generated by a complier or a code executable by an interpreter. The machine-readable storage medium may be provided in the form of a non-transitory storage medium. Wherein, the term 'non-transitory' simply means that the storage medium is a tangible device, and does not include a signal (e.g., an electromagnetic wave), but this term does not differentiate between where data is semi-permanently stored in the storage medium and where the data is temporarily stored in the storage medium.

(163) According to an embodiment, a method according to various embodiments of the disclosure may be included and provided in a computer program product. The computer program product may be traded as a product between a seller and a buyer. The computer program product may be distributed in the form of a machine-readable storage medium (e.g., compact disc read only memory (CD-ROM)), or be distributed (e.g., downloaded or uploaded) online via an application store (e.g., PlayStore™), or between two user devices (e.g., smart phones) directly. If distributed online, at least part of the computer program product may be temporarily generated or at least temporarily stored in the machine-readable storage medium, such as memory of the manufacturer's server, a server of the application store, or a relay server.

(164) According to various embodiments, each component (e.g., a module or a program) of the above-described components may include a single entity or multiple entities, and some of the multiple entities may be separately disposed in different components. According to various

embodiments, one or more of the above-described components may be omitted, or one or more other components may be added. Alternatively or additionally, a plurality of components (e.g., modules or programs) may be integrated into a single component. In such a case, according to various embodiments, the integrated component may still perform one or more functions of each of the plurality of components in the same or similar manner as they are performed by a corresponding one of the plurality of components before the integration. According to various embodiments, operations performed by the module, the program, or another component may be carried out sequentially, in parallel, repeatedly, or heuristically, or one or more of the operations may be executed in a different order or omitted, or one or more other operations may be added.

Claims

1. An electronic device comprising: communication circuitry; a depth camera; at least one processor; and memory storing instructions that, when executed by the at least one processor individually or collectively, cause the electronic device to: obtain distance information and direction information about a first external device disposed in a first room defining a first space of an enclosed area using the communication circuitry, and obtain first distance information between the electronic device and an object separating the first room from a second room defining another space of the enclosed area, wherein the first distance information indicates a distance range between the object and the electronic device using the depth camera, the object separating the first room from the second room, and when identifying that the first external device is located within the distance range between the object and the electronic device representing the first distance information based on the distance information and the direction information about the first external device and the first distance information, the electronic device identifies that the first external device is located in the first room defining the first space, and groups the first external device as a device in the first room.

2. The electronic device of claim 1, wherein the instructions, when executed by the at least one processor individually or collectively, cause the electronic device to: when identifying that the first external device is not located within the distance range representing the first distance information based on the distance information and the direction information about the first external device and the first distance information, identify that the first external device is located outside the first room defining the first space and not group the first external device as a device in the first room.

3. The electronic device of claim 1, wherein the instructions, when executed by the at least one processor individually or collectively, cause the electronic device to: when location information about a second external device obtained using the depth camera capturing the first room defining the first space is identical to location information about the first external device obtained using the communication circuitry, identify that the first external device is located in the first room, and group the first external device as a device in the first room.

4. The electronic device of claim 3, wherein the instructions, when executed by the at least one processor individually or collectively, cause the electronic device to: obtain the location information about the second external device in a second coordinate system using the depth camera, obtain the location information about the first external device in a first coordinate system using the communication circuitry, and identify whether the location information about the second external device is identical to the location information about the first external device by converting the location information about the first external device obtained in the first coordinate system into the second coordinate system.

5. The electronic device of claim 1, wherein the instructions, when executed by the at least one processor individually or collectively, cause the electronic device to: when a second external device is detected using the depth camera capturing the first room defining the first space, and the first external device is not detected using the communication circuitry, identify that the second external

device detected using the depth camera is located in the first room and group the first electronic device as a device in the first room, according to a user selection.

6. The electronic device of claim 1, wherein the instructions, when executed by the at least one processor individually or collectively, cause the electronic device to: when the first external device is detected using the communication circuitry, and a second external device is not detected using the depth camera capturing the first room defining the first space, if identifying that the first external device is located within an azimuth angle range of the first room and the distance range representing the first distance information, identify that the first external device is located in the first room, and group the first external device as a device in the first room.

7. The electronic device of claim 6, wherein the instructions, when executed by the at least one processor individually or collectively, cause the electronic device to: obtain location information about the second external device in a second coordinate system using the depth camera, obtain location information about the first external device in a first coordinate system using the communication circuitry, convert the location information about the first external device obtained in the first coordinate system into the second coordinate system, and obtain an azimuth angle of the first external device from the location information about the first external device converted into the second coordinate system, and identify whether the first external device is located within an azimuth angle range of the first room defining the first space based on the azimuth angle of the first external device and the azimuth angle range of the first room.

8. The electronic device of claim 6, wherein the instructions, when executed by the at least one processor individually or collectively, cause the electronic device to: when identifying that the first external device is not included within the azimuth angle range of the first room defining the first space or not located within the distance range representing the first distance information, identify that the first external device is located outside the first room.

9. A method of grouping external devices by space in an electronic device, the method comprising: obtaining distance information and direction information about a first external device using communication circuitry of the electronic device, and obtain first distance information between an object and the electronic device using a depth camera of the electronic device, wherein the first distance information indicates a distance range between the electronic device and the object of a first room defining a first space of an enclosed area, the object dividing the first room from a second room defining another space of the enclosed area; and when it is identified that the first external device is located within athe distance range between the object and the electronic device representing the first distance information based on the distance information and the direction information about the first external device and the first distance information, identifying using the electronic device that the first external device is located in the first room defining the first space, and grouping the first external device as a device in the first room.

10. The method of claim 9, further comprising, when location information about an other external device obtained using the depth camera capturing the first room defining the first space is identical to location information about the first external device obtained using the communication circuitry, identifying that the first external device is located in the first room, and grouping the first external device as a device in the first room.

11. The method of claim 10, further comprising: obtaining the location information about the external device in a second coordinate system using the depth camera; obtaining the location information about the first external device in a first coordinate system using the communication circuitry; and identifying whether the location information about the other external device is identical to the location information about the first external device by converting the location information about the first external device obtained in the first coordinate system into the second coordinate system.

12. The method of claim 9, further comprising, when an external device is detected using the depth camera capturing the first room defining the first space, and the first external device is not detected

using the communication circuitry, identifying that the other external device detected using the depth camera is located in the first room and grouping the first electronic device as a device in the first room, according to a user selection.

13. The method of claim 9, further comprising, when the first external device is detected using the communication circuitry, and an other external device is not detected using the depth camera capturing the first room defining the first space, if it is identified that the first external device is located within an azimuth angle range of the first room defining the first space and the distance range representing the first distance information, identifying that the first external device is located in the first room, and grouping the first external device as a device in the first room.

14. The method of claim 13, further comprising: obtaining location information about the other external device in a second coordinate system using the depth camera; obtaining location information about the first external device in a first coordinate system using the communication circuitry; converting the location information about the first external device obtained in the first coordinate system into the second coordinate system, and obtaining an azimuth angle of the first external device from the location information about the first external device converted into the second coordinate system; and identifying whether the first external device is located within an azimuth angle range of the first room defining the first space based on the azimuth angle of the first external device and the azimuth angle range of the first room.

15. The method of claim 13, further comprising, when it is identified that the first external device is not included within the azimuth angle range of the first room defining the first space or not located within the distance range representing the first distance information, identifying that the first external device is located outside the first room.

16. An electronic device comprising: a depth camera configured to capture an image of at least one object, and in response to capturing the at least one object the depth camera is configured to determine distance information r.sub.b between the at least one object and the electronic device; communication circuitry configured to wirelessly communicate with an external device located a distance away from the electronic device; and at least one processor; and memory storing instructions that, when executed by the at least one processor individually or collectively, cause the electronic device to: exchange wireless data with at least one external device disposed in a first room defining a first space of an enclosed area using the communication circuitry, identify first distance information between the at least one external device and the electronic device based on the wireless data; obtain second distance information indicating a distance range between the electronic device and a captured object among the at least one object defining the first room, the captured object dividing the first room from a second room defining another space of the enclosed area; in response to identifying that the first distance information indicates that the at least one external device is located within the distance range indicated by the second distance information, identify that the at least one external device is located in the first room; and grouping the at least one external device as at least one device in the first room.

17. The electronic device of claim 16, wherein the instructions, when executed by the at least one processor individually or collectively, cause the electronic device to: performs a time of flight (ToF) analysis on the captured object to identify the second distance.

18. The electronic device of claim 16, wherein the instructions, when executed by the at least one processor individually or collectively, cause the electronic device to: performs a light detection and ranging (LiDar) analysis on the captured object to identify the second distance.

19. The electronic device of claim 16, further comprising a sensor configured to identify an azimuth angle range of the at least one object and an azimuth angle of the at least one external device.

20. The electronic device of claim 19, wherein the instructions, when executed by the at least one processor individually or collectively, cause the electronic device to: identify the second distance

information based on a comparison between the azimuth angle of the at least one external device and the azimuth angle range of the at least one device.