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Electronic device and method for capturing image by using angle of view of camera module

Abstract

An electronic device may include: a first camera module that captures a first image at a first angle of view; a second camera module that captures a second image at a second angle of view different from the first angle of view; and a processor configured to activate the second camera module in response to a case in which at least one of objects detected in the first image deviates from the first angle of view.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS (1) This application is a continuation application of International Application No. PCT/KR2022/003153 designating the United States, filed on Mar. 7, 2022, in the Korean Intellectual Property Receiving Office and claiming priority to Korean Patent Application No. 10-2021-0035434, filed on Mar. 18, 2021, in the Korean Intellectual Property Office, the disclosures of which are incorporated by reference herein in their entireties.

BACKGROUND
Technical Field
(1) In certain example embodiments, there is provided an electronic device and/or method for capturing an image using at least the angle of view of a camera module.
Description of Related Art
(2) In general, an electronic device provides camera functions to generate and store an image and/or a video by capturing an external object(s). The camera functions initially used were only those required for basic capturing, storing, and transmitting, but techniques for improving performance, quality, and functions are being developed to meet the various needs of users. Recent electronic devices may include a plurality of camera modules, and each of the plurality of camera modules may have a different angle of view. An angle of view refers to an angle at which a camera may capture an image through a lens of the camera. When a camera has a wide angle of view, the range of capturing is widened such that many objects may be captured, and when a camera has a narrow angle of view, objects within a limited range may be captured. An electronic device may acquire different images using a plurality of cameras having different angles of view and display the acquired images on a display area.
SUMMARY
(3) An electronic device according to an example embodiment may include a first camera module, comprising a camera, configured to capture a first image at a first angle of view, a second camera module, comprising a camera, configured to capture a second image at a second angle of view different from the first angle of view, and a processor configured to activate the second camera module in response to at least one of objects detected in the first image being out of the first angle of view.
(4) The processor may be configured to display the first image in a first partial area within a display area and display the second image in a second partial area within the display area.
(5) The processor may be configured to generate a cropped image by cropping an area including the at least one object from the second image, and display the first image in a first partial area within a display area and display the generated cropped image in a second partial area within the display area.
(6) The processor may be configured to resize the generated cropped image based on the first image. “Based on” as used herein covers based at least on.
(7) The processor may be configured to resize the generated cropped image based on a comparison between a first object area displaying a reference object in the first image and a second object area displaying the reference object in the second image, and the reference object may be different from the at least one object.
(8) The processor may be configured to determine the sizes and positions of the first partial area and the second partial area within the display area, in response to at least one or a combination of two or more of the size, shape, ratio, and position of the first partial area, the size, shape, ratio, and position of the second partial area, and a user input, and resize the first image according to the

determined size of the first partial area and resize the generated cropped image according to the determined size of the second partial area.
(9) The processor may be configured to activate the second camera module in response to at least a portion of a target object among a plurality of objects detected from the first image being out of the first angle of view, display an area including the remaining objects excluding the target object among the plurality of objects from the first image in a first partial area, and display an area including the target object from the second image in a second partial area.
(10) The electronic device according to an example embodiment may further include a third camera module, comprising a camera, configured to capture a third image at a third angle of view different from the second angle of view, wherein the processor may be further configured to activate the third camera module in response to at least one of objects detected in the second image being out of the second angle of view. A “camera” herein may comprise one or more of imaging circuitry, at least one lens, and/or an image sensor.
(11) The processor may be configured to deactivate the first camera module in response to the second camera module being activated.
(12) The first camera module may include a first image sensor having a plurality of sensing elements configured to receive light and convert the light into image signals, and the processor may be further configured to acquire a landscape image by reading out a first sensing element corresponding to a first sensing area among the plurality of sensing elements, acquire a portrait image by reading out a second sensing element corresponding to a second sensing area among the plurality of sensing elements, and map the acquired landscape image and the acquired portrait image to each other.
(13) The processor may be configured to select one of the objects detected in the first image and generate a cropped image by cropping an area including the selected object from the acquired portrait image, and display the acquired landscape image in a first partial area within a display area and display the generated cropped image in a second partial area within the display area.
(14) An example method performed by an electronic device may include capturing a first image at a first angle of view of a first camera module, and activating a second camera module configured to capture a second image at a second angle of view different from the first angle of view, in response to at least one of objects detected in the first image being out of the first angle of view.
(15) An electronic device according to an example embodiment may activate a second camera module when at least one of objects detected from a first image is out of a first angle of view. An electronic device according to an example embodiment may display an object out of the angle of view of a first camera module in a display area based on a second image captured by a second camera module.
(16) An electronic device according to an example embodiment may generate a cropped image by cropping a second image based on an object out of the angle of view of a first camera module. An electronic device according to an example embodiment may adjust the size of an object by resizing a generated cropped image, display an image including the object whose size is adjusted in a display area, and thereby provide a user with a sense of unity between a plurality of images displayed in the display area.

Description

BRIEF DESCRIPTION OF DRAWINGS
(1) The above and other aspects, features, and advantages of certain embodiments of the present disclosure will be more apparent from the following detailed description, taken in conjunction with the accompanying drawings, in which:
(2) FIG. **1** is a block diagram illustrating an electronic device in a network environment according

to an example embodiment.
(3) FIG. **2** is a block diagram illustrating a camera module according to an example embodiment.
(4) FIG. **3** is a flowchart illustrating an operation of an electronic device according to an example embodiment.
(5) FIG. **4** illustrates an angle of view of a camera module included in an electronic device according to an example embodiment.
(6) FIG. **5** illustrates a process of detecting objects from an image by an electronic device according to an example embodiment.
(7) FIGS. **6**A and **6**B illustrate example cases in which at least one of objects detected from a first image is out of a first angle of view when capturing the objects with a camera module disposed in a horizontal direction by an example electronic device.
(8) FIGS. **7**A and **7**B illustrate example cases in which at least one of objects detected from a first image is out of a first angle of view when capturing the objects with a camera module disposed in a vertical direction by an example electronic device.
(9) FIGS. **8**A and **8**B illustrate a process of displaying a captured image in a display area within a display module by an electronic device according to an example embodiment.
(10) FIG. **9** illustrates a process of resizing a cropped image by an electronic device according to an example embodiment.
(11) FIG. **10** illustrates a process of determining the size and position of a partial area within a display area by an electronic device according to an example embodiment.
(12) FIG. **11** illustrates a case in which at least a portion of a target object among objects detected from an image of an electronic device is out of a first angle of view according to an example embodiment.
(13) FIG. **12** illustrates a case in which an electronic device activates a third camera module according to an example embodiment.
(14) FIG. **13** illustrates an image captured using a camera module by a conventional electronic device.
(15) FIG. **14** illustrates a process of acquiring a landscape image using a camera module by a conventional electronic device.
(16) FIGS. **15**A and **15**B illustrate a shape of an image sensor of a camera module in an electronic device according to an example embodiment.
(17) FIG. **16** illustrates a process of displaying an acquired landscape image and an acquired portrait image in a display area by an electronic device according to an example embodiment.

DETAILED DESCRIPTION

(18) FIG. **1** is a block diagram illustrating an electronic device **101** in a network environment **100** according to an embodiment. 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 communicate with at least one of 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**, a memory **130**, an input module **150**, a sound output module **155**, a display module **160**, an audio module **170**, and 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 (e.g., the connecting terminal **178**) of the components 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 integrated as a single component (e.g., the display module **160**).

(19) 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** connected, directly or indirectly, to the processor **120**, and may perform various data processing or computation. According to an embodiment, as at least a part of 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 a volatile memory **132**, process the command or the data stored in the volatile memory **132**, and store resulting data in a 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 separately from the main processor **121** or as a portion of the main processor **121**.
(20) The auxiliary processor **123** may control at least some of functions or states related to at least one (e.g., the display module **160**, the sensor module **176**, or the communication module **190**) of 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 an active state (e.g., executing an application). According to an embodiment, the auxiliary processor **123** (e.g., an ISP or a CP) may be implemented as a portion of another component (e.g., the camera module **180** or the communication module **190**) that is functionally related to the auxiliary processor **123**. According to an embodiment, the auxiliary processor **123** (e.g., an NPU) may include a hardware structure specified for artificial intelligence model processing. An AI model may be generated through machine learning. Such learning may be performed, for example, by the electronic device **101** in which an artificial intelligence model is executed, or via a separate server (e.g., the server **108**). Learning algorithms may include, but are not limited to, for example, supervised learning, unsupervised learning, semi-supervised learning, or reinforcement learning. The artificial intelligence model may include a plurality of artificial neural network layers. An artificial neural network may include, for example, 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.
(21) The memory **130** may store various pieces of data used by at least one component (e.g., the processor **120** or the sensor module **176**) of the electronic device **101**. The various pieces of data may include, for example, software (e.g., the program **140**) and input data or output data for a command related thereto. The memory **130** may include the volatile memory **132** or the non-volatile memory **134**.
(22) The program **140** may be stored as software in the memory **130**, and may include, for example, an operating system (OS) **142**, middleware **144**, or an application **146**.
(23) 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).
(24) The sound output module **155** may output a sound signal 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 to receive an incoming call. According to an embodiment, the receiver may be implemented separately from the speaker or as a part of the speaker.

(25) 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 sense a touch, or a pressure sensor adapted to measure the intensity of force incurred by the touch.

(26) The audio module **170** may convert a sound into an electrical signal or 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 an external electronic device (e.g., the electronic device **102** such as a speaker or a headphone) directly or wirelessly connected to the electronic device **101**.

(27) 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 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.

(28) 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., by wire) 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.

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

(30) The haptic module **179** may convert an electric signal into a mechanical stimulus (e.g., a vibration or a movement) or an electrical stimulus which may be recognized by a user via his or her 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.

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

(32) 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, for example, at least part of a power management integrated circuit (PMIC).

(33) 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.

(34) The communication module **190**, which may comprise communication circuitry, 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 CPs that are operable independently of the processor **120** (e.g., an AP) and that support 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 **104** 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., a LAN or a 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 SIM **196**.

(35) The wireless communication module **192**, which may comprise communication circuitry, may support a 5G 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., a 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 (MIMO), full dimensional MIMO (FD-MIMO), an array antenna, analog beam-forming, or a 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.

(36) 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 including 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 a communication network, such as the first network **198** or the second network **199**, may be selected by, for example, the communication module **190** from the plurality of antennas. The signal or the power may be transmitted or received between the communication module **190** and the external electronic device via the at least one selected 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 a part of the antenna module **197**.

(37) According to an embodiment, the antenna module **197** may form a 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.

(38) 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)).
(39) 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 external electronic devices **102** or **104** may be a device of the same type as or a different type from the electronic device **101**. According to an embodiment, all or some of operations to be executed by the electronic device **101** may be executed at one or more external electronic devices (e.g., the external electronic devices **102** and **104**, and the server **108**). For example, if the electronic device **101** needs to 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 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., a smart home, a smart city, a smart car, or healthcare) based on 5G communication technology or IoT-related technology.
(40) FIG. **2** is a block diagram **200** illustrating the camera module **180** according to various embodiments. According to an embodiment, the electronic device **101** may include a plurality of camera modules **180** having different properties or functions. In this case, for example, at least one of the plurality of camera modules **180** may be a wide-angle camera, and at least another one of the plurality of camera modules **180** may be a telephoto camera. Similarly, at least one of the plurality of camera modules **180** may be a front camera, and at least another one of the plurality of camera modules **180** may be a rear camera.
(41) Referring to FIG. **2**, the camera module **180** may include a lens assembly **210**, a flash **220**, an image sensor **230**, an image stabilizer **240**, a memory **250** (e.g., a buffer memory), or an ISP **260**. The lens assembly **210** may collect light emitted from an object which is a target of which an image is to be captured. The lens assembly **210** may include one or more lenses. According to an embodiment, the camera module **180** may include a plurality of lens assemblies **210**. In this case, the camera module **180** may constitute, for example, a dual camera, a 360-degree camera, or a spherical camera. A portion of the lens assemblies **210** may have the same lens properties (e.g., an angle of view, a focal length, an auto focus, an f number, or an optical zoom), or at least one lens assembly may have one or more lens properties that are different from those of another lens assembly. The lens assembly **210** may include, for example, a wide-angle lens or a telephoto lens. Thus, each “camera module” herein may comprise one or more of imaging circuitry, at least one lens, and/or an image sensor.
(42) The flash **220** may emit light to be used to enhance light emitted or reflected from the object. According to an embodiment, the flash **220** may include one or more light-emitting diodes (LEDs) (e.g., a red-green-blue (RGB) LED, a white LED, an infrared (IR) LED, or an ultraviolet (UV) LED), or a xenon lamp. The image sensor **230** may obtain an image corresponding to the object by

converting light emitted or reflected from the object and transmitted through the lens assembly **210** into an electrical signal. According to an embodiment, the image sensor **230** may include, for example, one image sensor selected from among image sensors having different properties, such as, for example, an RGB sensor, a black and white (BW) sensor, an IR sensor, or a UV sensor, a plurality of image sensors having the same property, or a plurality of image sensors having different properties. Each image sensor included in the image sensor **230** may be implemented using, for example, a charged coupled device (CCD) sensor or a complementary metal-oxide-semiconductor (CMOS) sensor.

(43) The image stabilizer **240** may move at least one lens included in the lens assembly **210** or the image sensor **230** in a specific direction, or control an operation characteristic of the image sensor **230**, in response to a movement of the camera module **180** or the electronic device **101** including the camera module **180**. For example, the image stabilizer **240** may adjust a read-out timing. This may compensate for at least a portion of a negative effect of the movement on an image to be captured. According to an embodiment, the image stabilizer **240** may sense such a movement of the camera module **180** or the electronic device **101** using a gyro sensor (not shown) or an acceleration sensor (not shown) disposed inside or outside the camera module **180**. According to an embodiment, the image stabilizer **240** may be implemented as, for example, an optical image stabilizer. The memory **250** may at least temporarily store at least a portion of the image obtained through the image sensor **230** for a subsequent image processing task. For example, when image acquisition is delayed by a shutter or a plurality of images is obtained at a high speed, an obtained original image (e.g., a Bayer-patterned image or a high-resolution image) may be stored in the memory **250**, and a copy image (e.g., a low-resolution image) corresponding the original image may be previewed through the display module **160**. Subsequently, when a specified condition (e.g., a user input or a system command) is satisfied, at least a portion of the original image stored in the memory **250** may be obtained and processed by, for example, the ISP **260**. According to an embodiment, the memory **250** may be configured as at least part of the memory **130** or as a separate memory operated independently of the memory **130**.

(44) The ISP **260** may perform one or more image processing operations on the image obtained through the image sensor **230** or the image stored in the memory **250**. The image processing operations may include, for example, depth map generation, three-dimensional (3D) modeling, panorama generation, feature point extraction, image synthesis, or image compensation (e.g., noise reduction, resolution adjustment, brightness adjustment, blurring, sharpening, or softening. Additionally or alternatively, the ISP **260** may control at least one of the components (e.g., the image sensor **230**) included in the camera module **180** (e.g., control an exposure time, control a read-out timing, or the like). The image processed by the ISP **260** may be stored again in the memory **250** for further processing or may be provided to an external component (e.g., the memory **130**, the display module **160**, the electronic device **102**, the electronic device **104**, or the server **108**) of the camera module **180**. According to an embodiment, the ISP **260** may be configured as at least part of the processor **120** or as a separate processor operated independently of the processor **120**. When the ISP **260** is configured as a processor separate from the processor **120**, at least one image processed by the ISP **260** may be displayed as it is or be displayed through the display module **160** after additional image processing is performed by the processor **120**.

(45) The electronic device according to the embodiments disclosed herein 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, or a home appliance. According to an embodiment of the disclosure, the electronic device is not limited to those described above.

(46) It should be appreciated that 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, “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”, each of which may include any one of the items listed together in the corresponding one of the phrases, or all possible combinations thereof. Terms such as “first”, “second”, or “first” or “second” may simply be used to distinguish the component from other components in question, and do not limit the components in other aspects (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 at least a third element(s). 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). Thus, each “module” herein may comprise circuitry.
(47) 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., an internal memory **136** or an 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. 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 code generated by a compiler or code executable by an interpreter. The machine-readable storage medium may be provided in the form of a non-transitory storage medium. Here, 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.
(48) According to an embodiment, a method according to various embodiments disclosed herein 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., smartphones) 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.
(49) According to 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 an embodiment, one or more of the above-described components or operations may be omitted, or one or more other components or operations 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, 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.

(50) FIG. **3** is a flowchart illustrating an operation of an electronic device according to an embodiment.

(51) In operation **310**, an electronic device (e.g., the electronic device **101** of FIG. **1**) according to an embodiment may capture a first image at a first angle of view using a first camera module.

(52) The electronic device according to an embodiment may include a plurality of camera modules (e.g., the camera module **180** of FIGS. **1** and **2**) having different angles of view. The electronic device according to an embodiment may include a first camera module configured to capture a first image at a first angle of view, a second camera module configured to capture a second image at a second angle of view different from the first angle of view, and a third camera module configured to capture a third image at a third angle of view different from the first angle of view and the second angle of view. However, the number of camera modules included in the electronic device is not limited thereto.

(53) In operation **320**, a processor (e.g., the processor **120** of FIG. **1**) of the electronic device according to an embodiment may detect objects from the first image. The objects may be, for example, human faces, humans, vehicles, or animals (e.g., cats or dogs). In this specification, it is assumed that the electronic device extracts human faces as objects from an image.

(54) In operation **330**, the electronic device according to an embodiment may determine whether at least one of the objects detected from the first image is out of the first angle of view.

(55) In operation **340**, the electronic device according to an embodiment may activate a second camera module having a second angle of view when at least one of the objects detected from the first image is out of the first angle of view.

(56) In operation **350**, the electronic device according to an embodiment may display at least one image containing the detected objects in a display area within a display module (e.g., the display module **160** of FIG. **1**). The electronic device according to an embodiment may display the first image in the display area within the display module when the objects detected from the first image are not out of the first angle of view. When at least one of the objects detected from the first image is out of the first angle of view, the electronic device may activate the second camera module to capture a second image and display the first image and the second image in the display area within the display module.

(57) FIG. **4** illustrates an angle of view of a camera module included in an electronic device according to an embodiment.

(58) A field of view (FOV) **410** may be an area in which objects are viewed when an electronic device (e.g., the electronic device **101** of FIG. **1**) according to an embodiment performs capturing with a camera module (e.g., the camera module **180** of FIGS. **1** and **2**) disposed in a horizontal direction. A first FOV **411** may be an area in which objects corresponding to a first angle of view are viewed when objects are captured with a first camera module disposed in a horizontal direction. A second FOV **412** may be an area in which objects corresponding to a second angle of view are viewed when objects are captured with a second camera module disposed in a horizontal direction. A third FOV **413** may be an area in which objects corresponding to a third angle of view are viewed when objects are captured with a third camera module disposed in a horizontal direction. A camera module includes an image sensor having a plurality of sensing elements for receiving light and converting the light into an image signal. Disposing a camera module in a horizontal direction is disposing an image sensor in such a direction that the number of sensing elements on the horizontal axis is greater than the number of sensing elements on the vertical axis. Similarly, disposing a camera module in a vertical direction is disposing an image sensor in such a direction that the number of sensing elements on the vertical axis is greater than the number of sensing elements on the horizontal axis.

(59) According to an embodiment, as shown in FIG. **4**, the second FOV **412** may be wider than the first FOV **411** and may include the first FOV **411**. The third FOV **413** may be wider than the

second FOV **412** and may include the second FOV **412**. However, the first FOV corresponding to the first angle of view, the second FOV corresponding to the second angle of view, and the third FOV corresponding to the third angle of view are not limited to those shown in FIG. **4**. According to another embodiment, only a partial area of the first FOV **411** may be included in the second FOV **412**. According to another embodiment, the first FOV **411** and the second FOV **412** may not have overlapping areas.
(60) Conversely, an FOV **420** may be an area in which objects are viewed when the electronic device according to an embodiment performs capturing with a camera module disposed in a vertical direction. A fourth FOV **424** may be an area in which objects are viewed when objects are captured with the first camera module disposed in a vertical direction. A fifth FOV **425** may be an area in which objects are viewed when objects are captured with the second camera module disposed in the vertical direction, and a sixth FOV **426** may be an area in which objects are viewed when an image is captured at a third angle of view with the third camera module in the vertical direction.
(61) FIG. **5** illustrates a process of detecting objects from an image by an electronic device according to an embodiment.
(62) An electronic device (e.g., the electronic device **101** of FIG. **1**) according to an embodiment may capture an image **510** using a camera module (e.g., the camera module **180** of FIGS. **1** and **2**). The electronic device may detect objects (e.g., human faces) from the image **510**.
(63) The electronic device according to an embodiment may detect objects by recognizing human faces on the image **510** captured by the camera module. Further, the electronic device may track the objects detected in the image captured by the camera module. Specifically, the electronic device may detect object areas **511**, **512**, **513**, **514**, and **515** displaying objects (e.g., areas including human faces) from the image. The electronic device may continuously track the object areas **511**, **512**, **513**, **514**, and **515** displaying objects within the image. The object areas may be areas corresponding to objects within the image. For example, when the electronic device detects human faces as objects, the object areas may be areas including the human faces. For example, the object areas may be rectangular areas. The electronic device may determine whether an object is out of the angle of view of the camera module by tracking the object areas detected from the image.
(64) According to an embodiment, the electronic device may calculate the number of objects detected in the image (e.g., **5**) by tracking the object areas detected from the image **510**. The electronic device may determine that at least one object is out of the angle of view of the camera module when the number of objects detected in continuous images captured by the camera module decreases.
(65) FIGS. **6***a*, **6***b*, **7***a* and **7***b* illustrate cases in which at least one of objects detected in an image is out of a first angle of view.
(66) FIGS. **6**A and **6**B illustrate cases in which at least one of objects detected from a first image is out of a first angle of view when capturing the objects with a camera module disposed in a horizontal direction by an electronic device.
(67) An electronic device may capture a first image at a first angle of view using a first camera module. At least one of objects detected in the first image may be out of the first angle of view and be within a second angle of view of a second camera module. When at least one of the objects detected in the first image is out of the first angle of view and the at least one object out of the first angle of view is within the second angle of view of the second camera module, the electronic device may activate the second camera module. According to an embodiment, when at least one object is out of the first angle of view, the electronic device may further activate the second camera module while the first camera module is activated. As described below, according to another embodiment, the electronic device may activate the second camera module and deactivate the first camera module when at least one object is out of the first angle of view.
(68) In the present specification, that an object detected in an image is within the angle of view of a

camera module is equivalent to that an object area detected in the image is in the FOV corresponding to the angle of view. That an object detected in an image is out of the angle of view is equivalent to that an object area detected from the image is out of the FOV corresponding to the angle of view.

(69) The electronic device according to an embodiment may activate the first camera module to capture a first image at a first angle of view. When at least one object area **631** and **632** of object areas detected in the first image are out of a first FOV **611** corresponding to the first angle of view and within a second FOV **612** corresponding to the second angle of view, the electronic device may activate the second camera module to capture a second image at the second angle of view. FIG. **6**A shows a case in which the object areas **631** and **632** get out of the first FOV **611** in the same direction, and FIG. **6**B shows a case in which object areas **641** and **642** get out of the first FOV **611** in different directions. Although not shown in FIGS. **6**A and **6**B, when at least one object detected in the second image is out of the second angle of view of the second camera module and in a third angle of view of a third camera module, the electronic device according to an embodiment may activate the third camera module.

(70) FIGS. **7**A and **7**B illustrate cases in which at least one of objects detected from a first image is out of a first angle of view when capturing the objects with a camera module disposed in a vertical direction by an electronic device.

(71) As described with reference to FIG. **6**, when at least one object area **731** and **732** of object areas detected in the first image are out of a fourth FOV **724** corresponding to the first angle of view and within a fifth FOV **725** corresponding to the second angle of view, the electronic device may activate the second camera module to capture a second image at the second angle of view. FIG. **7**A shows a case in which the object areas **731** and **732** get out of the fourth FOV **724** in the same direction, and FIG. **7**B shows a case in which object areas **741** and **742** get out of the fourth FOV **724** in different directions.

(72) FIGS. **8**A and **8**B illustrate a process of displaying a captured image in a display area within a display module by an electronic device according to an embodiment.

(73) An electronic device (e.g., the electronic device **101** of FIG. **1**) according to an embodiment may display a first image captured at a first angle of view of a first camera module (e.g., the camera module **180** of FIGS. **1** and **2**) in a first partial area **851** within a display area and display a second image captured at a second angle of view of a second camera module in a second partial area **852** within the display area. The first image may be an image captured by the first camera module at the first angle of view, and the second image may be an image captured by the second camera module at the second angle of view. The first image corresponds to a first FOV **811**, and the second image corresponds to a second FOV **812**.

(74) The electronic device according to an embodiment may divide the entire display area **850** into the plurality of display areas **851** and **852**. When none of the objects detected from the first image is out of the first FOV **811**, the electronic device may not activate the second camera module. In this case, the electronic device may display the first image as one on the entire display area **850** without dividing the entire display area **850**. In response to at least one of the objects detected from the first image being out of the first FOV **811**, the electronic device may divide the entire display area into the first partial area **851** and the second partial area **852**. In response to the second camera module being activated, the electronic device may divide the entire display area into the first partial area **851** and the second partial area **852**. The first partial area **851** and the second partial area **852** may not overlap each other within the display area.

(75) According to an embodiment, the electronic device may display the first image including objects within the first FOV **811** in the first partial area **851** and display the second image including objects out of the first FOV **811** in the second partial area **852**. According to another embodiment, the electronic device may display the first image in the first partial area **851** and display a cropped image generated by cropping a partial area of the second image in the second partial area **852**. The

generated cropped image may include the objects out of the first angle of view. The electronic device may generate the cropped image by cropping the second image based on the objects out of the first angle of view. The electronic device may generate the cropped image by cropping an area **860** including at least one object (e.g., an area including people) out of the first angle of view from the second image. The electronic device may display the cropped image generated from the second image in the second partial area **852**. FIG. **8**A illustrates a process of cropping a second image when object areas **831** and **832** get out of the first FOV **811** in the same direction. When the object areas **831** and **832** get out of the first FOV **811** in the same direction and the object areas **831** and **832** are within the second FOV **812**, the electronic device may generate the cropped image by cropping the one area **860** including the object areas **831** and **832** (e.g., the area including people) from the second image. The electronic device may display the generated cropped image in the second partial area **852**.

(76) FIG. **8**B illustrates a process of cropping a second image when object areas **841** and **842** get out of the first FOV **811** in different directions. When the object areas **841** and **842** get out of the first FOV **811** in different directions and the object areas **841** and **842** are within the second FOV **812**, the electronic device may generate a plurality of cropped images by cropping an area **861** including the object area **841** (e.g., an area including a person) and an area **862** including the object area **842** (e.g., an area including a person), respectively, from the second image. The electronic device according to an embodiment may display the generated plurality of cropped images separately in the second partial area **852**.

(77) FIG. **9** illustrates a process of resizing a cropped image by an electronic device according to an embodiment.

(78) An electronic device (e.g., the electronic device **101** of FIG. **1**) according to an embodiment may resize a cropped image **960** generated from a second image. Since the electronic device captures a plurality of images with a plurality of camera modules having different angles of view and different magnifications, objects detected from different images may have different sizes. For example, the size of an object detected in a first image captured by a first camera module may be different from the size of an object detected in a second image captured by a second camera module. The electronic device may adjust the size of objects by resizing the generated cropped image **960**. The electronic device may display an image including objects whose size is adjusted in a display area and thereby provide a user with a sense of unity between the plurality of images displayed in the display area. Hereinafter, the description will be provided based on the electronic device that resizes the cropped image **960**, but the electronic device may resize the first image or the second image as well as the cropped image **960**.

(79) The electronic device according to an embodiment may resize the cropped image **960** based on the first image. According to an embodiment, the electronic device may resize the cropped image **960** using a reference object that simultaneously exists within the first angle of view of the first camera module and the second angle of view of the second camera module. The reference object is an object different from the object out of the first angle of view. For example, the electronic device may select one object area **951** from the object areas **951**, **952**, and **953** that simultaneously exist in a first FOV **911** corresponding to the first angle of view and a second FOV **912** corresponding to the second angle of view. The selected object area **951** may be an object area corresponding to the reference object. The electronic device may capture the first image including the reference object at the first angle of view using the first camera module and capture the second image including the reference object at the second angle of view using the second camera module. The electronic device may resize the cropped image **960** based on a comparison between a first object area displaying the reference object (e.g., an area corresponding to a human face) in the first image and a second object area displaying the reference object (e.g., an area corresponding to a human face) in the second image.

(80) According to an embodiment, in the electronic device, an object area displaying an object may

be a rectangular area. The electronic device may calculate each of the number of pixels corresponding to the height of the first object area displaying the reference object and the number of pixels corresponding to the width of the first object area in the first image. Similarly, the electronic device may calculate the number of pixels corresponding to the height of the second object area displaying the reference object in the second image and calculate the number of pixels corresponding to the width of the second object area in the second image. The electronic device may resize the height of the cropped image **960** at a ratio of the number of pixels corresponding to the height of the first object area to the number of pixels corresponding to the height of the second object area. The electronic device may resize the width of the cropped image **960** at a ratio of the number of pixels corresponding to the width of the first object area to the number of pixels corresponding to the width of the second object area.

(81) According to another embodiment, the electronic device may calculate the total number of pixels of the first object area displaying the reference object from the first image and calculate the total number of pixels of the second object area displaying the reference object from the second image. The electronic device may resize the height and width of the cropped image **960** at a ratio of the total number of pixels of the first object area to the total number of pixels of the second object area. A method of resizing the cropped image **960** by the electronic device according to an embodiment is not limited to the above examples, and the cropped image may be resized in various other manners. The electronic device may display the first image in a first partial area **971** and display the resized cropped image in a second partial area **972**.

(82) According to another embodiment, the electronic device may resize the height of the second image at a ratio of the number of pixels corresponding to the height of the first object area to the number of pixels corresponding to the height of the second object area, and resize the width of the second image at a ratio of the number of pixels corresponding to the width of the first object area to the number of pixels corresponding to the width of the second object area. The electronic device according to an embodiment may crop the resized second image based on an object out of the first angle of view and display the cropped image in the second partial area **972**. “Based on” as used herein covers based at least on.

(83) FIG. **10** illustrates a process of determining the size and position of a partial area within a display area by an electronic device according to an embodiment.

(84) A processor (e.g., the processor **120** of FIG. **1**, comprising processing circuitry) of an electronic device (e.g., the electronic device **101** of FIG. **1**) according to an embodiment may determine the sizes and positions of a first partial area **1051** and a second partial area **1052** within a display area, in response to at least one or a combination of two or more of the size, shape, ratio, and position of the first partial area **1051**, the size, shape, ratio, and position of the second partial area **1052**, and a user input. For example, when the shape of the first partial area and the shape of the second partial area are determined to be circular, the electronic device may appropriately determine the sizes and positions of the first partial area **1051** and the second partial area **1052** within the display module so that the first partial area **1051** and the second partial area **1052** may each have a circular shape within the display area.

(85) For another example, the electronic device may adjust the sizes of the first partial area and the second partial area according to a received user input. The electronic device may receive a drag input on a boundary line between the first partial area **1051** and the second partial area **1052** from the user. The drag input may be an input of clicking or touching a point **1011** corresponding to the boundary line between the first partial area and the second partial area, moving while maintaining the click or touch, and releasing the click or touch at another point **1012**. When a drag input of a user is received, the electronic device may change the boundary line between the first partial area and the second partial area to correspond to the point **1012** at which the click or touch is released, and increase or decrease the size of the first partial area **1051** and the size of the second partial area **1052** according to the changed boundary line. The electronic device according to an embodiment

may resize a first image displayed in the first partial area **1051** according to the determined size of the first partial area **1051** and resize a cropped image displayed in the second partial area **1052** according to the determined size of the second partial area **1052**. For example, as shown in FIG. **10**, it is assumed that a partial area of a display module is a rectangular area in the electronic device according to an embodiment. The electronic device may calculate the number of pixels corresponding to each of the height and the width of the first partial area before the change and calculate the number of pixels corresponding to each of the height and the width of the first partial area after the change. The electronic device may resize the height of the first image at a ratio of the height of the first partial area after the change to the height of the first partial area before the change and resize the width of the first image at a ratio of the width of the first partial area after the change to the width of the first partial area before the change. The electronic device may display the resized first image in the corresponding first partial area after the change. Similarly, the electronic device may display the resized cropped image in the corresponding second partial area after the change.
(86) FIG. **11** illustrates a case in which at least a portion of a target object among objects detected from an image of an electronic device is out of a first angle of view according to an embodiment.
(87) An electronic device according to an embodiment may activate a second camera module in response to at least a portion of a target object among a plurality of objects detected from a first image being out of a first angle of view. At least a portion of the target object is a portion of a human face. When a portion of an area **1135** displaying the target object among a plurality of object areas **1131**, **1132**, **1133**, **1134**, and **1135** detected from the first image is out of a first FOV **1111**, the electronic device may activate the second camera module. The electronic device may crop an area **1161** including the remaining object areas **1131**, **1132**, **1133**, and **1134** (e.g., an area including people), excluding a target object area **1135** among the detected plurality of object areas **1131**, **1132**, **1133**, **1134**, and **1135**, from the first image and display the cropped area **1161** in a first partial area **1151**, and crop an area **1162** including the target object area **1135** (e.g., an area including a person) from a second image and display the cropped area **1162** in a second partial area **1152**. When a portion of the target object is out of the first angle of view, the electronic device according to an embodiment may display an area including the remaining objects, excluding the target object among the detected plurality of objects, in a first partial area and display an area including the target object separately in a second partial area.
(88) FIG. **12** illustrates a case in which an electronic device activates a third camera module according to an embodiment.
(89) An electronic device according to an embodiment may include a first camera module, a second camera module, and a third camera module. A third angle of view of the third camera module may be different from a first angle of view of the first camera module and a second angle of view of the second camera module. The electronic device according to an embodiment may activate the third camera module in response to at least one of objects detected in a second image being out of the second angle of view. The electronic device may display images captured by the respective camera modules in a display area. For example, when at least one of the objects detected from the second image is out of the second angle of view and the object out of the second angle of view is in the third angle of view, the electronic device may divide the display area into a first partial area **1251** or **1261**, a second partial area **1252** or **1262**, and a third partial area **1253** or **1263**. According to an embodiment, the electronic device may display a first image captured using the first camera module in the first partial area **1251** or **1261**, display the second image captured using the second camera module in the second partial area **1252** or **1262**, and display a third image captured using the third camera module in the third partial area **1253** or **1263**. According to another embodiment, the electronic device may display the first image in the first partial area **1251** or **1261**, crop the second image based on an object out of the first angle of view, display the cropped second image in the second partial area **1252** or **1262**, crop the third image based on the object out of the second

angle of view, and display the cropped third image in the third partial area **1253** or **1263**.
(90) According to an embodiment, the electronic device may activate the second camera module when at least one of objects detected from the first image is out of the first angle of view, and deactivate the first camera module in response to the second camera module being activated. The electronic device may display the first image captured by the first camera module in the display area while the first camera module is being activated. When at least one object is out of the first angle of view, the electronic device may activate the second camera module to capture the second image with the second camera module. The electronic device may display the second image instead of the first image in the display area by activating the second camera module and deactivating the first camera module at the same time. For example, it is assumed that a second FOV corresponding to the second angle of view of the second camera module is wider than a first FOV corresponding to the first angle of view of the first camera module and that the second FOV includes the first FOV. The electronic device may display the second image instead of the first image in the display area, thereby displaying all the objects detected from the first image in the display area.
(91) FIG. **13** illustrates an image captured using a camera module by a conventional electronic device.
(92) A camera module of an electronic device according to an embodiment may include an image sensor having a plurality of optical sensing elements (hereinafter, referred to as “sensing elements”) for receiving light and converting the light into image signals. A sensing element is an element configured to sense optical information based on light reflected from a physical location on a subject and incident to the corresponding element. For example, a sensing element may output a value indicating the intensity of incident light. The sensing element may include a photodiode.
(93) An image sensor of a camera module included in a conventional electronic device may include a plurality of sensing elements arranged in an array form. An image sensor may be disposed in a vertical direction to receive light reflected from a subject, and an image sensor may be disposed in a horizontal direction to receive light reflected from the subject. Disposing an image sensor in a horizontal direction indicates the number of sensing elements arranged on the horizontal axis (e.g., 1920) is greater than the number of sensing elements arranged on the vertical axis (e.g., 1440). Disposing an image sensor in a vertical direction indicates the number of sensing elements arranged on the vertical axis (e.g., 1920) is greater than the number of sensing elements arranged on the horizontal axis (e.g., 1440). The image sensor of the conventional camera module may include 1920×1440 sensing elements. A portrait image **1310** may be an image in which the number of pixels on the horizontal axis is greater than the number of pixels on the vertical axis. A landscape image **1320** may be an image in which the number of pixels on the vertical axis is greater than the number of pixels on the horizontal axis. Here, a pixel may be basic unit information constituting an image.
(94) The conventional electronic device may acquire a portrait image **1311** having a resolution of 1080×1920 by reading out 1080×1920 sensing elements from the image sensor having 1920×1440 sensing elements. The electronic device may change the resolution of a portrait image by changing an area to read out sensing elements from the image sensor. For example, the electronic device may acquire a portrait image **1312** having a maximum resolution of 1440×1920 by reading all 1440×1920 sensing elements from the corresponding image sensor.
(95) The conventional electronic device may acquire a landscape image **1321** having a resolution of 1920×1080 by reading out 1920×1080 sensing elements from the image sensor having 1920×1440 sensing elements. The electronic device may acquire a portrait image **1322** having a maximum resolution of 1920×1440 by reading all 1920×1440 sensing elements from the corresponding image sensor.
(96) FIG. **14** illustrates a process of acquiring a landscape image using a camera module by a conventional electronic device.
(97) As to a conventional electronic device, it is assumed that an image sensor is disposed in a

vertical direction to receive light reflected from a subject. The conventional electronic device may acquire a portrait image **1411** by reading out 1080×1920 sensing elements from the image sensor having 1920×1440 sensing elements and acquire a portrait image **1412** by reading out 1440×1920 sensing elements. On the other hand, when the image sensor is disposed in a vertical direction in the conventional electronic device, generally in order to acquire a landscape image, a landscape image **1431** may be acquired by reading out 1080×607 sensing elements from the image sensor having 1920×1440 sensing elements. When the conventional electronic device acquires the landscape image **1431** (e.g., having a resolution of 1080×607) using a camera module of the image sensor disposed in the vertical direction, the number of sensing elements to be read out decreases, and thus, the resolution of the landscape image **1431** may inevitably decrease.

(98) FIGS. **15**A and **15**B illustrate a shape of an image sensor of a camera module in an electronic device according to an embodiment.

(99) Referring to FIG. **15**A, a camera module of an electronic device according to an embodiment may include a square image sensor **1510**. The image sensor **1510** may include 1920×1920 sensing elements. 1920 sensing elements may be disposed on a first side **1501** of the image sensor **1510**, and 1920 sensing elements may be disposed on a second side **1502** perpendicular to the first side **1501**.

(100) The electronic device according to an embodiment may acquire a landscape image by reading out first sensing elements corresponding to a first sensing area **1511** among the 1920×1920 sensing elements of the image sensor. The electronic device according to an embodiment may acquire a portrait image by reading out second sensing elements corresponding to a second sensing area **1512** among the 1920×1920 sensing elements of the image sensor. The first sensing area **1511** may be an area including 1920×1080 sensing elements among the plurality of sensing elements included in the image sensor. The first sensing area **1511** may be rectangular area, wherein 1920 sensing elements may be disposed on one side thereof, and 1080 sensing elements may be disposed on the other side perpendicular to the one side. The second sensing area **1512** may be an area including 1080×1920 sensing elements among the plurality of sensing elements included in the image sensor. The second sensing area **1512** may be a rectangular area, wherein 1080 sensing elements may be disposed on one side thereof, and 1920 sensing elements may be disposed on the other side perpendicular to the one side.

(101) Referring to FIG. **15**B, a camera module of an electronic device according to an embodiment may include a cross-shaped image sensor **1520**. Sensing areas of the image sensor **1520** may include a square sensing area **1531** and rectangular sensing areas **1541**, **1542**, **1543**, and **1544** adjacent to the sensing area **1531**. The square sensing area **1531** may be an area including 1080×1080 sensing elements. The rectangular sensing areas **1541**, **1542**, **1543**, and **1544** may be areas each including 1080×420 sensing elements.

(102) The electronic device according to an embodiment may acquire a landscape image by reading out third sensing elements corresponding to a third sensing area **1521** from the image sensor **1520** and acquire a portrait image by reading out fourth sensing elements corresponding to a fourth sensing area **1522**. The third sensing area **1521** is an area including 1920×1080 sensing elements among the plurality of sensing elements included in the image sensor, the area corresponding to the first sensing area **1511**. The third sensing area **1521** may be an area including the sensing area **1541**, the sensing area **1531**, and the sensing area **1542**. 1080 sensing elements may be disposed on one side **1503** of the third sensing area **1521**, and 1920 sensing elements may be disposed on the other side **1504** perpendicular to the one side **1503**. The fourth sensing area **1522** is an area including 1080×1920 sensing elements among the plurality of sensing elements included in the image sensor, the area corresponding to the second sensing area **1512**. The fourth sensing area is an area including the sensing area **1544**, the sensing area **1531**, and the sensing area **1543**. 1920 sensing elements may be disposed on one side **1505** of the fourth sensing area **1522**, and 1080 sensing elements may be disposed on the other side **1506** perpendicular to the one side.

(103) An electronic device according to an embodiment may map the landscape image acquired by reading out the first sensing area and the portrait image acquired by reading out the second sensing area to each other. The electronic device may map the acquired landscape image and the acquired portrait image to each other and store the mapped images in a single image file. The electronic device may include a plurality of camera modules, and each of the plurality of camera modules may include at least one of the image sensor **1510** and the image sensor **1520**. The electronic device may acquire a landscape image and a portrait image by reading out the 1920×1080 sensing elements, irrespective of the direction in which the image sensor is disposed, thereby preventing or reducing degradation of image resolution.
(104) FIG. **16** illustrates a process of displaying an acquired landscape image and an acquired portrait image in a display area by an electronic device according to an embodiment.
(105) An electronic device according to an embodiment may display images captured by a camera module in a display area. The electronic device according to an embodiment may acquire a landscape image by reading out first sensing elements corresponding to a first sensing area **1611** of an image sensor **1600** of the camera module and may acquire a portrait image by reading out second sensing elements corresponding to a second sensing area **1612** of the image sensor **1600**. According to another embodiment, the electronic device may acquire a landscape image by capturing with one camera module and acquire a portrait image by capturing with another camera module. The plurality of camera modules included in the electronic device may include at least one of the image sensor **1510** and the image sensor **1520**. The electronic device may acquire a landscape image by reading out sensing elements corresponding to a first sensing area of an image sensor included in a first camera module and acquire a portrait image by reading out sensing elements corresponding to a second sensing area of an image sensor included in a second camera module.
(106) The electronic device according to an embodiment may display the landscape image and the portrait image in the display area. The electronic device may select one object from among objects detected in the images (the landscape image and the portrait image) captured by the first camera module. The electronic device may acquire the portrait image by reading out second sensing elements corresponding to the second sensing area **1612**. The electronic device may generate a cropped image by cropping an area **1661** including an object area displaying the selected object (e.g., an area including a person) from the acquired portrait image. The electronic device may display the landscape image acquired by reading out first sensing elements corresponding to the first sensing area **1611** in a first partial area **1651** within the display area. The electronic device may display the cropped image cropped from the portrait image in a second partial area **1652** within the display area.
(107) While the disclosure has been illustrated and described with reference to various embodiments, it will be understood that the various embodiments are intended to be illustrative, not limiting. It will further be understood by those skilled in the art that various changes in form and detail may be made without departing from the true spirit and full scope of the disclosure, including the appended claims and their equivalents. It will also be understood that any of the embodiment(s) described herein may be used in conjunction with any other embodiment(s) described herein.

Claims

1. An electronic device comprising: a first camera, comprising imaging circuitry, configured to capture an image at a first angle of view; a second camera, comprising imaging circuitry, configured to capture an image at a second angle of view different from the first angle of view; memory comprising one or more storage medium storing instructions; and at least one processor comprising processing circuitry; wherein the instructions, when executed by the at least one processor individually and/or collectively, cause the electronic device to: capture a first image at

the first angle of view, using the first camera; detect a target object in the first image; activate the second camera based on a determination of at least a portion of the target object detected in the first image being out of the first angle of view; capture a second image at the second angle of view, using the activated second camera; display at least a portion of the first image in a first partial area within a display area of the display, and display at least portion of the second image in a second partial area within the display area, wherein the at least portion of the second image comprises area displaying the at least portion of the target object being out of the first angle of view.
2. The electronic device of claim 1, wherein the electronic device further comprises a display; and wherein the instructions, when executed by the at least one processor individually or collectively, cause the electronic device to: display the first image in the first partial area, and display the second image in the second partial area.
3. The electronic device of claim 1, wherein the electronic device further comprises a display; and wherein the instructions, when executed by the at least one processor individually or collectively, cause the electronic device to: generate a cropped image at least by cropping an area comprising the target object from the second image, and display the first image in the first partial area, display the generated cropped image in the second partial area.
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: resize the generated cropped image based on the first image.
5. 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: resize the generated cropped image based on a comparison between a first object area displaying a reference object in the first image and a second object area displaying the reference object in the second image, and the reference object is different from the target object.
6. 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: determine the sizes and positions of the first partial area and the second partial area within the display area, in response to at least one of the size, shape, ratio, and position of the first partial area, the size, shape, ratio, and position of the second partial area, and a user input, and resize the first image based on the determined size of the first partial area and resize the generated cropped image based on the determined size of the second partial area.
7. 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: activate the second camera in response to at least a portion of the target object among a plurality of objects detected from the first image being out of the first angle of view, display an area comprising the remaining objects excluding the target object among the plurality of objects from the first image in a first partial area, and display an area comprising the target object from the second image in a second partial area.
8. The electronic device of claim 1, further comprising: a third camera, comprising imaging circuitry, configured to capture a image at a third angle of view different from the second angle of view, and wherein the instructions, when executed by the at least one processor individually or collectively, cause the electronic device to: activate the third camera based on a determination of at least one of objects detected in the second image being out of the second angle of view, and capture a third image using the activated third camera.
9. 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: deactivate the first camera in response to the second camera being activated.
10. The electronic device of claim 1, wherein the first camera comprises a first image sensor including a plurality of sensing elements configured to receive light and convert the light into image signals, each sensing element comprising circuitry, and wherein the instructions, when executed by the at least one processor individually or collectively, cause the electronic device to:

acquire a landscape image at least by reading out a first sensing element corresponding to a first sensing area among the plurality of sensing elements, acquire a portrait image at least by reading out a second sensing element corresponding to a second sensing area among the plurality of sensing elements, and map the acquired landscape image and the acquired portrait image to each other.

11. The electronic device of claim 10, wherein the instructions, when executed by the at least one processor individually or collectively, cause the electronic device to: select at least one object detected in the first image and generate a cropped image at least by cropping an area comprising the selected object from the acquired portrait image, and display the acquired landscape image in the first partial area display the generated cropped image in the second partial area.

12. A method performed by an electronic device including camera, the method comprising: capturing a first image at a first angle of view of a first camera comprising imaging circuitry; detecting a target object in the first image; and activating a second camera, comprising imaging circuitry, configured to capture a image at a second angle of view different from the first angle of view, based on determining that at least one object detected in the first image is out of the first angle of view capturing a second image at the second angle of view of the second camera, using the activated second camera; displaying at least portion of the first image in a first partial area within a display area of the display; and displaying at least portion of the second image in a second partial area within the display area, wherein the at least portion of the second image comprises area displaying the at least portion of the target object being out of the first angle of view.

13. The method of claim 12, further comprising: generating a cropped image at least by cropping an area comprising the target object from the second image, wherein the displaying the at least portion of the first image comprises displaying the first image in the first partial area; and wherein the displaying the at least portion of the second image comprises displaying the generated cropped image in the second partial area.

14. The method of claim 13, wherein the generating of the cropped image comprises resizing the generated cropped image based on a comparison between a first object area displaying a reference object in the first image and a second object area displaying the reference object in the second image, and the reference object is different from the target object.

15. The method of claim 12, further comprising: acquiring a landscape image at least by reading out a first sensing element corresponding to a first sensing area among a plurality of sensing elements included in a first image sensor of the first camera; acquiring a portrait image at least by reading out a second sensing element corresponding to a second sensing area among the plurality of sensing elements; and mapping the acquired landscape image and the acquired portrait image to each other.