

【DESCRIPTION】

【Invention Title】

METHOD AND SYSTEM FOR PROVIDING POSTURE AND JOINT MOTION
TEST SERVICE BASED ON ARTIFICIAL INTELLIGENCE

【Technical Field】

[1] The present invention relates to a method and system for providing a posture and joint motion test service based on artificial intelligence.

【Background Art】

[2] A musculoskeletal disease refers to pain or damage created in a musculoskeletal system, such as muscles, nerves, tendons, ligaments, bones, and surrounding tissues. A musculoskeletal disease appears in various places of a human body, such as a neck, a waist, arms, and legs.

[3] According to a report of the World Health Organization (WHO), economic loss due to a musculoskeletal disease is shown as fourth highest among entire diseases, and a musculoskeletal disease is chronic pain affecting not only daily life but also economic activities.

[4] Meanwhile, as technology develops, distribution of electronic devices (for example, a smartphone, a tablet PC, etc.) is popularized, and accordingly, dependence on the Internet in many parts of daily life gradually increases.

[5] As described above, with the development of various technologies including the Internet, a consumption pattern, which had high dependence on offline in the past, gradually moved to online, and currently, the consumption centered around the online world has been experiencing exponential growth.

- [6] In accordance with such a trend, an industrial field such as a medical industry, in which characteristics of services are based on offline, is also popularized to provide medical services through online.
- [7] Accordingly, recently, various medical services through online are provided, and a patient, that is, a user, becomes able to perform medical consultations with medical staff about diseases with only several clicks through an electronic device connected to the Internet.
- [8] As such technology, Korean Registered Patent No. 10-2193012 discloses technology related to a server and a system providing an online medical platform, and provides information on a point of providing medical services through online to a patient.
- [9] In accordance with such a trend, there exists a need for a service photographing posture and joint motion of a musculoskeletal patient, and providing a result analyzed based on artificial intelligence through online.

【Disclosure】

【Technical Problem】

- [10] The present invention is directed to providing a method and system for providing a posture and joint motion test service, capable of photographing posture or joint motion of a musculoskeletal patient and providing a result analyzed through an artificial intelligence model.
- [11] Further, the present invention is directed to providing a method and system for providing a posture and joint motion test service, capable of providing a photographing process sequentially proceeding photographing on posture or joint motion of a patient in a medical staff terminal.

[12] Further, the present invention is directed to providing a method and system for providing a posture and joint motion test service, capable of providing a sharing environment of a posture and joint motion test service in a hospital unit.

[13] Further, the present invention is directed to providing a method and system for providing a posture and joint motion test service, capable of providing an exercise program for a treatment purpose to a patient based on authority of medical staff.

【Technical Solution】

[14] To solve the aforementioned problems, there is provided a method for providing a posture and joint motion test service based on artificial intelligence, according to the present invention. The method may comprise: specifying a patient to be photographed based on information received from a medical staff terminal; receiving, from the medical staff terminal, a selection for at least one photographing item on which photographing is to be performed for the patient, among a plurality of photographing items respectively corresponding to a plurality of photographing topics related to a posture or a joint motion; specifying, based on the selection for the at least one photographing item, at least one photographing topic, among the plurality of photographing topics, on which photographing is to be performed for the patient; providing, to the medical staff terminal, a photographing process of sequentially proceeding a plurality of photographings to which a specific posture or a specific joint motion corresponding to the specified photographing topic is matched, with the patient as a subject; acquiring a plurality of images according to the plurality of photographings through the photographing process; and transmitting the plurality of images to a server.

[15] Further, each of the plurality of photographing topics may have, matched thereto, a plurality of sub-topics on which photographing is to be performed in relation to the

posture or the joint motion, and a photographing sequence of the plurality of sub-topics, and the photographing process may sequentially proceed the plurality of photographings matched to each of the plurality of sub-topics according to the photographing sequence.

- [16]** Further, when the specified photographing topic includes a first sub-topic and a second sub-topic different from the first sub-topic, the plurality of photographings may include a first photographing matched to the first sub-topic and a second photographing matched to the second sub-topic, and the photographing process may be provided to the medical staff terminal such that, after the first photographing is performed, the second photographing consecutively proceeds at the medical staff terminal.
- [17]** Further, while the first photographing proceeds at the medical staff terminal, on a display unit of the medical staff terminal, first guidance information matched to the first sub-topic and first sequence-guidance information guiding at least one of the first sub-topic and the first photographing sequence may be displayed, and in conjunction with the second photographing proceeding after the first photographing is performed, on the display unit of the medical staff terminal, second guidance information matched to the second sub-topic and second sequence-guidance information guiding at least one of the second sub-topic and the second photographing sequence may be displayed.
- [18]** Further, the plurality of images may include a first image acquired in the first photographing and a second image acquired in the second photographing, in which the method may further comprise: determining whether re-photographing is required for at least one of the plurality of images; as a result of the determination, when it is determined that re-photographing is required for the at least one image, specifying any one sub-topic corresponding to an image requiring the re-photographing; and providing, to the medical staff terminal, a re-photographing process such that re-

photographing matched to the specified sub-topic proceeds, and the image among the plurality of images for which the re-photographing is required may be updated with an image acquired through the re-photographing process.

- [19]** Further, when a first photographing topic and a second photographing topic different from the first photographing topic are specified among the plurality of photographing topics, the photographing process may be provided to the medical staff terminal such that, after the plurality of photographings corresponding to the first photographing topic are performed at the medical staff terminal, the plurality of photographings corresponding to the second photographing topic consecutively proceed.
- [20]** The method may further comprise: analyzing the specific posture or the specific joint motion of the patient based on the plurality of images; and providing, to the medical staff terminal, an analysis result regarding the specific posture or the specific joint motion of the patient.
- [21]** Further, the analysis may comprise: extracting keypoints respectively corresponding to a plurality of preset joint points from the plurality of images by using an artificial intelligence posture estimation model; analyzing relative positional relationships between the keypoints through an artificial intelligence motion analysis model; and analyzing the specific posture or the specific joint motion of the patient based on the analysis of the positional relationships.
- [22]** The method may further comprise: occurring, at the medical staff terminal, of a payment event related to an analysis-result providing service; specifying a payment amount, based on the occurrence of the payment event, by using a photographing-process proceeding history performed for a predetermined period for providing the analysis result; and performing a payment process for the payment amount.

[23] Meanwhile, there is provided a system for providing a posture and joint motion test service based on artificial intelligence, according to the present invention. The system may comprise: a control unit configured to: specify a patient to be photographed based on information received from a medical staff terminal; and receive, from the medical staff terminal, a selection for at least one photographing item on which photographing is to be performed for the patient, among a plurality of photographing items respectively corresponding to a plurality of photographing topics related to a posture or a joint motion, in which the control unit may be configured to: specify, based on the selection for the at least one photographing item, at least one photographing topic, among the plurality of photographing topics, on which photographing is to be performed for the patient; provide, to the medical staff terminal, a photographing process of sequentially proceeding a plurality of photographings to which a specific posture or a specific joint motion corresponding to the specified photographing topic is matched, with the patient as a subject; acquire a plurality of images according to the plurality of photographings through the photographing process; and transmit the plurality of images to a server.

[24] Meanwhile, there is provided a program stored on a computer-readable recording medium, executed by one or more processes in an electronic device, according to the present invention. The program may comprise instructions for performing: specifying a patient to be photographed based on information received from a medical staff terminal; receiving, from the medical staff terminal, a selection for at least one photographing item on which photographing is to be performed for the patient, among a plurality of photographing items respectively corresponding to a plurality of photographing topics related to a posture or a joint motion; specifying, based on the selection for the at least one photographing item, at least one photographing topic,

among the plurality of photographing topics, on which photographing is to be performed for the patient; providing, to the medical staff terminal, a photographing process of sequentially proceeding a plurality of photographings to which a specific posture or a specific joint motion corresponding to the specified photographing topic is matched, with the patient as a subject; acquiring a plurality of images according to the plurality of photographings through the photographing process; and transmitting the plurality of images to a server.

【Advantageous Effects】

[25] As examined above, the method and system for providing a posture and joint motion test service according to the present invention can, based on information received from a medical staff terminal, specify a patient to be photographed, and, among a plurality of photographing items respectively corresponding to a plurality of photographing topics related to posture or joint motion, receive, from the medical staff terminal, a selection for at least one photographing item on which photographing is to be performed for the patient, and, based on the selection for the at least one photographing item, specify at least one photographing topic, among the plurality of photographing topics, on which photographing is to be performed for the patient. Medical staff can perform patient-customized posture analysis by selecting a topic required for analysis of posture or joint motion of the patient.

[26] Further, the method and system for providing a posture and joint motion test service according to the present invention provides, to the medical staff terminal, a photographing process sequentially proceeding a plurality of photographings to which a specific posture or a specific joint motion corresponding to the specified photographing topic is matched, with the patient as a subject, and can obtain a plurality of images according to the plurality of photographings through the photographing

process. Through this, in the present invention, medical staff, by using a medical staff terminal possessed by the medical staff, can provide an analysis service analyzing joint motion of a musculoskeletal patient with artificial intelligence, even without expensive equipment.

【Description of Drawings】

- [27]** FIG. 1 is a conceptual diagram for explaining a system for providing a posture and joint motion test service according to the present invention.
- [28]** FIG. 2 is a conceptual diagram for explaining a plurality of photographing items respectively corresponding to a plurality of photographing topics related to posture or joint motion.
- [29]** FIG. 3 is a conceptual diagram for explaining a method for distinguishing and managing a medical staff account and a patient account in the present invention.
- [30]** FIG. 4 is a flowchart for explaining a method for providing a posture and joint motion test service according to the present invention.
- [31]** FIG. 5A, FIG. 5B, FIG. 5C, FIG. 5D, FIG. 5E, FIG. 5F, FIG. 5G, FIG. 5H, FIG. 6A, FIG. 6B, FIG. 6C, and FIG. 6D are conceptual diagrams for explaining a method for providing a posture and joint motion test service according to the present invention.
- [32]** FIG. 7A, FIG. 7B, FIG. 7C, FIG. 8A, FIG. 8B, FIG. 8C, FIG. 8D, and FIG. 8E are conceptual diagrams for explaining various functions provided using history information of a patient in the present invention.
- [33]** FIG. 9A, FIG. 9B, FIG. 9C, and FIG. 9D are conceptual diagrams for explaining a service provided to a patient through an analysis result of posture or joint motion of the patient in the present invention.
- [34]** FIG. 10 is a conceptual diagram for explaining a payment process provided in the present invention.

[35] FIG. 11A and FIG. 11B are conceptual diagrams for explaining a method for prescribing an exercise program to a patient in the present invention.

[36] FIG. 12, FIG. 13, FIG. 14A, FIG. 14B, and FIG. 14C are conceptual diagrams for explaining a method for performing analysis on posture or joint motion of a patient in the present invention.

【Mode for Disclosure】

[37] Hereinafter, exemplary embodiments disclosed in the present specification will be described in detail with reference to the accompanying drawings. The same or similar constituent elements are assigned with the same reference numerals regardless of reference numerals, and the repetitive description thereof will be omitted. The suffixes "module", "unit", "part", and "portion" used to describe constituent elements in the following description are used together or interchangeably in order to facilitate the description, but the suffixes themselves do not have distinguishable meanings or functions. In addition, in the description of the exemplary embodiment disclosed in the present specification, the specific descriptions of publicly known related technologies will be omitted when it is determined that the specific descriptions may obscure the subject matter of the exemplary embodiment disclosed in the present specification. In addition, it should be understood that the accompanying drawings are provided only to easily understand the embodiments disclosed in the present specification, and the technical teachings disclosed in the present specification are not limited by the accompanying drawings, and includes all alterations, equivalents, and alternatives that are included in the teachings and the technical scope of the present invention.

[38] The terms including ordinal numbers such as "first," "second," and the like may be used to describe various constituent elements, but the constituent elements are not

limited by the terms. These terms are used only to distinguish one constituent element from another constituent element.

- [39] When one constituent element is described as being "coupled" or "connected" to another constituent element, it should be understood that one constituent element can be coupled or connected directly to another constituent element, and an intervening constituent element can also be present between the constituent elements. When one constituent element is described as being "coupled directly to" or "connected directly to" another constituent element, it should be understood that no intervening constituent element exists between the constituent elements.
- [40] Singular expressions include plural expressions unless clearly described as different meanings in the context.
- [41] In the present application, it should be understood that terms "including", "having", and the like are intended to designate the existence of characteristics, numbers, steps, operations, constituent elements, and components described in the specification or a combination thereof, and do not exclude a possibility of the existence or addition of one or more other characteristics, numbers, steps, operations, constituent elements, and components, or a combination thereof in advance.
- [42] FIG. 1 is a conceptual diagram for explaining a system for providing a posture and joint motion test service according to the present invention. Further, FIG. 2 is a conceptual diagram for explaining a plurality of photographing items respectively corresponding to a plurality of photographing topics related to posture or joint motion.
- [43] With reference to FIG. 1, a system 100 for providing a posture and joint motion test service according to the present invention may provide a plurality of photographing items 1, 2, 3, and 4, respectively corresponding to a plurality of photographing topics, to a medical staff terminal 10.

- [44] The plurality of photographing topics described in the present invention may be related to posture or joint motion. More specifically, among a plurality of photographing topics (the first photographing topic to the fourth photographing topic), a first photographing topic may be related to “static posture”, and a second photographing topic may be related to “joint range of motion (shoulder)”, and a third photographing topic may be related to “joint range of motion (elbow)”, and a fourth photographing topic may be related to “joint range of motion (torso)”.
- [45] Meanwhile, as illustrated in FIG. 2, each of a plurality of photographing items 1, 2, 3, and 4 respectively corresponding to a plurality of photographing topics may have, matched thereto, at least one among a photographing-target scene (or scene), a photographing method, and a photographing sequence.
- [46] In the present invention, a statement that “a plurality of photographing items are matched (or corresponded)” may be understood to mean that a plurality of photographing topics are matched (or corresponded).
- [47] A photographing-target scene may be configured to include a plurality of scenes corresponding to a specific posture or a specific joint motion respectively corresponding to each of the plurality of photographing topics.
- [48] Among a plurality of photographing items 1, 2, 3, and 4, a first photographing item 1 may include a plurality of photographing-target scenes to which a specific posture corresponding to the first photographing topic (ex: static posture) is matched. For example, the first photographing item 1 may have, matched thereto, at least one photographing-target scene among a front static posture scene (e.g., "static posture (front)" 1a), a left static posture scene (e.g., "static posture (left)" 1b), and a right static posture scene (e.g., "static posture (right)" 1c).

- [49] In addition, among a plurality of photographing items 1, 2, 3, and 4, a third photographing item 3 may include a plurality of photographing-target scenes to which a specific joint motion corresponding to the third photographing topic (e.g., "joint range of motion (elbow)") is matched. For example, the third photographing item 3 may have, matched thereto, at least one photographing-target scene among a left elbow flexion scene (e.g., "elbow flexion (left)" 3a), a left elbow extension scene (e.g., "elbow extension (left)" 3b), a right elbow flexion scene (e.g., "elbow flexion (right)" 3c), and a right elbow extension scene (e.g., "elbow extension (right)" 3d).
- [50] That is, among a plurality of photographing items 1, 2, 3, and 4, the first photographing item 1 may have, matched thereto, a plurality of photographing-target scenes related to a specific posture, and each of first to fourth photographing items 2, 3, and 4 may have, matched thereto, a plurality of photographing-target scenes related to a specific joint motion.
- [51] Meanwhile, in a photographing-target scene matched for each of a plurality of photographing items 1, 2, 3, and 4, a photographing method used to photograph a plurality of scenes may be matched. Here, in a photographing method, at least one among a first photographing method (e.g., "photo shooting") and a second photographing method (e.g., "video shooting") may be included.
- [52] For example, a plurality of photographing-target scenes 1a to 1c matched to a first photographing item 1 may be configured to be photographed through the first photographing method.
- [53] In another example, a plurality of photographing-target scenes 3a to 3d matched to a third photographing item 3 may be configured to be photographed through the second photographing method.

- [54] That is, a scene photographed through the first photographing method may include an image related to a “specific posture”, and a scene photographed through the second photographing method may include an image related to a “specific joint motion”.
- [55] Meanwhile, for each of a plurality of photographing items 1, 2, 3, and 4, a photographing sequence in which a plurality of photographing-target scenes matched thereto are photographed may be preset to exist. Such a photographing sequence may be preset to exist in the system 100 for providing a posture and joint motion test service.
- [56] For example, a photographing sequence in which a plurality of scenes 1a to 1c matched to the first photographing item 1 among a plurality of photographing items 1, 2, 3, and 4 are photographed may be set such that a front static posture scene 1a – a left static posture scene 1b – a right static posture scene 1c are sequentially photographed.
- [57] In another example, a photographing sequence in which a plurality of scenes 3a to 3d matched to the third photographing item 3 are photographed may be set such that a left elbow flexion scene 3a – a left elbow extension scene 3b – a right elbow flexion scene 3c – a right elbow extension scene 3d are sequentially photographed.
- [58] That is, in the present invention, a photographing process capable of sequentially photographing a plurality of photographing-target scenes respectively matched to each of a plurality of photographing items 1, 2, 3, and 4 according to a preset photographing sequence may be provided to a medical staff terminal 10.
- [59] In this regard, when a plurality of photographing items are selected at the medical staff terminal 10, a plurality of photographing items may be sequentially photographed according to the photographing sequence preset in the system 100 for providing a posture and joint motion test service.
- [60] As one example, a preset photographing sequence for a plurality of photographing items may be set based on a photographing method. In this case, after a plurality of

photographing-target scenes photographed through the first photographing method are sequentially photographed, a plurality of photographing-target scenes photographed through the second photographing method may be set to be sequentially photographed.

[61] As another example, a preset photographing sequence for a plurality of photographing items may be set such that a first photographing item 1 – a second photographing item 2 – a third photographing item 3 – a fourth photographing item 4 are photographed in order. In this case, when it is assumed that a second photographing item 2 and a fourth photographing item 4 among a plurality of photographing items 1, 2, 3, and 4 are selected from a medical staff terminal 10, after a plurality of scenes matched to the second photographing item 2 are sequentially photographed according to the photographing sequence, a plurality of photographing-target scenes matched to the fourth photographing item 4 may be sequentially photographed according to the photographing sequence.

[62] However, the preset photographing sequence for a plurality of photographing items is not limited to the above-described case. In the present invention, a preset photographing sequence for a plurality of photographing items may be variously set by an administrator of a system 100 for providing a posture and joint motion test service or by a user who uses the posture and joint motion test service. Hereinafter, for convenience of explanation, the above-described case will be explained without distinguishing.

[63] For example, as illustrated in FIG. 2, it is assumed that a first photographing item 1 and a third photographing item 3 among a plurality of photographing items 1, 2, 3, and 4 are selected from the medical staff terminal 10. In the present invention, after a front static posture scene 1a – a left static posture scene 1b – a right static posture scene 1c matched to the first photographing item 1 are sequentially photographed, a left

elbow flexion motion 3a – a left elbow extension motion 3b – a right elbow flexion motion 3c – a right elbow extension motion 3d matched to the third photographing item 3 are sequentially photographed, so that a photographing process for a plurality of photographing items may be provided to the medical staff terminal 10.

[64] Further, in the present invention, “medical staff” described herein may include a person who works at a medical institution (e.g., a hospital, H), for example, at least one among a doctor, a nurse, and a physical therapist.

[65] In the present invention, for convenience of explanation, a doctor and a physical therapist will be described as examples of the medical staff. However, the medical staff is not limited thereto, and any user who works at a medical institution for a posture and joint motion test service may correspond to the medical staff according to the present invention.

[66] With reference back to FIG. 1, the system 100 for providing a posture and joint motion test service according to the present invention may include at least one component among a communication unit 110, a storage unit 120, and a control unit 130.

[67] The communication unit 110 may be connected with a server, a device, or the like through a wireless or wired network, and may be configured to receive or transmit overall data and information required for the system 100 for providing a posture and joint motion test service.

[68] In addition, the communication unit 110 may be communicatively connected with at least one among a medical staff terminal 10 and a patient terminal 20, and may receive requests related to a posture and joint motion test service from the medical staff terminal 10 and the patient terminal 20. For example, the communication unit 110 may receive a specific patient account registration request for registering a specific

patient account for a posture and joint motion test service from the medical staff terminal 10.

- [69] Here, the medical staff terminal 10 and patient terminal 20 may include at least among a cell phone, a smart phone, a notebook computer, a portable computer (laptop computer), a slate PC, a tablet PC, an ultrabook, a desktop computer, a digital broadcast terminal, a personal digital assistant (PDA), a portable multimedia player (PMP), a navigation device, a wearable device (e.g., a watch-type device (smartwatch), a glass-type device (smart glass), and a head mounted display (HMD)).
- [70] Although it is not illustrated, a medical staff terminal 10 and a patient terminal 20 may include at least one among a display unit for outputting information and an input unit for receiving, as input, information from medical staff and a patient.
- [71] The display unit and the input unit of the medical staff terminal 10 and the patient terminal 20 may independently exist from each other, but may exist integrally such as a touch screen. In a case where the display unit and the input unit exist integrally such as a touch screen, the input unit may be understood as a sensing unit that senses an input (e.g., a touch input or a scroll input, etc.) through the display unit, as one component of the display unit.
- [72] Hereinafter, without separately distinguishing whether the display unit and the input unit of the medical staff terminal 10 and the patient terminal 20 independently exist or integrally exist, a configuration that performs a function of outputting information will be named the display unit, and a configuration that performs a function of receiving, as input, information will be named the input unit.
- [73] Further, the communication unit 110 may support various communication methods according to communication standards of a communicating device.

- [74] For example, the communication unit 110 may be configured to communicate with at least one among the medical staff terminal 10, the patient terminal 20, a server, and a device (including a cloud server) by using at least one among wireless LAN (WLAN), wireless fidelity (Wi-Fi), wireless fidelity (Wi-Fi) direct, digital living network alliance (DLNA), wireless broadband (WiBro), world interoperability for microwave access (WiMAX), high speed downlink packet access (HSDPA), high speed uplink packet access (HSUPA), long term evolution (LTE), long term evolution-advanced (LTE-A), fifth generation mobile telecommunication (5G), Bluetooth™, radio frequency identification (RFID), infrared communication (infrared data association (IrDA)), ultra-wideband (UWB), ZigBee, near field communication (NFC), and wireless universal serial bus (wireless USB) technologies.
- [75] Meanwhile, the storage unit 120, which may also be named a database (DB), may be configured to store various information related to the present invention. In the present invention, the storage unit 120 may be provided in the system 100 for providing a posture and joint motion test service itself. In addition, at least a part of the storage unit 120 may be configured as a cloud server (or a cloud storage). That is, the storage unit 120 may be understood as being sufficient if it is a space in which information required for the system 100 for providing a posture and joint motion test service according to the present invention is stored, and may have no limitation in physical space.
- [76] Further, in the storage unit 120, data and commands required for the operation of the system 100 for providing a posture and joint motion test service according to the present invention may be stored. For example, in the storage unit 120, training data required for training an artificial intelligence model used for analysis of a patient's

posture and joint motion may be stored, and commands implemented to perform a patient's posture and joint motion analysis task may be stored.

[77] Meanwhile, in the storage unit 120, information regarding at least one among a photographing-target scene, a photographing method, and a photographing sequence included in a plurality of photographing items 1, 2, 3, and 4 respectively corresponding to a plurality of photographing topics may be matched and stored. For example, as illustrated in FIG. 2, the storage unit 120, may have, matched thereto, at least one among i) information regarding a plurality of scenes 1a to 1c matched to the first photographing item 1, ii) photographing method information of the plurality of scenes 1a to 1c matched to the first photographing item 1, and iii) photographing sequence information of the plurality of scenes 1a to 1c matched to the first photographing item 1.

[78] In another example, the storage unit 120 may have, matched thereto, at least one among i) information regarding a plurality of scenes 3a to 3d matched to the third photographing item 3, ii) photographing method information of the plurality of scenes 3a to 3d matched to the third photographing item 3, and iii) photographing sequence information of the plurality of scenes 3a to 3d matched to the third photographing item 3.

[79] In addition, in the storage unit 120, information related to a preset photographing sequence for a plurality of photographing items may be stored. For example, the system 100 for providing a posture and joint motion test service may provide a photographing process capable of sequentially proceeding photographing for each of a plurality of photographing items to the medical staff terminal 10 by using information stored in the storage unit 120.

- [80]** Further, in the storage unit 120, information regarding a specific medical staff and information regarding a specific patient may be matched and stored. For example, the storage unit 120 may have, matched thereto, at least one among i) information regarding a specific patient (or a patient account), ii) information regarding a medical staff (or a medical staff account) who photographed the specific patient, iii) information regarding a specific photographing item that photographed the specific patient, iv) information regarding an image (or a photo) in which the specific patient is photographed with respect to a specific photographing item, v) information regarding a date and a time when the specific photographing item is photographed, and vi) information regarding an analysis result of posture or joint motion of the specific patient.
- [81]** Meanwhile, the control unit 130 may perform a role of controlling an overall operation of the system 100 for providing a posture and joint motion test service related to the present invention. The control unit 130 may perform a series of data processing for processing signals, data, information, and the like that are input or output through the constituent elements described above, or for providing or processing appropriate information and functions to a user.
- [82]** The control unit 130 may detect a subject U from an image by using an object detection algorithm, based on a subject corresponding to an entire patient body being included in a specific area. For example, the control unit 130 may use an algorithm (Weighted Box Fusion, WBF) that ensembles a plurality of bounding boxes.
- [83]** In addition, the control unit 130 may train an artificial intelligence model by using training data stored in the storage unit 120 in order to analyze a patient's posture and joint motion. Further, the control unit 130 may analyze a patient's posture and joint motion included in an image photographed from a medical staff terminal 10 by using

an artificial intelligence model specialized for posture and joint motion analysis, and may provide the analyzed result to the medical staff terminal 10.

[84] Further, the control unit 130 may provide, to the medical staff terminal 10, a photographing process that is capable of sequentially proceeding photographing for a plurality of scenes matched to a specific posture or a specific joint motion corresponding to a specified photographing topic, by using information related to a plurality of photographing items 1, 2, 3, and 4 stored in the storage unit 120.

[85] Hereinafter, a method for distinguishing and managing a medical staff account and a patient account in the present invention will be more specifically described. FIG. 3 is a conceptual diagram for explaining a method for distinguishing and managing a medical staff account and a patient account in the present invention.

[86] As illustrated in FIG. 3, the control unit 130 may distinguish and manage a medical staff account of medical staff and a patient account of a patient. Hereinafter, for convenience of explanation, the same reference numerals “U1”, “U2”, “U4”, and “U5” as medical staff will be given to a medical staff account, and the same reference numerals “U3” and “U6” as a patient will be given to a patient account.

[87] The control unit 130 may manage medical staff accounts U1, U2, U4, and U5 on a hospital (H1, H2) unit basis. More specifically, the control unit 130 may match medical staff accounts U1, U2, U4, and U5 with at least one hospital (or hospital information, H1, H2) in which the medical staff works (or belongs), and may store the matched information in a storage unit 120.

[88] For example, the control unit 130 may manage medical staff accounts U1 and U2 of medical staff (e.g., “therapist A” and “doctor A”) who work at a first hospital H1 matched with the first hospital H1, and may manage medical staff accounts U4 and U5

of medical staff (e.g., “therapist B” and “doctor B”) who work at a second hospital H2, matched with the second hospital H2.

[89] Meanwhile, in the present invention, a medical staff account may be distinguished into a first type and a second type according to an authority granted to the account.

[90] A first type medical staff account may be understood as a medical staff account to which at least one among i) an authority to register a patient account, ii) an authority to photograph a patient registered in one’s own account, and iii) an authority to check an individual patient record through user authentication is granted.

[91] A second type medical staff account may be understood as a medical staff account to which at least one among i) an authority to access all photographing records of patients registered in a first type medical staff account, ii) an authority to modify joint points of a patient, iii) an authority to check and share an analysis result regarding a patient’s posture or joint motion, and iv) an authority to independently prescribe an exercise program to a patient is granted.

[92] However, at least a part of the authority granted to a first type medical staff account may also be performed in a second type medical staff account.

[93] The control unit 130 may set a medical staff account to either the first type or the second type based on occupation information of the medical staff.

[94] For example, when the occupation of the medical staff is a first type occupation (e.g., “therapist”), the control unit 130 may set a type of the medical staff account as the first type. On the other hand, when the occupation of the medical staff is a second type occupation (e.g., “doctor”), the control unit 130 may set a type of the medical staff account as the second type.

- [95] As described above, in the present invention, based on whether a type of a medical staff account is the first type or the second type, posture and joint motion test service may be provided to a patient according to different processes.
- [96] Meanwhile, as illustrated in FIG. 3, in the storage unit 120, patient accounts U3 and U6 may exist. The patient accounts U3 and U6 may have, matched thereto, at least one among i) symptom information regarding a patient's symptoms, ii) photographing record information of the patient with respect to a specific photographing item, iii) analysis result information of the patient's posture and joint motion, iv) medical staff information of medical staff in charge of the patient, and v) hospital information to which the medical staff belongs.
- [97] The control unit 130 may configure a patient account registration page 510 for registering a patient account. For example, as illustrated in FIG. 5A, the control unit 130 may configure a patient account registration page 510 such that an input is made for at least one among i) patient name information, ii) patient date-of-birth information, iii) patient gender information, iv) patient mobile phone number information, and v) patient e-mail address information.
- [98] That is, the control unit 130 may create a patient account even if occupation information of the patient or hospital information of a related hospital is not input.
- [99] Such a patient account registration page 510 may be provided to at least one among a medical staff terminal 10 and a patient terminal 20.
- [100] For example, when a patient visits a hospital, the control unit 130 may provide the patient account registration page 510 to the medical staff terminal 10. Medical staff may generate a patient account by inputting patient information of a patient through the medical staff terminal 10.

[101] In another example, a patient may directly generate a patient account through the patient account registration page 510 provided to the patient terminal 20.

[102] Hereinafter, based on the configuration of the system 100 for providing a posture and joint motion test service described above, a photographing process provided in the present invention will be described in more detail. FIG. 4 is a flowchart for explaining a method for providing a posture and joint motion test service according to the present invention, FIG. 5A, FIG. 5B, FIG. 5C, FIG. 5D, FIG. 5E, FIG. 5F, FIG. 5G, FIG. 5H, FIG. 6A, FIG. 6B, FIG. 6C, and FIG. 6D are conceptual diagrams for explaining a method for providing a posture and joint motion test service according to the present invention, FIG. 7A, FIG. 7B, FIG. 7C, FIG. 8A, FIG. 8B, FIG. 8C, FIG. 8D, and FIG. 8E are conceptual diagrams for explaining various functions provided using history information of a patient in the present invention, FIG. 9A, FIG. 9B, FIG. 9C, and FIG. 9D are conceptual diagrams for explaining a service provided to a patient through an analysis result of posture or joint motion of the patient in the present invention, and FIG. 10 is a conceptual diagram for explaining a payment process provided in the present invention. FIG. 11A and FIG. 11B are conceptual diagrams for explaining a method for prescribing an exercise program to a patient in the present invention, and FIG. 12, FIG. 13, FIG. 14A, FIG. 14B, and FIG. 14C are conceptual diagrams for explaining a method for performing analysis on posture or joint motion of a patient in the present invention.

[103] In the present invention, based on information received from a medical staff terminal, a process of specifying a patient to be photographed may proceed (S410, see FIG. 4).

[104] As illustrated in FIG. 5A, the control unit 130 may provide a patient management page 500 capable of registering and managing a patient account to a medical staff terminal 10 in which a specific medical staff account U1 is logged in.

- [105]** Here, the specific medical staff account U1 may be understood as a first type medical staff account. As described above, a first type medical staff account may be understood as a medical staff account to which at least one among i) an authority to register a patient account, ii) an authority to photograph a patient registered in one's own account, and iii) an authority to check an individual patient record through user authentication is granted.
- [106]** The control unit 130 may provide, on the patient management page 500, a graphic object 501 linked to a patient account registration request. Further, the control unit 130, based on selection for the graphic object 501 included in the patient management page 500 from the medical staff terminal 10, may provide a patient account registration page 510 capable of registering a patient account for a specific patient to the medical staff terminal 10.
- [107]** The patient account registration page 510 may be configured to receive, as input, various information related to a patient. For example, the patient account registration page 510 may be configured to receive an input for at least one among i) patient name information, ii) patient date-of-birth information, iii) patient gender information, iv) patient mobile phone number information, and v) patient e-mail address information.
- [108]** The control unit 130 may control the process such that, when all patient information for a specific patient is input from the medical staff terminal 10, a graphic object 511 included in the patient account registration page 510 is displayed in an activated state. Further, based on selection for the activated graphic object 511 from the medical staff terminal 10, the control unit 130 may control the process such that a specific medical staff account U1 has a specific patient account registered.

- [109] Further, when a specific patient account is registered in a specific medical staff account U1, the control unit 130 may match the specific medical staff account U1 and the specific patient account, and may store the matched pair in a storage unit 120.
- [110] Meanwhile, the control unit 130 may provide a patient account page including information related to a specific patient account to the medical staff terminal 10. For example, as illustrated in FIG. 5B, the control unit 130 may provide, to the medical staff terminal 10, a patient account page 520 including at least one among i) name information of a specific patient (e.g., “patient A”, U3), ii) gender information of the specific patient (e.g., “male”), iii) date-of-birth information of the specific patient (e.g., “1980.10.20”), and iv) mobile phone number information of the specific patient (e.g., “011-1234-5678”), which is matched to a specific patient account (e.g., “patient A”, U3).
- [111] The control unit 130 may control the process such that a graphic object 521 linked to a request for activating a photographing process is included in the patient account page 520. The control unit 130, based on selection for the graphic object 521 included in the patient account page 520 from the medical staff terminal 10, may receive a request of a specific medical staff U1 for activating the photographing process.
- [112] In addition, the graphic object 521 may be linked to a request for specifying a patient to be photographed. When the graphic object 521 included in the patient account page 520 is selected from the medical staff terminal 10, the control unit 130 may specify a patient to be photographed. For example, when the control unit 130 receives a selection for the graphic object 521 included in the patient account page 520, the control unit 130 may check which specific patient-related information is included in the patient account page 520 that includes the graphic object 521. Further, based on the checked information, the control unit 130 may specify a patient

to be photographed U3 among a plurality of patients matched to a specific medical staff account U1.

- [113]** Further, the graphic object 521 may be linked to a request for providing a plurality of photographing items respectively corresponding to a plurality of photographing topics related to posture or joint motion. When the graphic object 521 included in the patient account page 520 is selected from the medical staff terminal 10, the control unit 130 may provide a plurality of photographing items respectively corresponding to a plurality of photographing topics to the medical staff terminal 10. For example, as illustrated in FIG. 5C, when the control unit 130 receives a selection for the graphic object 521 included in the patient account page 520, the control unit 130 may provide a plurality of photographing items 1, 2, 3, and 4 respectively corresponding to a plurality of photographing topics to the medical staff terminal 10.
- [114]** Meanwhile, in the present invention, a process of receiving, from a medical staff terminal, a selection for at least one photographing item, among a plurality of photographing items respectively corresponding to a plurality of photographing topics related to posture or joint motion, on which photographing is to be performed for a patient, may proceed (S420, see FIG. 4).
- [115]** Further, in the present invention, based on selection for at least one photographing item, a process of specifying at least one photographing topic, among a plurality of photographing topics, on which photographing is to be performed for a patient, may proceed (S430, refer to FIG. 4).
- [116]** As illustrated in FIG. 5C, the control unit 130 may provide, to the medical staff terminal 10, the plurality of photographing items 1, 2, 3, and 4 respectively corresponding to a plurality of photographing topics related to posture or joint motion.

- [117] When at least one item among the plurality of photographing items 1, 2, 3, and 4 is selected from the medical staff terminal 10, the control unit 130 may control the process such that a graphic object 531 provided to the medical staff terminal 10 is displayed in an activated state. In this case, the graphic object 531 may be configured to include text related to a number corresponding to the selected items (e.g., “photographing 2 items”, 531a).
- [118] The control unit 130 may receive, from the medical staff terminal 10, a selection for at least one photographing item on which photographing is to be performed for a specific patient U3, among a plurality of photographing items. For example, based on receiving selection for a first photographing item 1 and a third photographing item 3 among a plurality of photographing items 1, 2, 3, and 4, and selection for the activated graphic object 531 from the medical staff terminal 10, the control unit 130 may receive a selection for photographing items on which photographing is to be performed for a specific patient U3.
- [119] In the present invention, a statement that “receiving a selection for a photographing item” may be understood to mean receiving a selection for a photographing topic.
- [120] Further, the control unit 130, based on selection received from the medical staff terminal 10, may specify a photographing topic on which photographing is to be performed for a specific patient U3 among a plurality of photographing topics. For example, the control unit 130, based on the fact that photographing items selected from the medical staff terminal 10 are a first photographing item 1 and a third photographing item 3, may check photographing topics respectively corresponding to the first photographing item 1 and the third photographing item 3. Here, the first photographing item 1 may correspond to a first photographing topic (e.g., “static posture”), and the third photographing item 3 may correspond to a third photographing

topic (e.g., “joint range of motion (elbow)”). Accordingly, the control unit 130 may specify the first photographing topic and the third photographing topic as photographing topics on which photographing is to be performed for a specific patient U3.

[121] Meanwhile, in the present invention, a process of providing, to a medical staff terminal, a photographing process that sequentially proceeds a plurality of photographings to which a specific posture or a specific joint motion corresponding to a specified photographing topic is matched, with the patient as a subject, may proceed (S440, see FIG. 4).

[122] Further, in the present invention, through the photographing process, a process of acquiring a plurality of images according to the plurality of photographings may proceed (S450, see FIG. 4).

[123] In the present invention, a patient object included in a photographing-target scene (or photographed image) may be described by being named as a “subject”. In the present invention, the “subject” may mean a patient included in a photographed image or a body part of the patient. In the present invention, “subject” and “patient” may be used interchangeably, and hereinafter, the same reference numeral “U3” will be given to “subject” and “patient”.

[124] In the present invention, each of a plurality of photographing topics may have, matched thereto, a plurality of sub-topics on which photographing is to be performed in relation to posture or joint motion and a photographing sequence of the plurality of sub-topics. For example, as illustrated in FIG. 5D, each first photographing topic (e.g., “static posture”), among a plurality of photographing topics, may have, matched thereto, a plurality of sub-topics (e.g., “static posture (front)”, “static posture (left)”, “static posture (right)”) on which photographing is to be performed in relation to a specific

posture, and a photographing sequence of the plurality of sub-topics (e.g., “static posture (front) – static posture (left) – static posture (right)”).

- [125] In another example, each third photographing topic (e.g., “joint range of motion (elbow)”), among a plurality of photographing topics, may have, matched thereto, a plurality of sub-topics (e.g., “elbow flexion/extension (left)”, “elbow flexion/extension (right)”) on which photographing is to be performed in relation to a specific posture, and a photographing sequence of the plurality of sub-topics (e.g., “elbow flexion/extension (left) – elbow flexion/extension (right)”).
- [126] In this regard, the photographing process may be configured to sequentially proceed a plurality of photographings to which a plurality of sub-topics are respectively matched, according to a photographing sequence of the plurality of sub-topics.
- [127] The control unit 130 may provide, to the medical staff terminal 10, a photographing process that sequentially proceeds a plurality of photographings to which a specific posture or a specific joint motion corresponding to a specified photographing topic is matched.
- [128] For example, as illustrated in FIG. 5D, it is assumed that a first photographing topic (e.g., “static posture”) is specified as a photographing topic on which photographing will sequentially proceed, with a specific patient U3 as a subject. The control unit 130 may provide, to the medical staff terminal 10, a photographing process that sequentially proceeds a plurality of photographings for a plurality of scenes to which a specific posture or a specific joint motion corresponding to the first photographing topic is matched.
- [129] In this case, when the specified first photographing topic includes a first sub-topic and a second sub-topic different from the first sub-topic, a plurality of photographings

related to the first photographing topic may include a first photographing matched to the first sub-topic and a second photographing matched to the second sub-topic.

[130] Accordingly, a photographing process for the specified first photographing topic may be provided to the medical staff terminal 10 such that, after a first photographing is performed in the medical staff terminal 10, a second photographing consecutively proceeds.

[131] While photographing proceeds for the specified photographing topic, each of a plurality of scenes corresponding to the specified photographing topic may include at least one among i) guidance information matched to each of a plurality of sub-topics, ii) sub-topic guidance information for guiding a specific sub-topic, and iii) photographing sequence-guidance information for guiding a photographing sequence of a specific sub-topic.

[132] According to a photographing process of the first photographing topic (e.g., static posture), a first photographing for a front static posture scene 1a, among a plurality of scenes 1a, 1b, and 1c corresponding to the first photographing topic, may be performed first. For example, as illustrated in FIG. 5E (a), the control unit 130 may provide, to the medical staff terminal 10, the front static posture scene 1a such that the first photographing for the front static posture scene 1a proceeds first.

[133] On a display unit of the medical staff terminal 10 in which the first photographing for the front static posture scene 1a is proceeding, at least one among first guidance information matched to a first sub-topic (e.g., static posture (front)) (e.g., “Beginning static posture photo photographing. Please proceed with photographing according to the guideline.”, 541a), first sub-topic guidance information for guiding the first sub-topic (e.g., “static posture (front)”, 541b), and first sequence- guidance information for

guiding a photographing sequence of the first sub-topic (e.g., “1/3”, 541c) may be displayed.

- [134] A medical staff U1 may perform a first photographing of a subject U3 who takes a specific posture (e.g., front static posture) according to the guideline, through the first guidance information 541a. In addition, through the first sub-topic guidance information 541b, the medical staff U1 may intuitively recognize a first sub-topic that becomes a photographing target of the subject U3. Further, through the first sequence-guidance information 541c, the photographing sequence of the first sub-topic and the number of remaining photographing-target scenes may be intuitively recognized.
- [135] The control unit 130, based on selection for a graphic object 541d linked to a first photographing of a front static posture scene 1a from a medical staff terminal 10, may receive a first photographing request for the front static posture scene 1a. Further, the control unit 130, in response to the received request, may control the process such that a first photographing for the front static posture scene 1a is performed.
- [136] The control unit 130 may control the process such that, after a first photographing for the front static posture scene 1a is performed, a second photographing consecutively proceeds. For example, as illustrated in FIG. 5E (b), the control unit 130 may provide a left static posture scene 1b to the medical staff terminal 10 such that a second photographing for the left static posture scene 1b consecutively proceeds.
- [137] After a first photographing for the front static posture scene 1a is performed, in conjunction with a second photographing for the left static posture scene 1b proceeding, at least one among second guidance information 542a matched to a second sub-topic (“static posture (left)”) (e.g., “Beginning static posture photo photographing. Please proceed with photographing according to the guideline.”), second sub-topic

guidance information 542b for guiding the second sub-topic (e.g., “static posture (left)”), and second sequence-guidance information 542c for guiding a photographing sequence of the second sub-topic (e.g., “2/3”) may be displayed on the display unit of the medical staff terminal 10.

- [138]** The medical staff U1 may perform a second photographing of a subject U3 who takes a specific posture (e.g., left static posture) according to the guideline, through the second guidance information 542a. In addition, through the second sub-topic guidance information 542b, a second sub-topic that becomes a photographing target of the subject U3 may be intuitively recognized. Further, through the second sequence-guidance information 542c, a photographing sequence of the second sub-topic and a number of remaining photographing-target scenes may be intuitively recognized.
- [139]** The control unit 130, based on selection for the graphic object 542d linked to a second photographing of a left static posture scene 1b from the medical staff terminal 10, may receive a second photographing request for the left static posture scene 1b. Further, the control unit 130, in response to the received request, may control the process such that a second photographing for the left static posture scene 1b is performed.
- [140]** The control unit 130 may control the process such that, after a second photographing for the left static posture scene 1b is performed, a third photographing consecutively proceeds. For example, as illustrated in FIG. 5E (c), the control unit 130 may provide a right static posture scene 1c to the medical staff terminal 10 such that a third photographing for the right static posture scene 1c consecutively proceeds.
- [141]** After a second photographing for the left static posture scene 1b is performed, in conjunction with a third photographing for the right static posture scene 1c proceeding, at least one among third guidance information 543a matched to a third sub-topic (“static posture (right)”) (e.g., “Beginning static posture photo photographing. Please

proceed with photographing according to the guideline.”), third sub-topic guidance information 543b for guiding the third sub-topic (e.g., “static posture (right)”), and third sequence-guidance information 543c for guiding a photographing sequence of the third sub-topic (e.g., “3/3”) may be displayed on the display unit of the medical staff terminal 10.

- [142]** The medical staff U1 may perform a third photographing of a subject U3 who takes a specific posture (e.g., right static posture) according to the guideline, through the third guidance information 543a. In addition, through the third sub-topic guidance information 543b, a third sub-topic that becomes a photographing target of the subject U3 may be intuitively recognized. Further, through the third sequence-guidance information 543c, a photographing sequence of the third sub-topic and a number of remaining photographing-target scenes may be intuitively recognized.
- [143]** The control unit 130, based on selection for a graphic object 543d linked to a third photographing of the right static posture scene 1c from the medical staff terminal 10, may receive a third photographing request for the right static posture scene 1c. Further, the control unit 130, in response to the received request, may control the process such that a third photographing for the right static posture scene 1c is performed.
- [144]** When the third photographing for the right static posture scene 1c is completed, the control unit 130 may acquire (or receive) a plurality of images according to a plurality of photographings of a plurality of scenes 1a, 1b, and 1c corresponding to a first photographing topic. Here, the plurality of images may include at least one among a first image acquired from a first photographing, a second image acquired from a second photographing, and a third image acquired from a third photographing.

[145] Further, the control unit 130 may detect a subject (or a patient) from the received plurality of images by using an object detection algorithm. Further, the control unit 130 may analyze a patient's posture or joint motion included in each of the plurality of images and may extract a patient's joint points included in each of the plurality of images by using an artificial intelligence model specialized for posture or joint motion analysis. An analysis of a patient's posture or joint motion may be performed in a server (or an artificial intelligence server). When images are acquired according to a photographing process, the control unit 130 may transmit the acquired images to the server (or the artificial intelligence server). The server (or the artificial intelligence server), based on at least one among a posture estimation model and a motion analysis model learned by using training data, may extract joint points corresponding to joints of a patient from the plurality of images. Such a server may be an external server communicatively linked to the system 100 according to the present invention or may correspond to at least a part of the system 100 according to the present invention. A description regarding analysis of a patient's posture or joint motion from an image in the server will be described later. When extraction of joint points is completed, the control unit 130 may display graphic objects corresponding to the extracted joint points by overlapping (overlap) or rendering the graphic objects on a patient's subject. For example, as illustrated in FIGS. 5E and 5F, the control unit 130 may provide, to a medical staff terminal 10, graphic objects corresponding to joint points by displaying the graphic objects on a specific patient's subject U3 included in each of plurality of images 551, 552, and 553. In this case, joint points displayed on a specific patient's subject U3 may be extracted and displayed differently for each specific posture matched to each of the plurality of images 551, 552, and 553.

- [146]** That is, the control unit 130 may extract joint points of a patient U3 taking different postures according to a specific photographing topic corresponding to each of the plurality of images 551, 552, and 553, and may provide the extracted joint points for each different posture to the medical staff terminal 10 by displaying the joint points on the patient's subject U3 included in each of the plurality of images 551, 552, and 553. Through this, a specific medical staff U1 may intuitively recognize which specific posture is represented by joint points included in a specific image.
- [147]** Meanwhile, the control unit 130 may determine whether re-photographing is required for at least one image among a plurality of images.
- [148]** In the present invention, whether re-photographing is required may be preset according to various criteria. For example, preset re-photographing conditions may include at least one among i) a case in which a patient cannot be identified in a photographed image, ii) a case in which a patient's body line is not identified in a photographed image, iii) a case in which a patient does not wear clothing having a color contrasting with a background in a photographed image, iv) a case in which artificial intelligence analysis regarding a patient's posture or joint motion fails in a photographed image, and v) a case in which a patient is photographed not in accordance with a guideline. However, whether re-photographing is needed may also be determined by a medical staff who photographed a patient.
- [149]** When at least one image among a plurality of images satisfies preset re-photographing conditions, the control unit 130 may provide, in the medical staff terminal 10, a re-photographing process capable of performing re-photographing for the image. Differently, when all the plurality of images do not satisfy preset re-photographing conditions, the control unit 130 may continuously proceed photographing or may terminate photographing according to whether a next photographing-target topic

exists. For example, as illustrated in FIGS. 5D and 5F, the control unit 130, based on selection for a graphic object 561 linked to a photographing proceed (or termination) request from the medical staff terminal 10, may determine whether to proceed photographing or to terminate photographing. In this case, based on the fact that a second photographing topic is specified as a photographing topic to be photographed following a first photographing topic, the control unit 130 may provide, to the medical staff terminal 10, a photographing process such that, after a plurality of photographings corresponding to the first photographing topic are performed, a plurality of photographings corresponding to the second photographing topic consecutively proceed. On the other hand, based on the fact that there is no photographing topic to be photographed following the first photographing topic, the control unit 130 may control the process such that a plurality of photographings corresponding to the first photographing topic are terminated.

[150] As illustrated in FIG. 5F, the control unit 130 may determine whether re-photographing is required for at least one among the plurality of images 551, 552, and 553. As a result of the determination, when it is determined that re-photographing is required for at least one image, the control unit 130 may specify any one sub-topic corresponding to the image requiring re-photographing. For example, it is assumed that a first image 551, among the plurality of images 551, 552, and 553, which is photographed through a first photographing, is determined to require re-photographing. The control unit 130 may specify a sub-topic corresponding to the first image 551. Based on the fact that the sub-topic corresponding to the first image 551 is performed through a first photographing, the control unit 130 may specify that a first sub-topic (e.g., “static posture (front)”) matched to the first photographing corresponds to the first image 551.

- [151] The control unit 130 may provide, to the medical staff terminal, a re-photographing process such that re-photographing proceeds for the first image 551 matched to the first sub-topic. For example, as illustrated in FIG. 5E, based on the fact that the first image 551 is determined to be a re-photographing-target image, the control unit 130 may control the display unit of the medical staff terminal 10 to be switched to a first photographing-target scene 1a for re-photographing of the first image 551.
- [152] Meanwhile, when re-photographing for a re-photographing-target image is completed in the medical staff terminal 10, the control unit 130 may again determine whether re-photographing is needed for the acquired re-photographing image.
- [153] Here, a statement that “re-photographing is determined again” may be understood to mean verifying whether re-photographing is required again for the acquired re-photographing image.
- [154] In one example, when the control unit 130 performs re-verification for the acquired re-photographing image and the re-photographing image satisfies preset re-photographing conditions, the control unit 130 may control the display unit of the medical staff terminal 10 to be switched to a scene corresponding to the re-photographing image.
- [155] In another example, when the control unit 130 performs re-verification for the acquired re-photographing image and the re-photographing image does not satisfy re-photographing conditions, the control unit 130 may provide, to the medical staff terminal 10, a photographing process capable of sequentially proceeding a plurality of photographings for a plurality of scenes corresponding to a next photographing topic. On the other hand, when there is no next photographing topic, all photographing processes may be terminated.

- [156] Meanwhile, an image among a plurality of images that requires re-photographing may be updated with an image acquired through a re-photographing process.
- [157] The control unit 130, when re-photographing for at least one re-photographing-target image among the plurality of images is completed, may update the re-photographing-target image with an image acquired through the re-photographing process. For example, as illustrated in FIG. 5G, it is assumed that, among the plurality of images A, B, and C in which photographing is completed according to a photographing process, a third image C is a re-photographing-target image. When re-photographing for the third image C is completed from a medical staff terminal 10, the control unit 130 may update the third image C with a fourth image D in which re-photographing is completed.
- [158] Further, the control unit 130 may store, in a storage unit 120, updated information through the re-photographing process, matched with a specific patient account and a specific medical staff account.
- [159] Meanwhile, according to various embodiments of the re-photographing process described above, the control unit 130 may display, on a partial area of a re-photographing-target image, a graphic object for guiding that the image is a re-photographing target, when at least one image among the plurality of images satisfies preset re-photographing conditions. For example, as illustrated in FIG. 5F, it is assumed that an image 551 corresponding to a front static posture scene 1a and an image 553 corresponding to a right static posture scene 1c among the plurality of images 551, 552, and 553 are determined to be re-photographing-target images. The control unit 130 may display graphic objects 551a and 553a, which guide that the images 551 and 553 corresponding to re-photographing targets are re-photographing-target images, on partial areas of the images 551 and 553.

- [160]** In another example, the graphic objects 551a and 553a may also be displayed depending on whether re-photographing is selected by a medical staff. The control unit 130 may provide, on partial areas of each of the plurality of images 551, 552, and 553, graphic objects 551b and 553b linked to re-photographing selection. Further, the control unit 130, based on selection for the graphic objects 551b and 553b from the medical staff terminal 10, may display the graphic objects 551a and 553a, which guide that the selected images 551 and 553 are re-photographing-target images, on partial areas of the selected images 551 and 553.
- [161]** A medical staff may intuitively recognize re-photographing-target images that require re-photographing among the plurality of images through the graphic objects 551a and 553a.
- [162]** Further, when a re-photographing request for a re-photographing-target image is received from the medical staff terminal 10, the control unit 130 may control the display unit of the medical staff terminal 10 to be switched to a scene corresponding to the re-photographing-target image. For example, as illustrated in FIGS. 5E and 5F, the control unit 130, based on selection for a graphic object 553b linked to a re-photographing request for an image 553 corresponding to a right static posture scene 1c among the plurality of images 551, 552, and 553 from the medical staff terminal 10, may control the display unit of the medical staff terminal 10 such that the right static posture scene 1c corresponding to the re-photographing-target image 553 is provided to the medical staff terminal 10. A medical staff may photograph an image of a patient when the patient enters a guideline.
- [163]** Not limited thereto, whether re-photographing is needed may be determined by a control unit 130 in a state where a plurality of photographings according to a photographing process is proceeding. For example, as illustrated in FIG. 5H, when

photographing of a left static posture scene 1b is completed in the medical staff terminal 10, the control unit 130 may determine whether re-photographing is needed for the photographed image. Further, based on the fact that the image satisfies preset re-photographing conditions, the control unit 130 may control the display unit of the medical staff terminal 10 such that a left static posture scene 1b for re-photographing and guidance information (e.g., “Guideline is not satisfied. Please proceed re-photographing.”) are provided to the medical staff terminal 10.

[164] Meanwhile, when a first photographing topic and a second photographing topic different from the first photographing topic among a plurality of photographing topics is specified, the control unit 130 may provide, to the medical staff terminal 10, a photographing process such that, after a plurality of photographings corresponding to the first photographing topic are performed, a plurality of photographings corresponding to the second photographing topic consecutively proceed.

[165] That is, when a plurality of photographing topics are specified, the control unit 130 may provide, to the medical staff terminal 10, a photographing process capable of proceeding a plurality of photographings for a plurality of scenes 1a, 1b, and 1c corresponding to the first photographing topic, and then proceeding a plurality of photographings corresponding to the second photographing topic.

[166] Hereinafter, for convenience of explanation, the second photographing topic will be described by assuming “joint range of motion (elbow)”.

[167] When a plurality of photographings corresponding to the first photographing topic among a plurality of photographing topics (the first photographing topic and the second photographing topic) are all performed in the medical staff terminal 10, the control unit 130 may control the display unit of the medical staff terminal 10 such that a plurality

of photographings corresponding to the second photographing topic (e.g., joint range of motion (elbow)) consecutively proceed.

[168] According to a photographing process of the second photographing topic, a first photographing for a right elbow flexion and extension scene 301 among a plurality of scenes 301 and 302 corresponding to the second photographing topic may be performed first. For example, as illustrated in FIG. 6A (a), the control unit 130 may provide a left elbow flexion and extension scene 302 to the medical staff terminal 10 such that a first photographing for the right elbow flexion and extension scene 301 first proceeds.

[169] On the display unit of the medical staff terminal 10 in which a first photographing for the right elbow flexion and extension scene 301 is proceeding, at least one among first guidance information matched to a first sub-topic (e.g., “joint range of motion: elbow – flexion/extension (right)”) (e.g., “Beginning elbow photographing. After starting photographing according to the guideline, please press the finish button. Please guide the patient to move slowly at a consistent speed.”, 601a), first sub-topic guidance information for guiding the first sub-topic (e.g., “joint range of motion: elbow – flexion/extension (left)”, 601b), and first sequence-guidance information for guiding a photographing sequence of the first sub-topic (e.g., “1/2”, 601c) may be displayed.

[170] The medical staff U1 may perform a first photographing by aligning a subject U3 taking a specific posture (e.g., a posture of flexing and extending a right elbow) with a guideline through first guidance information 601a. In addition, through the first sub-topic guidance information 601b, the medical staff U1 may intuitively recognize a first sub-topic that becomes a photographing target of the subject U3. Further, through the first sequence-guidance information 601c, the photographing sequence of

the first sub-topic and the number of remaining photographing-target scenes may be intuitively recognized.

- [171] The control unit 130 may receive a first photographing request for the right elbow flexion and extension scene 301 based on a graphic object 601d linked with the first photographing of the right elbow flexion and extension scene 301 being selected from the medical staff terminal 10. Further, the control unit 130 may control the process such that the first photographing for the right elbow flexion and extension scene 301 is performed in response to the received request.
- [172] The control unit 130 may control the process such that a second photographing consecutively proceeds after the first photographing for the right elbow flexion and extension scene 301 is performed. For example, as illustrated in FIG. 6A(b), the control unit 130 may provide a left elbow flexion and extension scene 302 to the medical staff terminal 10 such that a second photographing for the left elbow flexion and extension scene 302 consecutively proceeds.
- [173] After the first photographing for the right elbow flexion and extension scene 301 is performed, in association with the second photographing for the left elbow flexion and extension scene 302 proceeding, at least one among second guidance information matched to a second sub-topic (e.g., “joint range of motion: elbow – flexion/extension (left)”) (e.g., “Beginning elbow photographing. After starting photographing according to the guideline, please press the finish button. Please guide the patient to move slowly at a consistent speed.”, 602a), second sub-topic guidance information for guiding the second sub-topic (e.g., “joint range of motion: elbow – flexion/extension (left)”, 602b), and second sequence-guidance information for guiding a photographing sequence of the second sub-topic (e.g., “2/2”, 602c) may be displayed on the display unit of the medical staff terminal 10.

- [174] The medical staff U1 may perform a second photographing by aligning a subject U3 taking a specific posture (e.g., a posture of flexing and extending a left elbow) with a guideline through second guidance information 602a. In addition, through the second sub-topic guidance information 602b, a second sub-topic that becomes a photographing target of the subject U3 may be intuitively recognized. Further, through the second sequence-guidance information 602c, a photographing sequence of the second sub-topic and a number of remaining photographing-target scenes may be intuitively recognized.
- [175] The control unit 130 may receive a second photographing request for the left elbow flexion and extension scene 302 based on a graphic object 602d linked with the second photographing of the left elbow flexion and extension scene 302 being selected from the medical staff terminal 10. Further, the control unit 130 may control the process such that the second photographing for the left elbow flexion and extension scene 302 is performed in response to the received request.
- [176] When the second photographing for the left elbow flexion and extension scene 302 is completed, the control unit 130 may acquire a plurality of images according to a plurality of photographings of a plurality of scenes 301 and 302 corresponding to the second photographing topic. In this case, the control unit 130 may determine whether re-photographing is required for the acquired plurality of images.
- [177] As a result of the determination, when at least one image among the plurality of images meets preset re-photographing conditions, the control unit 130 may provide a re-photographing process capable of performing re-photographing for the image at the medical staff terminal 10. Differently, when all the plurality of images do not satisfy preset re-photographing conditions, the control unit 130 may continuously proceed photographing or may terminate photographing according to whether a next

photographing-target topic exists. For example, as illustrated in FIG. 5D and FIG. 6D, the control unit 130 may determine whether photographing is to proceed or terminate based on a graphic object 611 linked with a photographing proceed (or termination) request being selected from the medical staff terminal 10. In this case, the control unit 130 may control the process such that the plurality of photographings corresponding to the second photographing topic are terminated based on a photographing topic to be photographed next after the second photographing topic not existing.

- [178]** Meanwhile, a plurality of images acquired through the second photographing may be understood as images frame-divided according to a specific joint motion.
- [179]** Specifically, the plurality of images photographed through the second photographing method may be images in which one image is frame-divided into a plurality according to a specific joint motion. For example, as illustrated in FIG. 6B, the control unit 130 may frame-divide the image photographed for the left elbow flexion and extension scene 301 according to a plurality of joint motions (e.g., left elbow flexion and left elbow extension) and may generate a first image (e.g., “elbow flexion (left)”, 301a) and a second image (e.g., “elbow extension (left)”, 301b). In another example, the control unit 130 may frame-divide the image photographed for the right elbow flexion and extension scene 302 according to a plurality of joint motions (e.g., right elbow flexion and right elbow extension) and may generate a first image (e.g., “elbow flexion (right)”, 302a) and a second image (e.g., “elbow extension (right)”, 302b).
- [180]** Further, the control unit 130 may detect a subject (or a patient) from the received plurality of images by using an object detection algorithm. Further, the control unit 130 may analyze a patient’s posture or joint motion included in each of the plurality of images and may extract a patient’s joint points included in each of the plurality of

images by using an artificial intelligence model specialized for posture or joint motion analysis.

[181] When extraction of joint points is completed, the control unit 130 may display graphic objects corresponding to the extracted joint points by overlapping (overlap) or rendering the graphic objects on a patient's subject. For example, as illustrated in FIG. 6C and FIG. 6D, the control unit 130 may display graphic objects corresponding to the joint points on the subject U3 of a specific patient included in each of the plurality of images 301a, 301b, 302a, and 302b and provide the plurality of images to the medical staff terminal 10. In this case, the joint points displayed on the subject U3 of the specific patient may be extracted and displayed differently for each specific posture matched to each of the plurality of images 301a, 301b, 302a, and 302b.

[182] That is, the control unit 130 may extract joint points of the patient U3 taking different postures according to a specific photographing topic corresponding to each of the plurality of images 301a, 301b, 302a, and 302b, and may display the joint points extracted for different postures on the subject U3 of the patient included in each of the plurality of images 301a, 301b, 302a, and 302b and provide the plurality of images to the medical staff terminal 10. Through this, a specific medical staff U1 may intuitively recognize which specific posture is represented by joint points included in a specific image.

[183] Meanwhile, in the present invention, a process of transmitting a plurality of images to a server may proceed (S460, see FIG. 4).

[184] The control unit 130 may transmit the plurality of images to the server such that the plurality of images acquired through the photographing process are stored in the server matched with patient information of the patient and medical staff information. Here, the server may be understood as a server on which a posture and joint motion test

service according to the present invention is provided. As illustrated in FIG. 5F, the control unit 130 may transmit a plurality of images 551, 552, and 553 according to a plurality of photographings of a plurality of scenes 1a, 1b, and 1c corresponding to the first photographing topic to the server 200.

[185] In another example, as illustrated in FIG. 6C and FIG. 6D, the control unit 130 may transmit a plurality of images 301a, 301b, 302a, and 302b according to photographing of a plurality of scenes 301 and 302 corresponding to the second photographing topic to the server 200. As illustrated in FIG. 12, an image of a patient photographed by the medical staff terminal 10 may be transmitted to the server (or artificial intelligence server, 200) performing analysis of the patient's posture or joint motion through the system 100 according to the present invention.

[186] The server 200 may perform analysis regarding the patient's posture or joint motion from the image based on an artificial intelligence model (also named as a posture estimation model or a motion analysis model) trained with training data.

[187] The server 200 may include at least one configuration selected from a keypoint extraction unit 211, an artificial intelligence motion analysis unit 212, a rule-based motion analysis unit 213, and a control unit 220, and the keypoint extraction unit 211, the artificial intelligence motion analysis unit 212, or the rule-based motion analysis unit 213 may correspond to the above-described artificial intelligence model (artificial intelligence posture estimation model or artificial intelligence motion analysis model).

[188] The server 200 may extract keypoints corresponding to joint points of the patient from the image based on the artificial intelligence model. For example, the server 200 may extract at least one keypoint based on a posture estimation model 52 trained by using training data related to joint points.

- [189]** In this case, the server 200 may extract at least one of a visible joint point or an invisible joint point based on visibility of the joint point according to the artificial intelligence model. For example, when a specific joint point is not visible in the image, the server 200 may predict and extract a visible joint point and a keypoint corresponding to the specific joint point based on the artificial intelligence model.
- [190]** Further, the server 200 may analyze relative positional relationships between the keypoints from the extracted keypoints by using the artificial intelligence model and, based on analysis of the positional relationships, may analyze posture or joint motion regarding motion performed by the patient.
- [191]** Here, the “relative position between keypoints” may be understood as a position of another keypoint (e.g., a second keypoint, “P2”) based on a specific keypoint (for example, a first keypoint, “P1”) between at least two keypoints (refer to reference numerals “P1” and “P2” in FIG. 13).
- [192]** The analysis result performed in the server 200 may be very various. The server 200 may perform analysis regarding at least one among a joint range of motion, a movement distance, a movement speed (or acceleration) of a joint, a body balance of a subject (corresponding to a patient) included in an analysis-target image, a body symmetry, and a body alignment state (e.g., a leg axis alignment state, a spine alignment state, etc.). In addition, the server 200 may estimate and analyze information regarding at least one among i) a position of a joint point, ii) a joint range of motion of a joint point, iii) a movement path of a joint point, iv) a connection relationship between joint points, and v) a symmetry relationship of joint points regarding the subject U.
- [193]** The server 200 may extract relative positional relationships between associated keypoints matched to a specific prescription exercise from a plurality of continuous

frames related to the specific prescription exercise, and may acquire (or calculate) a joint range of motion of the patient regarding the specific prescription exercise by using the extracted relative positional relationships. The server 200 may extract keypoints in each of a first analysis-target frame (a frame formed earlier in time (before)) and a second analysis-target frame (a frame formed later in time (after)). The server 200 may perform analysis regarding the patient's posture or joint motion based on at least one of a positional relationship between keypoints extracted from the first analysis-target frame and a positional relationship between keypoints extracted from the second analysis-target frame.

[194] Meanwhile, the server 200 may analyze the relative positional relationships between keypoints based on rule information related to a prescription exercise. Here, the rule information may be understood as information in which rules are predefined to analyze the relative positional relationships between keypoints. The server 200 may analyze the patient's posture or joint motion by determining whether the relative positional relationships between keypoints satisfy the rule information.

[195] Further, the server 200 may perform analysis regarding the patient's posture and joint motion by referring to a user DB (reference numeral 30 in FIG. 12) and considering at least one among the patient's age information, gender information, height information, weight information, surgery history information, and musculoskeletal disease information. The plurality of images transmitted to the server may be stored matched with patient information of the patient and medical staff information. More specifically, the server may store, together with the plurality of images including a specific patient, information regarding a specific medical staff and information regarding the specific patient matched with the plurality of images. For example, the server may have, matched thereto, at least one among i) information regarding a

specific patient (or a patient account), ii) information regarding a medical staff (or a medical staff account) who photographed the specific patient, iii) information regarding a specific photographing item by which the specific patient was photographed, iv) information regarding an image (or photograph) in which the specific patient was photographed regarding the specific photographing item, v) information regarding a date and time at which the specific photographing item was photographed, and vi) information regarding an analysis result of posture or joint motion of the specific patient. Such matching information may also be utilized as history information regarding the specific patient.

[196] As illustrated in FIG. 14A, a training dataset 400 may be configured to include data related to a subject U extracted from a training-target image 300. The server 200 may configure the training dataset 400 by extracting data regarding the subject U from the training-target image. In this case, the training-target image 300 may correspond to at least one among images collected from an external server, images input from a user, and images received from a medical staff terminal. That is, the artificial intelligence server 200 may perform training regarding an artificial intelligence model (an artificial intelligence posture estimation model or an artificial intelligence motion analysis model) by using images that are targets of analysis of a patient's posture or joint motion.

[197] The training dataset 400 may be composed of a plurality of sub datasets 401 to 403. In the present invention, the training dataset 400 may correspond to an upper-level concept, and the sub datasets 401 to 403 may be understood as datasets corresponding to lower-level concepts.

- [198]** As illustrated in FIG. 14B(a), the training dataset 400 may be configured with a plurality of data groups 410 to 460 corresponding to each of a plurality of different information attributes.
- [199]** The server 200 may control the artificial intelligence model to perform training regarding the training dataset 400 and group-specific associations by specifying group-specific associations between the plurality of data groups 410 to 460 based on associations between the plurality of information attributes 410a to 450a.
- [200]** As illustrated in FIG. 14C, the first data group 410 may include position information 411 and 412 of a plurality of training-target joint points P1 and P2, and the second data group 420 may include a data value indicating visibility of the training-target joint points P1 and P2 in the image arranged in the same order as the position information included in the first data group 410. The third data group 430 may include a data value indicating a photographing direction in which the subject U included in the image was photographed, and the fourth data group 440 may include a code matched to a posture or joint motion performed by the subject U included in the training-target image. Further, the fifth data group 450 may include a size of a bounding box 301 regarding the subject U included in the training-target image, and the sixth data group may include image identification information.
- [201]** The server 200 may train the artificial intelligence model by using the training dataset 400 composed of the first to sixth data groups 410 to 460 described above. Further, the server 200 may perform analysis regarding a patient's posture or joint motion from an image by using the trained artificial intelligence model. Meanwhile, in the present invention, various functions related to a posture and joint motion test service according to the present invention may be provided by using matching information to which patient information and medical staff information are matched.

- [202] As illustrated in FIG. 7A, the control unit 130 may provide, on a patient account page 700 including patient information of a specific patient U3, a graphic object 701 linked with a request for viewing photographing records regarding the specific patient U3.
- [203] The control unit 130 may provide photographing records regarding the specific patient U3 based on a graphic object 701 included in the patient account page 700 being selected from the medical staff terminal 10. For example, as illustrated in FIG. 7B, photographing records 710 may include information in a form of [photographing posture][photographing date and time][photographer] (e.g., static posture and joint range of motion (three items) | 2023.07.24 13:46 | Kim OO). In addition, the photographing records may include a first image set 711 and a second image set 712 photographed at a specific date and time (e.g., “October 18, 2023, 17:20”). Here, the first image set 711 may include a plurality of images in which a plurality of scenes corresponding to the first photographing topic (e.g., static posture) are photographed, and the second image set 712 may include a plurality of images in which a plurality of scenes corresponding to the second photographing topic (e.g., joint range of motion (elbow)) are photographed.
- [204] The control unit 130 may provide a page corresponding to a selected image to the medical staff terminal 10 based on at least one image among the plurality of images included in the second image set 712 being selected from a terminal 10 of a specific medical staff account U1. As illustrated in FIG. 7B and FIG. 7C(a), the control unit 130 may provide a first image page 750 to the medical staff terminal 10 based on a first image (“flexion (left)”) included in the second image set 712 being selected.
- [205] The first image page 750 may include at least one graphic object 752 and 753 related to output of a list together with a first image 751.

- [206]** For example, as illustrated in FIG. 7C(a) and (b), when a first graphic object 752 is selected from the medical staff terminal 10, the control unit 130 may control the process such that a list 752a regarding the plurality of images included in the first image set 711 is displayed on the medical staff terminal 10. The control unit 130 may control the process such that, when any one among the plurality of images included in the list 752a is selected, the image corresponding to the selected item is switched.
- [207]** In another example, as illustrated in FIG. 7C(c), when a second graphic object 753 is selected from the medical staff terminal 10, the control unit 130 may provide a list 753a including at least one first image photographed at a date and time different from the first image 751 output on the medical staff terminal 10.
- [208]** Meanwhile, in the present invention, a user environment enabling management of a patient account and use of various functions related to a posture and joint motion test service may be provided through a website.
- [209]** As illustrated in FIG. 8A, the control unit 130 may provide a service page 800 including various functions related to a posture and joint motion test service to the medical staff terminal 10.
- [210]** The control unit 130 may display, on one region of the service page 800, a graphic object 801 linked with a function capable of managing patients (or patient accounts) registered in a specific medical staff account U1. Further, based on the graphic object 801 linked with the patient management function being selected from the medical staff terminal 10, the control unit 130 may provide, on one region of the service page 800, a list 810 including at least one patient registered in the specific medical staff account U1.
- [211]** The control unit 130 may provide, on one region of the service page 800, patient information and photographing records of a specific patient U3 based on a graphic

object 811 corresponding to the specific patient U3 among the plurality of patients included in the list 810 being selected. For example, as illustrated in FIG. 8B, the control unit 130 may control the process such that patient information 830 of a specific patient U3 and photographing records 840 of the specific patient U3 are displayed on the service page 800.

[212] In one region of the service page 800, a graphic object 831 linked with a function capable of modifying patient information 830 of a specific patient account U3 may be displayed. For example, a specific medical staff U1 may modify patient information 830 of the specific patient account U3 by selecting the graphic object 831.

[213] In addition, in one region of the service page 800, a graphic object 841 linked with a function capable of checking an analysis result of posture or joint motion of the specific patient U3 may be displayed.

[214] As described above, the control unit 130 may analyze a specific posture or a specific joint motion of the patient based on the plurality of images.

[215] The control unit 130 may provide an analysis result regarding the patient's specific posture or specific joint motion to the medical staff terminal 10. For example, as illustrated in FIG. 9C, when the graphic object 841 is selected from the medical staff terminal 10, the control unit 130 may provide an analysis result of posture or joint motion 910 of the specific patient U3.

[216] Further, in one region of the service page 800, a graphic object 842 linked with a function capable of checking photographing records 840 of the specific patient U3 by photographing date and time may be displayed. For example, when the graphic object 842 is selected from the medical staff terminal 10, the control unit 130 may provide a list capable of checking photographing records of the specific patient U3 by photographing date and time.

- [217] Meanwhile, in the present invention, a function capable of comparing analysis results regarding a plurality of postures or joint motions photographed at different points in time (or dates or times) may be provided.
- [218] As illustrated in FIG. 8C and FIG. 8D, based on a first image 843 among a plurality of images included in photographing records 840 of the specific patient U3 being selected from the medical staff terminal 10, the control unit 130 may provide a first image page 850 including information regarding the first image 843.
- [219] The control unit 130 may provide, in one region of the first image page 850, a graphic object 852a linked with a list output function including images linked with different dates and times to compare a first image 851 photographed of the specific patient U3 at a specific date and time with an image photographed of the specific patient U3 at another date and time different from the first image 851.
- [220] The control unit 130 may provide a function capable of comparing a first image 851 photographed at a first point in time with an image photographed at a second point in time different from the first point in time based on the graphic object 852a being selected. For example, as illustrated in FIG. 8C and FIG. 8D, it is assumed that a second point in time (e.g., “October 18, 2023, 16:16”) among a plurality of points in time included in the list is selected. The control unit 130 may control the process such that a first image 751 photographed at the first point in time and a second image 852 photographed at the second point in time are displayed together in one region of the first image page 850.
- [221] Further, the control unit 130 may provide recommended photographing item information for photographing to be performed for the specific patient U3 to the medical staff terminal 10 by using history information of the specific patient U3. For example, as illustrated in FIG. 8E, when the control unit 130 receives a selection for

at least one item among a plurality of items 1, 2, 3, and 4 from the medical staff terminal 10, the control unit 130 may provide recommended photographing item information 870 regarding photographing of a specific patient U3 by using history information of the specific patient U3. In this case, the recommended photographing item information 870 may also be provided even when another medical staff performs photographing regarding the specific patient U3, thereby allowing intuitive recognition of which photographing item among the plurality of photographing items 1, 2, 3, and 4 the specific patient U3 mainly photographed, and allowing photographing regarding the specific patient U3 to proceed based on the recommended photographing item.

[222] Meanwhile, in the present invention, a user environment capable of modifying joint points of a patient included in an image may be provided. In this case, modification of joint points may be understood as being performed in a terminal on which a second type of medical staff account U2 is logged in.

[223] A second type medical staff account may be understood as a medical staff account to which at least one among i) an authority to access all photographing records of patients registered in a first type medical staff account, ii) an authority to modify joint points of a patient, iii) an authority to check and share an analysis result regarding a patient's posture or joint motion, and iv) an authority to independently prescribe an exercise program to a patient is granted.

[224] As illustrated in FIG. 9A, the control unit 130 may provide, in one region of a first image page 900, a graphic object 901a linked with a function capable of modifying joint points of a specific patient.

[225] Further, when a graphic object 911 is selected from a terminal of the second type of medical staff account U2, the control unit 130 may control the process such that a joint point modification function is activated. For example, as illustrated in FIG. 9B, the

control unit 130 may activate the joint point modification function together with guidance information (e.g., “You can modify joint points by drag and drop.”, 901b).

The second type of medical staff account U2 may modify a graphic object overlapped on a region corresponding to a joint point according to the guidance information 901b.

[226] Further, when joint points of a subject U3 are modified in a terminal of the second type of medical staff account U2, the control unit 130 may control the process such that a position of the joint points being changed in real time is reflected. Further, when a graphic object 901c linked with a storage function is selected, joint points modified in the second type of medical staff account U2 may be stored matched with a specific medical staff account U1.

[227] Furthermore, in the present invention, a medical report may be provided based on an analysis result of posture or joint motion of a patient. For example, as illustrated in FIG. 9C and FIG. 9D, the control unit 130 may store a medical report 920 regarding a specific patient U3, written from a second type of medical staff account U2 based on an analysis result 910 of posture or joint motion of the patient, matched with a specific patient account, and may provide the medical report to a terminal of the specific patient U3.

[228] Meanwhile, in the present invention, various services according to subscription to a paid plan may be provided. For example, as illustrated in FIG. 10, the control unit 130 may provide a service page 1010 related to an analysis-result providing service.

[229] The control unit 130 may, when a payment event related to the analysis-result providing service of the service page 1010 occurs from a medical staff terminal 10 on which a specific medical staff account U1 is logged in, based on the occurrence of the payment event, specify a payment amount by using a photographing-process

proceeding history performed for a predetermined period for providing analysis results.

[230] Further, the control unit 130 may provide, to the medical staff terminal 10, a payment-target amount regarding the photographing-process proceeding history performed for the predetermined period such that a payment process regarding the specified amount is performed from the medical staff terminal 10. As one example, a payment amount on which payment is performed in the payment process may be configured such that a number of shootings photographed in a first period (e.g., January) is summed, and a cost is charged in a second period (e.g., February).

[231] As illustrated in FIG. 11A, the control unit 130 may provide, on a medical staff terminal 10 on which a specific medical staff account U1 is logged in, an exercise prescription page 1100 including a prescription function related to exercise of a patient.

[232] The control unit 130 may provide, on the medical staff terminal 10, an exercise prescription page 1100 for each patient account such that prescription is performed regarding a specific patient account among patient accounts matched with the specific medical staff account U1.

[233] For example, in the present invention, let us assume that a first patient account (e.g., “Kim Woo-Young” patient account) and a second patient account (e.g., “Kim So-Hee” patient account) are matched with the specific medical staff account U1. The control unit 130 may, based on receiving an exercise prescription request for the first patient account (e.g., “Kim Woo-Young” patient account) from the medical staff terminal 10, provide, on the medical staff terminal 10, an exercise prescription page 1100 corresponding to the first patient account.

[234] The control unit 130 may display, on the exercise prescription page 1100, information regarding at least some among a plurality of exercise items registered in an exercise-

treatment providing service, or display information regarding at least one exercise program registered in the exercise-treatment providing service.

- [235]** Specifically, the control unit 130 may display, on the exercise prescription page 1100, information regarding at least one among a my-exercise program linked with the specific medical staff account U1, a shared-exercise program shared with the specific medical staff account U1, and a recommended-exercise program provided from the exercise-treatment providing service.
- [236]** In this case, based on the fact that the my-exercise program and the shared-exercise program linked with each medical staff account are different from each other, the control unit 130 may display, on the exercise prescription page 1100 provided to each medical staff account, information regarding different my-exercise programs or different shared-exercise programs.
- [237]** The control unit 130 may, based on selection for any one among the exercise programs displayed on the exercise prescription page 1100, receive selection information (or a selection event) of the specific medical staff account U1 from the medical staff terminal 10.
- [238]** For example, as illustrated in FIG. 11A, let us assume that information corresponding to a my-exercise program linked with the specific medical staff account U1 and an icon (e.g., “add” or “select” or “put in”) are displayed on the exercise prescription page 1100. The control unit 130 may, based on selection for information regarding an exercise program or an icon corresponding to the exercise program on the exercise prescription page 1100, receive selection information regarding the exercise program.
- [239]** Further, the control unit 130 may, based on receiving prescription information including the selected exercise program from the medical staff terminal 10, assign the selected exercise program to a patient account.

- [240] A specific patient U3 may, by using a patient terminal 20 logged in with the patient account, receive exercise treatment according to the exercise program assigned to the patient account.
- [241] For example, as illustrated in FIG. 11B, the control unit 130 may, such that the specific patient U3 may follow the exercise treatment while viewing an image, provide, on the patient terminal 20 logged in with the patient account, an image corresponding to the exercise program assigned to the patient account. That is, the control unit 130 may check the exercise program assigned to the patient account and exercise items included in the exercise program, and provide, on the patient terminal 20, an image corresponding to the exercise item.
- [242] As examined above, the method and system for providing a posture and joint motion test service according to the present invention can, based on information received from a medical staff terminal, specify a patient to be photographed, and, among a plurality of photographing items respectively corresponding to a plurality of photographing topics related to posture or joint motion, receive, from the medical staff terminal, a selection for at least one photographing item on which photographing is to be performed for the patient, and, based on the selection for the at least one photographing item, specify at least one photographing topic, among the plurality of photographing topics, on which photographing is to be performed for the patient. Medical staff can perform patient-customized posture analysis by selecting a topic required for analysis of posture or joint motion of the patient.
- [243] Further, the method and system for providing a posture and joint motion test service according to the present invention provides, to the medical staff terminal, a photographing process sequentially proceeding a plurality of photographings to which a specific posture or a specific joint motion corresponding to the specified

photographing topic is matched, with the patient as a subject, and can obtain a plurality of images according to the plurality of photographings through the photographing process. Through this, in the present invention, medical staff, by using a medical staff terminal possessed by the medical staff, can provide an analysis service analyzing joint motion of a musculoskeletal patient with artificial intelligence, even without expensive equipment.

[244] Meanwhile, the present invention described above may be executed by one or more processes on a computer and implemented as a program that may be stored on a computer-readable medium (or recording medium).

[245] Further, the present invention described above may be implemented as computer-readable code or instructions on a medium in which a program is recorded. That is, the present invention may be provided in the form of a program.

[246] Meanwhile, the computer-readable medium includes all kinds of recording devices for storing data readable by a computer system. Examples of computer-readable media include hard disk drives (HDDs), solid state disks (SSDs), silicon disk drives (SDDs), ROMs, RAMs, CD-ROMs, magnetic tapes, floppy discs, optical data storage devices, and the like.

[247] Further, the computer-readable medium may be a server or cloud storage that includes storage and that the electronic device is accessible through communication. In this case, the computer may download the program according to the present invention from the server or cloud storage, through wired or wireless communication.

[248] Further, in the present invention, the computer described above is an electronic device equipped with a processor, that is, a central processing unit (CPU), and is not particularly limited to any type.

[249] Meanwhile, it should be appreciated that the detailed description is interpreted as being

illustrative in every sense, not restrictive. The scope of the present invention should be determined on the basis of the reasonable interpretation of the appended claims, and all of the alternations within the equivalent scope of the present invention belong to the scope of the present invention.

【CLAIMS】

【Claim 1】

A method for providing a posture and joint motion test service based on artificial intelligence, the method comprising:

specifying a patient to be photographed based on information received from a medical staff terminal;

receiving, from the medical staff terminal, a selection for at least one photographing item on which photographing is to be performed for the patient, among a plurality of photographing items respectively corresponding to a plurality of photographing topics related to a posture or a joint motion;

specifying, based on the selection for the at least one photographing item, at least one photographing topic, among the plurality of photographing topics, on which photographing is to be performed for the patient;

providing, to the medical staff terminal, a photographing process of sequentially proceeding a plurality of photographings to which a specific posture or a specific joint motion corresponding to the specified photographing topic is matched, with the patient as a subject;

acquiring a plurality of images according to the plurality of photographings through the photographing process; and

transmitting the plurality of images to a server.

【Claim 2】

The method of claim 1, wherein each of the plurality of photographing topics has, matched thereto, a plurality of sub-topics on which photographing is to be performed in relation to the posture or the joint motion, and a photographing sequence of the plurality of sub-topics, and

wherein the photographing process sequentially proceeds the plurality of photographings matched to each of the plurality of sub-topics according to the photographing sequence.

【Claim 3】

The method of claim 2, wherein, when the specified photographing topic includes a first sub-topic and a second sub-topic different from the first sub-topic, the plurality of photographings includes a first photographing matched to the first sub-topic and a second photographing matched to the second sub-topic, and the photographing process is provided to the medical staff terminal such that, after the first photographing is performed, the second photographing consecutively proceeds at the medical staff terminal.

【Claim 4】

The method of claim 3, wherein, while the first photographing proceeds at the medical staff terminal, on a display unit of the medical staff terminal, first guidance information matched to the first sub-topic and first sequence-guidance information guiding at least one of the first sub-topic and the first photographing sequence are displayed, and in conjunction with the second photographing proceeding after the first photographing is performed, on the display unit of the medical staff terminal, second guidance information matched to the second sub-topic and second sequence-guidance information guiding at least one of the second sub-topic and the second photographing sequence are displayed.

【Claim 5】

The method of claim 2, wherein the plurality of images includes a first image acquired in the first photographing and a second image acquired in the second photographing,

wherein the method further comprises:

determining whether re-photographing is required for at least one of the plurality of images;

as a result of the determination, when it is determined that re-photographing is required for the at least one image,

specifying any one sub-topic corresponding to an image requiring the re-photographing;
and

providing, to the medical staff terminal, a re-photographing process such that re-photographing matched to the specified sub-topic proceeds, and

wherein the image among the plurality of images for which the re-photographing is required is updated with an image acquired through the re-photographing process.

【Claim 6】

The method of claim 2, wherein, when a first photographing topic and a second photographing topic different from the first photographing topic are specified among the plurality of photographing topics, the photographing process is provided to the medical staff terminal such that, after the plurality of photographings corresponding to the first photographing topic are performed at the medical staff terminal, the plurality of photographings corresponding to the second photographing topic consecutively proceed.

【Claim 7】

The method of claim 1, further comprising:

analyzing the specific posture or the specific joint motion of the patient based on the plurality of images; and

providing, to the medical staff terminal, an analysis result regarding the specific posture or the specific joint motion of the patient.

【Claim 8】

The method of claim 7, wherein, the analysis comprises:

extracting keypoints respectively corresponding to a plurality of preset joint points from the plurality of images by using an artificial intelligence posture estimation model;

analyzing relative positional relationships between the keypoints through an artificial intelligence motion analysis model; and

analyzing the specific posture or the specific joint motion of the patient based on the analysis of the positional relationships.

【Claim 9】

The method of claim 7, further comprising:

occurring, at the medical staff terminal, of a payment event related to an analysis-result providing service;

specifying a payment amount, based on the occurrence of the payment event, by using a photographing-process proceeding history performed for a predetermined period for providing the analysis result; and

performing a payment process for the payment amount.

【Claim 10】

A system for providing a posture and joint motion test service based on artificial intelligence, the system comprising:

a control unit configured to:

specify a patient to be photographed based on information received from a medical staff terminal; and

receive, from the medical staff terminal, a selection for at least one photographing item on which photographing is to be performed for the patient, among a plurality of photographing items respectively corresponding to a plurality of photographing topics related to a posture or a joint motion,

wherein the control unit is configured to:

specify, based on the selection for the at least one photographing item, at least one photographing topic, among the plurality of photographing topics, on which photographing is to be performed for the patient;

provide, to the medical staff terminal, a photographing process of sequentially proceeding a plurality of photographings to which a specific posture or a specific joint motion corresponding to the specified photographing topic is matched, with the patient as a subject;

acquire a plurality of images according to the plurality of photographings through the photographing process; and

transmit the plurality of images to a server.

【Claim 11】

A program stored on a computer-readable recording medium, executed by one or more processes in an electronic device, the program comprising instructions for performing:

specifying a patient to be photographed based on information received from a medical staff terminal;

receiving, from the medical staff terminal, a selection for at least one photographing item on which photographing is to be performed for the patient, among a plurality of photographing items respectively corresponding to a plurality of photographing topics related to a posture or a joint motion;

specifying, based on the selection for the at least one photographing item, at least one photographing topic, among the plurality of photographing topics, on which photographing is to be performed for the patient;

providing, to the medical staff terminal, a photographing process of sequentially proceeding a plurality of photographings to which a specific posture or a specific joint motion corresponding to the specified photographing topic is matched, with the patient as a subject;

acquiring a plurality of images according to the plurality of photographings through the photographing process; and

transmitting the plurality of images to a server.