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Inventor(s)	KOREHISA; Makoto et al.

SURGERY SYSTEM, CONTROL METHOD, SURGICAL APPARATUS, AND PROGRAM

Abstract

The present technology relates to a surgery system, a control method, a surgical apparatus, and a program that allow easy updating of a function of a medical apparatus. A configuration includes an information processor, and a surgical apparatus. The information processor includes a storage section storing an application, and a transmission section transmitting, in response to a request from the surgical apparatus, the application stored in the storage section. The surgical apparatus includes a reception section receiving the application transmitted by the transmission section, and an execution section executing the application received by the reception section.

Inventors: **KOREHISA; Makoto (Kanagawa, JP), HAYASHI; Shunsuke (Kanagawa, JP)**

Applicant: **Sony Group Corporation** (Tokyo, JP)

Family ID: **1000008574996**

Assignee: **Sony Group Corporation (Tokyo, JP)**

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS [0001] The present application is a continuation of U.S. application Ser. No. 18/177,221, filed Mar. 2, 2023, which is a continuation of U.S. application Ser. No. 16/629,969, filed Jan. 10, 2020, which is based on PCT filing PCT/JP2018/025471, filed Jul. 5, 2018, which claims priority to JP 2017-140081, filed Jul. 19, 2017, the entire contents of each are incorporated herein by reference.

TECHNICAL FIELD
[0002] The present technology relates to a surgery system, a control method, a surgical apparatus, and a program, and relates to, for example, a surgery system, a control method, a surgical apparatus, and a program that allow easy updating of an application.
BACKGROUND ART
[0003] For a purpose of use at a medical site, for example, there have been proposed various techniques to generate, and display, an image synthesized by overlaying, on an ordinary image of an internal organ, etc. captured by an endoscopic surgery system, a special image indicating a location of a blood vessel or a lesion such as a tumor, which is difficult to recognize by the ordinary image.
[0004] For example, PTL 1 describes capturing an ordinary image and a special image by time sharing. In addition, for example, PTL 2 describes synthesizing an ordinary image and a special image and displaying the synthesized image.
CITATION LIST
Patent Literature
[0005] PTL 1: Japanese Unexamined Patent Application Publication No. 2007-313171 [0006] PTL 2: Japanese Unexamined Patent Application Publication No. 2012-24283
SUMMARY OF THE INVENTION
Problem to be Solved by the Invention
[0007] In a case of using an endoscopic surgery system in a surgery or examination, observation light used for capturing a special image, a method of image processing, etc. differ depending on a clinical department such as digestive surgery, urology, or otolaryngology. In addition, an efficient use of an operating room has become indispensable to a smooth operation of hospital management, and there is even a case of sharing one operating room among a plurality of clinical departments.
[0008] Installation of a plurality of medical apparatuses for respective clinical departments requires a storage area, and also requires an installation work for every use. In addition, there has been a possibility that incorporating applications for a plurality of clinical departments in one medical apparatus would cause an increase in storage region for application programs, complicate a structure inside the medical apparatus, and result in an increase in system cost and development expenditure.
[0009] Meanwhile, for example, an endoscopic surgery system is expected to be more useful, and

is expected to allow updating of an application, etc. more reliably and more easily for better usability.
[0010] The present technology is considered in view of such a circumstance and makes it possible to perform updating of an application, etc. more reliably and more easily.
Means for Solving the Problem
[0011] A surgery system in an aspect of the present technology includes an information processor, and a surgical apparatus. The information processor includes a storage section storing an application, and a transmission section transmitting, in response to a request from the surgical apparatus, the application stored in the storage section. The surgical apparatus includes a reception section receiving the application transmitted by the transmission section, and an execution section executing the application received by the reception section.
[0012] A first control method in an aspect of the present technology, for a surgery system that includes an information processor and a surgical apparatus, includes: causing the information processor to store an application per clinical department, and transmit the stored application in response to a request from the surgical apparatus; and causing the surgical apparatus to receive the application transmitted by the information processor, and execute the received application.
[0013] A surgical apparatus in an aspect of the present technology includes an acquisition section that acquires an application per clinical department from an information processor that stores the application, and an execution section that executes the application acquired by the acquisition section.
[0014] A second control method in an aspect of the present technology includes acquiring an application per clinical department from an information processor that stores the application, and executing the acquired application to thereby execute processing suitable for the clinical department.
[0015] A program in an aspect of the present technology causes a computer, which controls a medical apparatus, to execute processing that includes: acquiring an application per clinical department from an information processor that stores the application; and executing the acquired application to thereby execute processing suitable for the clinical department.
[0016] In the surgery system and the first control method in an aspect of the present technology, the information processor transmits an application that is stored therein in response to a request from the surgical apparatus, and the surgical apparatus receives the application from the information processor and executes the received application.
[0017] In the surgical apparatus, the second control method, and the program in an aspect of the present technology, an application is acquired from the information processor that stores an application per clinical department, and the acquired application is executed.
[0018] It is to be noted that the surgical apparatus may be an independent apparatus or may be an internal block included in an apparatus.
[0019] In addition, it is possible to provide the program through transmission via a transmission medium or recording on a recording medium.
Effects of the Invention
[0020] According to an embodiment of the present technology, it is possible to perform updating of an application, etc. more reliably and more easily.
[0021] It is to be noted that the above-described effects are not necessarily limitative, and may be any of the effects described in the present disclosure.

Description

BRIEF DESCRIPTION OF DRAWINGS
[0022] FIG. **1** illustrates a configuration of an embodiment of a medical system to which the

present technology is applied.
[0023] FIG. **2** illustrates a configuration of an embodiment of an endoscopic surgery system.
[0024] FIG. **3** is a block diagram that illustrates an example of a functional configuration of a camera head and a CCU.
[0025] FIG. **4** describes a function of a medical apparatus.
[0026] FIG. **5** describing a function of a monitoring apparatus.
[0027] FIG. **6** describes processing by a system according to a first embodiment.
[0028] FIG. **7** illustrates an example of a screen displayed in a display.
[0029] FIG. **8** illustrates another example of the screen displayed in the display.
[0030] FIG. **9** describes processing by a system in a second embodiment.
[0031] FIG. **10** describes processing by a system in a third embodiment.
[0032] FIG. **11** describes a recording medium.

MODES FOR CARRYING OUT THE INVENTION

[0033] In the following, modes to carry out the present technology (hereinafter, referred to as embodiments) are described.

<Configuration of Medical System>

[0034] The present technology is applicable to a medical system. As a medical system, for example, it is possible to assume a system having a configuration as illustrated in FIG. **1**. FIG. **1** assumes a hospital, and illustrates a case where the hospital includes an operating room A, an operating room B, an operating room C, a laboratory D, a laboratory E, a laboratory F, and a monitoring room G.
[0035] A medical apparatus **10-1** is provided in the operating room A, a medical apparatus **10-2** is provided in the operating room B, and a medical apparatus **10-3** is provided in the operating room C. In addition, a medical apparatus **10-4** is provided in the laboratory D, a medical apparatus **10-5** is provided in the laboratory E, and a medical apparatus **10-6** is provided in the laboratory F. In addition, a monitoring apparatus **11** is provided in the monitoring room G.
[0036] The monitoring apparatus **11** and each of the medical apparatuses **10-1** to **10-6** are coupled to each other via a network to enable data transfer between each other. It is possible to configure the network using a wired or/and wireless LAN (Local Area Network).
[0037] As described later, for example, the medical apparatus **10-1** downloads an application managed by the monitoring apparatus **11** and executes processing on the basis of the application. In addition, here, the medical system is continuously described by exemplifying a case of including the medical apparatuses **10-1** to **10-6** and the monitoring apparatus **11**, but the medical system is not limited to such a configuration. The medical system to which the present technology is applied is applicable to a configuration that includes at least one medical apparatus **10** and the monitoring apparatus **11**.
[0038] The medical apparatuses **10-1** to **10-6** are each a surgical apparatus used in performing a surgery, or an examination apparatus used in performing an examination. In addition, for example, the medical apparatuses **10-1** to **10-6** are each a rigid endoscope that is an endoscope for a surgery, an endoscope for a diagnosis (including a flexible scope and a capsule type), an MRI (Magnetic Resonance Imaging), an ultrasonic diagnostic apparatus, etc. In the following description, in a case where it is not necessary to distinguish the medical apparatuses **10-1** to **10-6** from one another separately, the medical apparatuses **10-1** to **10-6** are simply referred to as the medical apparatus **10**.
[0039] It is possible to configure the monitoring apparatus **11** with an information processor such as a personal computer (PC), and as described later, the monitoring apparatus **11** has a function to cause an application to be downloaded in response to a request from the medical apparatus **10**, while having a function to manage the application.

<Configuration of Endoscopic Surgery System>

[0040] A configuration of an endoscope is described here as an example of the medical apparatus **10**. Here, an endoscopic surgery system is described as an example, but the medical apparatus **10** is

also applicable to a surgical operation system, a microsurgery system, and so on.

[0041] FIG. **2** illustrates an example of a schematic configuration of the endoscopic surgery system **10** to which a technique according to the present disclosure is applicable. FIG. **2** illustrates a state in which a surgeon (doctor) **71** is performing a surgery on a patient **75** on a patient bed **73**, using the endoscopic surgery system **10**. As illustrated, the endoscopic surgery system **10** includes an endoscope **20**, another surgical instrument **30**, a supporting arm apparatus **40** that supports the endoscope **20**, and a cart **50** on which various apparatuses for an endoscopic surgery are mounted.

[0042] In the endoscopic surgery, instead of performing a laparotomy by cutting an abdominal wall, a plurality of tubular perforating instruments referred to as trocars **37***a* to **37***d* is pierced through the abdominal wall. Then, through the trocars **37***a* to **37***d*, a lens tube **21** of the endoscope **20**, and other surgical instruments **30** are inserted into a body cavity of the patient **75**. In the illustrated example, as other surgical instruments **30**, a pneumoperitoneum tube **31**, an energy treatment tool **33**, and forceps **35** are inserted into the body cavity of the patient **75**. In addition, the energy treatment tool **33** is a treatment tool with which to perform a tissue incision and an abrasion, or a blood vessel blockage, etc. by a high-frequency current or ultrasonic vibration. However, the surgical instrument **30** that is illustrated is a mere example, and as the surgical instrument **30**, for example, various surgical instruments typically used for an endoscopic surgery such as tweezers or a retractor may be used.

[0043] An image of an operative site in the body cavity of the patient **75**, which is captured by the endoscope **20**, is displayed in a display apparatus **53**. The surgeon **71**, while looking at the image of the operative site displayed in the display apparatus **53** in real time, performs treatment, for example, excising an affected area using the energy treatment tool **33** and the forceps **35**. It is to be noted that each of the pneumoperitoneum tube **31**, the energy treatment tool **33**, and the forceps **35** is supported by the surgeon **71**, an assistant, or the like during a surgery.

(Supporting Arm Apparatus)

[0044] The supporting arm apparatus **40** includes an arm part **43** that extends from a base part **41**. In the illustrated example, the arm part **43** includes joint parts **45***a*, **45***b*, and **45***c* and links **47***a* and **47***b*, and is driven by control from an arm controlling apparatus **57**. The arm part **43** supports the endoscope **20** and controls a position and a posture thereof. This makes it possible to achieve fixing of a stable position of the endoscope **20**.

(Endoscope)

[0045] The endoscope **20** includes the lens tube **21** having a predetermined length from an apical end being inserted into the body cavity of the patient **75**, and the camera head **23** coupled to a base end of the lens tube **21**. In the illustrated example, illustrated is the endoscope **20** configured as a so-called rigid scope that includes the lens tube **21** having rigidness, but the endoscope **20** may be configured as a so-called flexible scope that includes the lens tube **21** having flexibility.

[0046] The apical end of the lens tube **21** has an opening in which an objective lens is fitted. To the endoscope **20**, a light source apparatus **55** is coupled, and light generated by the light source apparatus **55** is guided to the apical end of the lens tube by a light guide that extends across an inside of the lens tube **21**, to be emitted to an observation target in the body cavity of the patient **75** via the objective lens. It is to be noted that the endoscope **20** may be a forward-viewing endoscope, or may be an oblique-viewing endoscope or a lateral-viewing endoscope.

[0047] Inside the camera head **23**, an optical system and an imaging device are provided, and light reflected from the observation target (observation light) is collected into the imaging device by the optical system. The imaging device performs photoelectric conversion of the observation light, to generate an electric signal corresponding to the observation light, that is, an image signal corresponding to an observed image. The image signal is transmitted to a camera control unit (CCU: Camera Control Unit) **51** as raw data. It is to be noted that the camera head **23** has a function to adjust a magnification and a focal length by driving the optical system appropriately.

[0048] It is to be noted that for example, to correspond to stereopsis (3D or three-dimensional

display), etc., the camera head **23** may include a plurality of imaging devices. In this case, inside the lens tube **21**, a plurality of relay optical systems is provided each of which is intended to guide the observation light into a corresponding one of the plurality of imaging devices.

(Various Apparatuses Mounted on Cart)

[0049] The CCU **51** includes a CPU (Central Processing Unit) and a GPU (Graphics Processing Unit), and integrally controls an action of the endoscope **20** and the display apparatus **53**. Specifically, the CCU **51** performs various types of image processing, for example, development processing (demosaicing) on an image signal received from the camera head **23** and displays an image on the basis of the image signal. The CCU **51** provides, to the display apparatus **53**, the image signal on which the image processing is performed. In addition, the CCU **51** transmits a control signal to the camera head **23**, to control driving thereof. The control signal may include information regarding an imaging condition such as a magnification or a focal length.

[0050] The display apparatus **53**, in accordance with the control from the CCU **51**, displays an image on the basis of the image signal on which image processing is performed by the CCU **51**. For example, in a case where the endoscope **20** corresponds to high-resolution imaging such as 4K (horizontal pixel number **3840**×vertical pixel number **2160**) or 8K (horizontal pixel number **7680**×vertical pixel number **4320**), and/or in a case where the endoscope **20** corresponds to 3D display, in accordance with each of the cases, a corresponding one of the display apparatus **53** that enables high-resolution display and/or the display apparatus **53** that enables three-dimensional display may be used. In a case where the display apparatus **53** corresponds to high-resolution imaging such as 4K or 8K, using the display apparatus **53** having a size of 55 inches or larger makes it possible to obtain a stronger sense of immersion. In addition, a plurality of display apparatuses **53** having different resolutions and sizes may be provided in accordance with an intended use.

[0051] For example, the light source apparatus **55** includes a light source such as an LED (light emitting diode), and supplies the endoscope **20** with irradiation light that is used when imaging the operative site.

[0052] For example, the arm controlling apparatus **57** includes a processor such as a CPU, and operates in accordance with a predetermined program, thus controlling driving of the arm part **43** in the supporting arm apparatus **40** in accordance with a predetermined control method.

[0053] An inputting apparatus **59** is an input interface for the endoscopic surgery system **10**. A user is able to perform input of various types of information and input of an instruction to the endoscopic surgery system **10** via the inputting apparatus **59**. For example, via the inputting apparatus **59**, the user inputs various types of information regarding a surgery such as physical information on a patient or information regarding a surgery technique. In addition, for example, via the inputting apparatus **59**, the user inputs an instruction to drive the arm part **43**, an instruction to change an imaging condition (such as a type of irradiation light, a magnification, or a focal length) for imaging by the endoscope **20**, an instruction to drive the energy treatment tool **33**, and so on.

[0054] A type of the inputting apparatus **59** is not limited, and the inputting apparatus **59** may be any type of known inputting apparatus. For example, as the inputting apparatus **59**, a mouse, a keyboard, a touch panel, a switch, a foot switch **69** and/or a lever, etc. is applicable. In a case of using a touch panel as the inputting apparatus **59**, the touch panel may be provided on a display surface of the display apparatus **53**.

[0055] Alternatively, for example, the inputting apparatus **59** is a device worn by a user, such as an eyeglass-type wearable device or an HMD (Head Mounted Display), and various types of input are performed in accordance with a gesture or line of sight of the user that is detected by these devices. In addition, the inputting apparatus **59** includes a camera that is able to detect a motion of the user, and various types of input are performed in accordance with the gesture or line of sight of the user that is detected from a video captured by the camera.

[0056] Furthermore, the inputting apparatus **59** includes a microphone that is able to collect a voice

of the user, and various types of input are performed by voice via the microphone. Thus, configuring the inputting apparatus **59** to allow input of various types of information in a non-contact manner particularly allows a user belonging to a clean area (for example, the surgeon **71**) to manipulate an apparatus belonging to an unclean area in a non-contact manner. In addition, this also allows the user to manipulate the apparatus without releasing a hand from a surgical instrument that the user is holding, thus increasing user convenience.

[0057] A treatment tool controlling apparatus **61** controls driving of the energy treatment tool **33** that is used for tissue cauterization, incision, blood vessel blockage, and so on. To secure a visual field by the endoscope **20** as well as securing a workspace for the surgeon, a pneumoperitoneum apparatus **63** sends gas into the body cavity of the patient **75** through the pneumoperitoneum tube **31** to inflate the body cavity. A recorder **65** is an apparatus that is able to record various types of information regarding a surgery. A printer **67** is an apparatus that is able to print various types of information regarding a surgery in various formats such as text, an image, or a graph.

[0058] In the following, a particularly characteristic configuration in the endoscopic surgery system **10** is further described in detail.

(Supporting Arm Apparatus)

[0059] The supporting arm apparatus **40** includes the base part **41** that is a pedestal, and the arm part **43** that extends from the base part **41**. In the illustrated example, the arm part **43** includes a plurality of joint parts **45***a*, **45***b*, and **45***c* and links **47***a* and **47***b* that are linked together by the joint **45***b*. However, FIG. **2** illustrates a simplified configuration of the arm part **43** for the sake of simplicity.

[0060] Actually, to allow the arm part **43** to have a desired degree of freedom, a shape, the number, and a position of each of the joint parts **45***a* to **45***c* and each of the links **47***a* and **47***b*, as well as a direction of a rotational axis of each of the joint parts **45***a* to **45***c*, and so on may be appropriately set. For example, the arm part **43** may be preferably configure to have a six or higher degrees of freedom. This allows the endoscope **20** to travel with freedom within a movable range of the arm part **43**, thus making it possible to insert the lens tube **21** of the endoscope **20** into the body cavity of the patient **75** from a desired direction.

[0061] The joint parts **45***a* to **45***c* each include an actuator, and the joint parts **45***a* to **45***c* are each configured to be rotatable around a predetermined rotational axis when driven by the actuator. The arm controlling apparatus **57** controls driving of the actuator, which controls a rotation angle of each of the joint parts **45***a* to **45***c*, thus controlling the driving of the arm part **43**. This makes it possible to achieve a control of the position and the posture of the endoscope **20**. At this time, the arm controlling apparatus **57** is able to control the driving of the arm part **43** in accordance with various known control methods such as force control or position control.

[0062] For example, the surgeon **71** may appropriately perform manipulation input via the inputting apparatus **59** (including the foot switch **69**), and thereby cause the arm controlling apparatus **57** to appropriately control the driving of the arm part **43** in accordance with the manipulation input, to control the position and the posture of the endoscope **20**. The control allows the endoscope **20** at the apical end of the arm part **43** to travel from a given position to another given position, and then to support the endoscope **20** in a fixed manner at a position after the travel. It is to be noted that the arm part **43** may be manipulated by a so-called master-slave method. In this case, the arm part **43** may be remotely manipulated by a user via the inputting apparatus **59** that is provided at a place distant from the operating room.

[0063] In addition, in a case where force control is applied, the arm controlling apparatus **57** may perform so-called power assist control in which the arm controlling apparatus **57**, in response to an external force from the user, drives the actuator in each of the joint parts **45***a* to **45***c*, to cause the arm part **43** to travel smoothly following the external force. When the user moves the arm part **43** while having direct contact with the arm part **43**, this allows the user to move the arm part **43** with relatively small force. This accordingly makes it possible to move the endoscope **20** more

intuitively and by easier manipulation, thus making it possible to increase user convenience.
[0064] Here, generally, in an endoscopic surgery, the endoscope **20** is supported by a doctor called a scopist. In contrast, using the supporting arm apparatus **40** makes it possible to securely fix the position of the endoscope **20** without depending on manpower, thus making it possible to stably obtain an image of the operative site and perform a surgery smoothly.
[0065] It is to be noted that the arm controlling apparatus **57** need not necessarily be provided on the cart **50**. In addition, the arm controlling apparatus **57** need not necessarily be one apparatus. For example, the arm controlling apparatus **57** may be provided in each of the joint parts **45***a* to **45***c* in the arm part **43** in the supporting arm apparatus **40**, and driving control of the arm part **43** may be achieved by a plurality of arm controlling apparatuses **57** working in cooperation with one another.
(Light Source Apparatus)
[0066] The light source apparatus **55** supplies irradiation light to the endoscope **20** when imaging an operative site. For example, the light source apparatus **55** is configured by a white light source that includes an LED, a laser light source, or a combination thereof. At this time, in a case where the white light source includes a combination of RGB, or red, green, and blue, laser light sources, it is possible to control an output intensity and an output timing of each color (each wavelength) with high accuracy, thus making it possible to adjust a white balance of the captured image in the light source apparatus **55**.
[0067] In addition, in this case, it is also possible to irradiate the observation target with laser light from each of the RGB laser light sources by time division, and control driving of the imaging device in the camera head **23** in synchronization with the irradiation timing, thus capturing an image corresponding to each of RGB by time division. This method makes it possible to obtain a color image without providing the imaging device with a color filter.
[0068] In addition, driving of the light source apparatus **55** may be controlled to change intensity of outputted light at a predetermined time. Through obtaining an image by time division by controlling the driving of the imaging device in the camera head **23** in synchronization with a timing of the change in light intensity, and synthesizing the image, it is possible to generate a high dynamic range image without a so-called blocked up shadow or blown out highlight.
[0069] In addition, the light source apparatus **55** may be configured to be able to supply light having a predetermined wavelength bandwidth corresponding to a special light observation. In the special light observation, for example, a so-called narrow band light observation (Narrow Band Imaging) is performed. In the narrow band observation, light having a narrower bandwidth than the irradiation light (in other words, white light) in an ordinary observation is emitted utilizing a wavelength dependence of light absorption in a body tissue, thus imaging a predetermined tissue such as a blood vessel in a mucous membrane surface layer at a high contrast.
[0070] Alternatively, in the special light observation, a fluorescence observation that is to obtain an image by fluorescence generated by emitting excitation light may be performed. In the fluorescence observation, observation may be performed such as observing fluorescence from a body tissue by irradiating the body tissue with excitation light (self-fluorescence observation), or obtaining a fluorescent image by locally injecting a reagent such as indocyanine green (ICG) into a body tissue while irradiating the body tissue with excitation light corresponding to a fluorescence wavelength of the reagent. The light source apparatus **55** may be configured to be able to supply narrow band light and/or excitation light that correspond to such a special light observation.
(Camera Head and CCU)
[0071] With reference to FIG. **3**, a function of each of the camera head **23** and the CCU **51** in the endoscope **20** is described in more detail. FIG. **3** is a block diagram that illustrates an example of a functional configuration of each of the camera head **23** and the CCU **51** that are illustrated in FIG. **2**.
[0072] When referring to FIG. **3**, the camera head **23** includes, as a function thereof, a lens unit **25**, an image pickup unit **27**, a driving unit **29**, a communication unit **26**, and a camera head controlling

unit **28**. In addition, the CCU **51** includes, as a function thereof, a communication unit **81**, an image processing unit **83**, and a control unit **85**. The camera head **23** and the CCU **51** are coupled to each other by a transmission cable **91** to enable bidirectional communication.

[0073] First, the functional configuration of the camera head **23** is described. The lens unit **25** is an optical system provided at a part where the lens unit **25** is coupled to the lens tube **21**. Observation light introduced through the apical end of the lens tube **21** is guided to the camera head **23**, to enter the lens unit **25**. The lens unit **25** is configured by a combination of a plurality of lenses including a zoom lens and a focus lens. The lens unit **25** has an optical characteristic adjusted to collect the observation light on a light receiving surface of the imaging device in the image pickup unit **27**. In addition, the zoom lens and the focus lens are each configured to have a position movable on an optical axis to adjust the magnification and the focal point of a captured image.

[0074] The image pickup unit **27** includes an imaging device, and is disposed in a subsequent stage of the lens unit **25**. Observation light transmitted through the lens unit **25** is collected on the light receiving surface of the imaging device, and an image signal corresponding to an observed image is generated by photoelectric conversion. The image signal generated by the image pickup unit **27** is provided to the communication unit **26**.

[0075] As the imaging device included in the image pickup unit **27**, for example, a CMOS (Complementary Metal Oxide Semiconductor) type imaging sensor is used that has a Bayer array and enables color imaging. It is to be noted that as the imaging device, for example, an imaging device may be used that is compatible with capturing of a high-resolution image of 4K or higher. Obtaining a high-resolution image of the operative site allows the surgeon **71** to grasp a state of the operative site in more detail, thus making it possible to operate the surgery more smoothly.

[0076] In addition, the imaging device included in the image pickup unit **27** includes a pair of imaging devices each of which is intended to obtain, for a corresponding one of a right eye and a left eye, an image signal that corresponds to a 3D display. Performing the 3D display allows the surgeon **71** to grasp a depth of a body tissue in the operative site more accurately. It is to be noted that in a case of the image pickup unit **27** having a multi-plate configuration, a plurality of systems of the lens unit **25** is provided in a manner corresponding to respective imaging devices.

[0077] In addition, the image pickup unit **27** need not necessarily be provided in the camera head **23**. For example, the image pickup unit **27** may be provided immediately behind the objective lens, inside the lens tube **21**.

[0078] The driving unit **29** includes an actuator and, in accordance with the control from the camera head controlling unit **28**, causes the zoom lens and the focus lens in the lens unit **25** to travel along an optical axis by a predetermined distance. This makes it possible to appropriately adjust the magnification and the focal point of an image captured by the image pickup unit **27**.

[0079] The communication unit **26** includes a communication device intended to transmit and receive various types of information to and from the CCU **51**. The communication unit **26** transmits, as the raw data, an image signal obtained from the image pickup unit **27** to the CCU **51** via the transmission cable **91**. At this time, to display the captured image of the operative site with a low latency, it is preferable that the image signal be transmitted by optical communication.

[0080] One reason for this is that, upon surgery, the surgeon **71** performs a surgery while observing a state of an affected area in accordance with the captured image, which requires a moving image of the operative site to be displayed as close to real time as possible. In a case of performing optical communication, the communication unit **26** includes a photoelectric conversion module that converts an electric signal into an optical signal. The image signal is converted into an optical signal by the photoelectric conversion module and then transmitted to the CCU **51** via the transmission cable **91**.

[0081] In addition, the communication unit **26** receives, from the CCU **51**, a control signal to control driving of the camera head **23**. For example, the control signal includes information regarding an imaging condition, such as information specifying a frame rate for the captured image,

information specifying an exposure value at the time of imaging, and/or information specifying the magnification and the focal point of the captured image. The communication unit **26** provides the received control signal to the camera head controlling unit **28**.

[0082] It is to be noted that the control signal form the CCU **51** may also be transmitted by optical communication. In this case, the communication unit **26** includes a photoelectric conversion module that converts an optical signal into an electric signal, and the control signal is converted into an electric signal by the photoelectric conversion module and then provided to the camera head controlling unit **28**.

[0083] It is to be noted that the above-described imaging condition, such as the frame rate, the exposure value, the magnification, or the focal point, is automatically set by the control unit **85** in the CCU **51** on the basis of the obtained image signal. In other words, the endoscope **20** has a so-called AE (Auto Exposure) function, an AF (Auto Focus) function, and an AWB (Auto White Balance) function.

[0084] The camera head controlling unit **28** controls the driving of the camera head **23** on the basis of the control signal received from the CCU **51** via the communication unit **26**. For example, the camera head controlling unit **28** controls the driving of the imaging device in the image pickup unit **27** on the basis of the information specifying the frame rate of the captured image and/or the information specifying an exposure at the time of imaging. In addition, for example, on the basis of the information specifying the magnification and the focal point of the captured image, the camera head controlling unit **28** causes, via the driving unit **29**, the zoom lens and the focus lens in the lens unit **25** to travel appropriately. The camera head controlling unit **28** may further have a function to store information for identifying the lens tube **21** and the camera head **23**.

[0085] It is to be noted that disposing a configuration such as the lens unit **25** or the image pickup unit **27** in a sealing structure having a high airtightness and waterproof property allows the camera head **23** to have a tolerance to an autoclave sterilization treatment.

[0086] Next, the functional configuration of the CCU **51** is described. The communication unit **81** includes a communication device intended to transmit and receive various types of information to and from the camera head **23**. The communication unit **81** receives an image signal transmitted from the camera head **23** via the transmission cable **91**. At this time, as described above, the image signal may be preferably transmitted by optical communication. In this case, in a manner corresponding to the optical communication, the communication unit **81** includes a photoelectric conversion module that converts an optical signal into an electric signal. The communication unit **81** provides the image processing unit **83** with the image signal converted into the electric signal.

[0087] In addition, the communication unit **81** transmits, to the camera head **23**, a control signal to control the driving of the camera head **23**. The control signal may also be transmitted by optical communication.

[0088] The image processing unit **83** performs various types of image processing on an image signal that is the raw data transmitted from the camera head **23**. Examples of the image processing include various types of known signal processing development processing, image-quality enhancement processing (including band-emphasis processing, super-resolution processing, NR (noise reduction) processing, and/or camera-shake correction processing), and/or enlargement processing (electronic zoom processing). In addition, the image processing unit **83** performs detection processing on the image signal to perform AE, AF, and AWB.

[0089] The image processing unit **83** includes a processor such as a CPU or a GPU, and the processor operates in accordance with a predetermined program, thus making it possible to perform the above-described image processing and detection processing. It is to be noted that in a case where the image processing unit **83** includes a plurality of GPUs, the image processing unit **83** appropriately divides information regarding the image signal, to cause the plurality of GPUs to perform image processing in parallel.

[0090] The control unit **85** performs various types of control regarding imaging of an operative site

by the endoscope **20** and display of the captured image. For example, the control unit **85** generates a control signal to control the driving of the camera head **23**. At this time, in a case where an imaging condition is inputted by a user, the control unit **85** generates a control signal on the basis of the input by the user. Alternatively, in a case where the endoscope **20** has the AE function, the AF function, and the AWB function, the control unit **85** appropriately calculates, in accordance with a result of the detection processing by the image processing unit **83**, the exposure value, the focal length, and the white balance at an optimum level, to generate the control signal.

[0091] In addition, the control unit **85** causes the display apparatus **53** to display an image of the operative site on the basis of the image signal on which image processing is performed by the image processing unit **83**. At this time, the control unit **85** recognizes various objects in the image of the operative site using various image recognition techniques.

[0092] For example, the control unit **85** detects an edge shape, a color, etc. of an object included in the image of the operative site, thus making it possible to recognize a surgical instrument such as forceps, a specific body site, bleeding, mist at the time of using the energy treatment tool **33**, etc. When causing the display apparatus **53** to display the image of the operative site, the control unit **85** uses results of the recognition to display various types of surgery support information to be superimposed on an image of the operative site. The surgery support information, which is superimposed and displayed, is presented to the surgeon **71**, thus making it possible to operate a surgery more safely and reliably.

[0093] The transmission cable **91** that couples the camera head **23** and the CCU **51** to each other is an electric signal cable corresponding to electric-signal communication, an optical fiber corresponding to optical communication, or a composite cable thereof.

[0094] Here, in the illustrated example, wired communication is performed using the transmission cable **91**, but communication between the camera head **23** and the CCU **51** may also be performed wirelessly. In a case where wireless communication is performed therebetween, it is not necessary to install the transmission cable **91** in the operating room, and thus it may be possible to resolve a situation where movement of medical staff in the operating room is hampered by the transmission cable **91**.

[0095] The example of the endoscopic surgery system **10** to which the technology according to the present disclosure is applicable has been described above.

[0096] It is to be noted that the endoscopic surgery system **10** has been described here as an example, but a system to which the technology according to the present disclosure is applicable is not limited to such an example. For example, the technology according to the present disclosure may also be applied to a flexible endoscopic surgery system for examination or a microsurgery system.

<Configuration of Medical Apparatus>

[0097] With reference to FIGS. **2** and **3**, the specific configuration of the medical apparatus **10** has been described by exemplifying a case where the medical apparatus **10** is an endoscopic surgery system. Next, a function of the medical apparatus **10** is further described.

[0098] The medical apparatus **10** illustrated in FIG. **4** includes an application execution section **101**, a user interface **102**, an application selection section **103**, an application acquisition section **104**, a communication control section **105**, a coupled apparatus recognition section **106**, and a storage section **107**. In addition, the storage section **107** stores a common application **111**.

[0099] The coupled apparatus recognition section **106** recognizes, from among coupled apparatuses **131-1** to **131-3** each having a possibility of being coupled to the medical apparatus **10**, which one of the coupled apparatuses has been coupled. For example, the coupled apparatuses **131-1** to **131-3** may be each an apparatus including an imaging unit that images an affected area, or an apparatus including an imaging unit that images an examination site.

[0100] For example, the CCU **51** in the endoscopic surgery system **10** illustrated in FIGS. **2** and **3** is allowed to have the function of the medical apparatus **10** illustrated in FIG. **4**.

[0101] The medical apparatus **10**, for example, the endoscopic surgery system **10** is used for a surgery, an examination, etc. of various organs. The endoscopic surgery system **10** is a rigid endoscope that is an endoscope for a surgery, a flexible endoscope that is an endoscope for an examination, a capsule endoscope, and so on. In addition, examples of types of endoscope include a brain scope, an otolaryngological scope, a thoracoscope, a bronchoscope, a laparoscope, an enteroscope, a ureteroscope, a hysteroscope, and so on. Examples of an apparatus having a possibility of being coupled to the medical apparatus **10** as the coupled apparatus **131** may include these endoscopes, for example, the brain scope, and the otolaryngological scope.
[0102] In other words, the medical apparatus **10**, for example, the CCU **51** may be a shared part, which is to be used, by the coupled apparatus **131** that is to be coupled to the medical apparatus **10**, as a medical apparatus that performs an examination or surgery in brain, or used as a medical apparatus that performs an examination or surgery on ear, nose, and throat.
[0103] Thus, a target (organ) or a purpose (such as an examination purpose or a surgery purpose) differs depending on the coupled apparatus **131** that is to be coupled to the medical apparatus **10**, and the coupled apparatus **131** suitable for the target and the purpose is selected and coupled.
[0104] The coupled apparatus recognition section **106** recognizes the coupled apparatus **131** that has been coupled. In accordance with a result of this recognition, it is determined what the medical apparatus **10** is intended for and what purpose the medical apparatus **10** is used for. Although described later, this determination is performed in any one of the coupled apparatus recognition section **106**, the application selection section **103**, the application acquisition section **104**, and the monitoring apparatus **11**, or in a plurality of these.
[0105] For example, when the coupled apparatus **131** that has been coupled is a brain scope, information that the coupled apparatus **131** is used for an examination or surgery in brain is acquired. Then, in this case, on the basis of this information, an application corresponding to an examination or surgery to be performed using the brain scope is supplied from the monitoring apparatus **11** to the medical apparatus **10**.
[0106] The application acquisition section **104** acquires an application corresponding to the coupled apparatus **131** from the monitoring apparatus **11** (FIG. **1**). For example, in a case where the coupled apparatus **131** is a brain scope, an application to cause the medical apparatus **10** to function as an apparatus that performs an examination or surgery in brain is acquired.
[0107] The application execution section **101** executes the application acquired by the application acquisition section **104**, thus causing the medical apparatus **10** to execute processing based on the application. For example, in a case where the acquired application is an application for an examination or surgery in brain, the application execution section **101** executes the application, thus causing the medical apparatus **10** to function as an apparatus that performs image processing, etc. suitable for the examination or surgery in brain.
[0108] Processing that is executed as a result of the coupled apparatus recognition section **106** recognizing the coupled apparatus **131** is described later as a third embodiment. It is to be noted that in a case where processing is performed on the basis of a first embodiment or a second embodiment as described in the following, a configuration may eliminate the coupled apparatus recognition section **106** from the medical apparatus **10**.
[0109] Although described in detail later, in the first or the second embodiment, an interface provided to a user through the user interface **102** is used, and in accordance with an option selected by the user, the application selection section **103** selects an application, and the application acquisition section **104** acquires the application selected by the application selection section **103**.
[0110] It is assumed that the user interface **102** has a function to provide a user interface, and has a configuration including an apparatus that outputs an image or voice such as a display or a speaker, and an apparatus through which to input an instruction from a user such as a touch panel, a keyboard, and a mouse. For example, the user interface **102** has a configuration that allows the user to select a desired option from options displayed in the display.

[0111] The application execution section **101** executes an application that is acquired by the application acquisition section **104** or acquired as a result of the communication control section **105** performing control on communication with the monitoring apparatus **11** via a network. For example, in a case where the application execution section **101** uses a Linux (registered trademark) OS, i.e., operating system, the application is executed as a result of being added to a program that is dynamically executed using a function dlopen.
[0112] In addition, in a case where the application execution section **101** has a Web function, the application execution section **101** executes an application on a browser, or executes an application using java (registered trademark).
[0113] The application (application program) that is enabled for execution may be executed after an execution instruction from a user is accepted, or may be executed, even without any execution instruction from the user, when a predetermined trigger occurs.
[0114] The storage section **107** stores the common application **111**. The common application **111** is an application shared by each medical apparatus **10**. For example, execution of the common application **111** executes basic signal processing to display a surgery image (examination image), displays an option, or executes downloading of an application.
[0115] The medical apparatus **10** downloads an application from the monitoring apparatus **11**, thus functioning as an apparatus that performs an examination or surgery in brain, or functioning as an apparatus that performs an examination or surgery on ear, nose, and throat. In the present embodiment, the monitoring apparatus **11** manages an application per clinical department, and the medical apparatus **10** downloads an application corresponding to a desired clinical department from the monitoring apparatus **11**, to be used as the medical apparatus **10** that is able to perform processing corresponding to the clinical department.
<Configuration of Monitor>
[0116] A function of the monitoring apparatus **11** that manages an application per clinical department in this manner is described with reference to FIG. **5**.
[0117] As illustrated in FIG. **5**, the monitoring apparatus **11** includes a user interface **201**, an application managing section **202**, a communication control section **203**, and a storage section **204**. In addition, the storage section **204** stores a digestive application **211**, a urological application **212**, and an orthopedic-surgical application **213**.
[0118] As illustrated in FIG. **1**, the monitoring apparatus **11** is provided in the monitoring room G, and has a configuration that enables, via a network, transmission and reception of an application or data transfer to and from each of the medical apparatuses **10-1** to **10-6**.
[0119] Here, the monitoring apparatus **11** is continuously described assuming that the monitoring apparatus **11** is provided in the monitoring room G, but the monitoring apparatus **11** may be provided in a room other than the monitoring room G. In addition, the monitoring room G is a room provided for monitoring a surgery or examination that is performed in each of the operating rooms A to C or in each of the laboratories D to F. In the monitoring room G, an observer is present, and the observer monitors a surgery or examination.
[0120] In the second embodiment described later, description is given by exemplifying a case where the monitoring apparatus **11** is provided in the monitoring room G and an observer monitors a surgery or examination in this manner. In the first and the third embodiments, it is sufficient that the monitoring apparatus **11** is coupled to enable communication with the medical apparatuses **10-1** to **10-6** as a server, and the monitoring apparatus **11** may be provided at any place. In other words, the monitoring apparatus **11** may be provided in any room other than the monitoring room G.
[0121] When referring to FIG. **5**, the user interface **201** in the monitoring apparatus **11** has a function to accept a manipulation from a user. For example, it is assumed that the interface **201** has a configuration that includes a display including a touch panel. It is to be noted that as in the first or the second embodiment described later, in a case of providing the monitoring apparatus **11** as a server, it is also possible to assume the monitoring apparatus **11** having a configuration from which

the user interface **201** is eliminated.
[0122] The application managing section **202** manages an application stored in the storage section **204**. The storage section **204** stores the digestive application **211**, the urological application **212**, and the orthopedic-surgical application **213**. When receiving, from the medical apparatus **10**, a request to download an application, the application managing section **202** reads, from the storage section **204**, an application that meets the request and transmits the application to the medical apparatus **10** under a control of the communication control section **203**.
[0123] For example, when the medical apparatus **10** is used as an apparatus that performs a digestive examination or surgery, the application managing section **202** reads the digestive application **211** from the storage section **204**, and transmits the digestive application **211** to the medical apparatus **10** via the communication control section **203**.
[0124] Although the storage section **204** is continuously described assuming that the digestive application **211**, the urological application **212**, and the orthopedic-surgical application **213** are stored therein, this description is merely an example.
[0125] In other words, the storage section **204** also stores another application, for example, an application for another clinical department such as a brain-surgical application or an orthopedic-surgical application. Thus, the storage section **204** stores an application per clinical department.
[0126] The digestive application **211** is an application downloaded by the medical apparatus **10** when using the medical apparatus **10** as an apparatus to perform a digestive examination or surgery, and is an application intended to enable performance of processing specialized in a digestive examination or surgery.
[0127] The same applies to another application, and the urological application **212** is an application specialized in performing a urological examination or surgery, and the orthopedic-surgical application **213** is an application specialized in performing an examination or surgery related to orthopedic surgery.
[0128] Additional description is given of processing executed in a medical system that includes the monitoring apparatus **11** and the medical apparatus **10** each having such a configuration.

Processing in First Embodiment

[0129] FIG. **6** is a flowchart that describes processing by a medical system in the first embodiment. The processing based on the flowchart illustrated in FIG. **6** is started after a medical apparatus is powered on.
[0130] In Step S**101**, the medical apparatus **10** accepts a selection of a function to use and a clinical department. For example, in Step S**101**, an option as illustrated in FIG. **7** is displayed on a display **301** included in the user interface **102** (FIG. **4**) in the medical apparatus **10**, and a user selects a desired option, and thereby the selection of the function to use is accepted.
[0131] When referring to FIG. **7**, the display **301** displays an option **321** that is “special observation light”, an option **322** that is “screen rotation”, an option **323** that is “AF”, and an option **324** that is “AWB”. The option **321** that is “observation light” is an option selected when performing observation with special observation light. The option **322** that is “screen rotation” is an option selected when rotating a screen.
[0132] The option **323** that is “AF” is an option selected when turning autofocus (Autofocus) on or off. The option **324** that is “AWB” is an option selected when tuning color adjustment on or off in auto white balance (Auto White Balance).
[0133] The display **301** may display an option other than these options, or the display **301** may display these options together with the option other than these options.
[0134] An option regarding the function as illustrated in FIG. **7** may be displayed to allow a user (surgeon) to select a desired function. In addition, an option regarding the clinical department as illustrated in FIG. **8** may be displayed to allow the user (surgeon) to select a desired clinical department.
[0135] When referring to FIG. **8**, in the example of a display illustrated in FIG. **8**, the display **301**

displays an option **341** that is “digestive surgery”, an option **342** that is “urology”, an option **343** that is “otolaryngology”, and an option **344** that is “orthopedic surgery”.

[0136] The option **341** that is “digestive surgery” is an option selected when performing a digestive examination or surgery. The option **342** that is “urology” is an option selected when performing a urological examination or surgery.

[0137] The option **343** that is “otolaryngology” is an option selected when performing an otolaryngological examination or surgery. The option **344** that is “orthopedic surgery” is an option selected when performing an examination or surgery regarding orthopedic surgery.

[0138] The display **301** may display an option other than these options, or the display **301** may display these options together with the option other than these options.

[0139] The option regarding the function illustrated in FIG. **7** may be displayed after the option regarding the clinical department as illustrated in FIG. **8** is displayed and the user selects a desired clinical department.

[0140] Returning to the description with reference to the flowchart illustrated in FIG. **6**, in Step S**101**, in a case where the function or clinical department is selected by the user on side of the medical apparatus **10**, and the selection is accepted, the processing proceeds to Step S**102**.

[0141] In Step S**102**, the medical apparatus **10** requests the monitoring apparatus **11** to download an application.

[0142] For example, the application acquisition section **104** (FIG. **4**) transmits, to the monitoring apparatus **11**, via the communication control section **105**, information regarding the function (clinical department) accepted by the user interface **102**, thus requesting the monitoring apparatus **11** to download an application.

[0143] Alternatively, the application acquisition section **104** selects, from the function (clinical department) accepted by the user interface **102**, an application that is to be downloaded by the application selection section **103** (FIG. **4**), and transmits a result of the selection to the monitoring apparatus **11** via the communication control section **105**, thus requesting the monitoring apparatus **11** to download the application.

[0144] In Step S**131**, when accepting a request from the medical apparatus **10**, the monitoring apparatus **11** selects an application in Step S**132**. When the communication control section **203** (FIG. **5**) in the monitoring apparatus **11** receives the request from the medical apparatus **10**, the application managing section **202** (FIG. **5**) reads, from the storage section **204**, an application corresponding to the request.

[0145] For example, in a case where the received request is a request at the time when the option **341** that is “digestive surgery” is selected, the application managing section **202** reads the digestive application **211** from the storage section **204**.

[0146] In Step S**133**, the monitoring apparatus **11** transmits the application read from the storage section **204** to the medical apparatus **10** under a control of the communication control section **203**.

[0147] In Step S**103**, the medical apparatus **10** receives the application transmitted from the monitoring apparatus **11**. Thus, the medical apparatus **10** downloads the application from the monitoring apparatus **11**.

[0148] The medical apparatus **10** functions as an apparatus that is able to execute processing based on the downloaded application. For example, in a case where the digestive application **211** is downloaded, the medical apparatus **10** functions as an apparatus that performs a digestive examination or surgery.

[0149] In addition, for example, in a case where the urological application **212** is downloaded, the medical apparatus **10** functions as an apparatus that performs a urological examination or surgery. In addition, for example, in a case where the orthopedic-surgical application **213** is downloaded, the medical apparatus **10** functions as an apparatus that performs an orthopedic-surgical examination or surgery.

[0150] In a case where the medical apparatus **10** is used as a digestive endoscope that performs a

digestive examination or surgery on the basis of the digestive application **211**, an image in which an object appears red (a color of an organ) is often handled.
[0151] Therefore, it is assumed that the digestive application **211** that is intended to allow the medical apparatus **10** to be used as a digestive endoscope is an application intended to set a parameter that enables appropriate image processing of the red object, in other words, to set a parameter for performing image processing that makes the operative site clearly visible, and perform the processing using the parameter.
[0152] In a case where the medical apparatus **10** is used as a urological endoscope that performs a urological examination or surgery on the basis of the urological application **212**, a rigid scope in the urological endoscope has a small diameter, which is likely to cause a lens distortion.
[0153] Therefore, it is assumed that the urological application **212** that is intended to allow the medical apparatus **10** to be used as a urological endoscope is an application intended to perform signal processing that corrects the lens distortion, set a parameter suitable for performing such a correction, and perform the processing using the parameter.
[0154] In addition, in a case where the medical apparatus **10** is used as a urological endoscope, there is a case where rotating an image by image processing makes it easier for the surgeon to perform the surgery, etc.
[0155] Therefore, it is assumed that the urological application **212** that is intended to allow the medical apparatus to be used as a urological endoscope is an application including a mechanism that performs such image processing as image rotation without an instruction from a surgeon or allows the surgeon to provide an instruction easily.
[0156] In a case where the medical apparatus **10** is used as an orthopedic-surgical endoscope that performs an orthopedic-surgical examination or surgery on the basis of the orthopedic-surgical application **213**, an image in which an object appears white (a color of a bone) is often handled.
[0157] Therefore, it is assumed that the orthopedic-surgical application **213** that is intended to allow the medical apparatus **10** to be used as an orthopedic-surgical endoscope is an application intended to set a parameter that enables appropriate image processing of the white object, in other words, to set a parameter for performing image processing that makes the operative site clearly visual, and perform the processing using the parameter.
[0158] Thus, the application downloaded to the medical apparatus **10** enables the medical apparatus **10** to function as a medical apparatus corresponding to various clinical departments. In addition, this also allows the application to be an application that sets a parameter suitable for each clinical department and executes processing using the parameter.
[0159] Returning to the description with reference to the flowchart illustrated in FIG. **6**, when the medical apparatus **10** receives an application in Step S**103**, the processing proceeds to Step S**104**. In Step S**104**, the application execution section **101** accepts a request to execute the downloaded application. For example, in a case where a user performs a predetermined manipulation, such as manipulating a button to instruct to start an examination, it is determined that a request to execute the application is issued, and the request is accepted.
[0160] It is to be noted that it is also possible to omit the processing in Step S**104**. In other words, upon downloading of the application, the application execution section **101** may start processing based on the application.
[0161] In Step S**105**, the application execution section **101** in the medical apparatus **10** executes the downloaded application. For example, in a case where the digestive application **211** is downloaded, a digestive examination or surgery is started, and image processing, etc. related to the examination or surgery is started.
[0162] In Step S**106**, it is determined whether or not the surgery (examination) is finished. For example, in a case where the surgeon manipulates a button to finish the examination or surgery, in a case where a predetermined period of time has elapsed during which no manipulation is performed or no updating of an image is performed, in a case where the power supply is turned off, etc., it is

determined that the surgery (or examination) is finished.
[0163] In Step S**106**, until it is determined that the surgery (or examination) is finished, the processing in Step S**106** is repeated, and in a case where it is determined that the surgery (or examination) is finished, the processing proceeds to Step S**107**.
[0164] In Step S**107**, the downloaded application is deleted from the medical apparatus **10**.
[0165] Thus, the medical apparatus **10** downloads an application when starting processing, and deletes the application when the processing is finished. Accordingly, when using the medical apparatus **10**, it is possible to download and use an application suitable for an intended use.
[0166] It is to be noted that in the medical apparatus **10**, during a period from when processing starts to when the processing is finished, the medical apparatus **10** and the monitoring device **11** may perform data transfer between each other. For example, the monitoring apparatus **11** may perform a portion of processing that is performed in the medical apparatus **10**, the medical apparatus **10** may transmit, as needed, necessary data for performing the processing (for example, image data, observation data, and so on) to the monitoring apparatus **11**, and the monitoring apparatus **11** may transmit a result of the processing to the medical apparatus **10**.
[0167] Thus, in a case of managing an application at the monitoring apparatus **11**, in other words, in a case of not causing the medical apparatus **10** to manage an application, it is possible to collectively update the medical apparatuses **10**-**1** to **10**-**6**.
[0168] In other words, updating an application managed by the monitoring apparatus **11**, which is, for example, updating (update) of the digestive application **211**, the urological application **212**, and the orthopedic-surgical application **213** in the example illustrated in FIG. **5**, means updating all of the medical apparatuses **10**-**1** to **10**-**6** that perform processing using the updated application.
[0169] When assuming a case where each of the medical apparatuses **10**-**1** to **10**-**6** manages an application separately, it is necessary to perform updating for each of the medical apparatuses **10**-**1** to **10**-**6**. In such a case, it is obvious that it takes a trouble and time to perform updating, and there is also a possibility of resulting in a state where updating of some of the medical apparatuses **10**-**1** to **10**-**6** is forgotten.
[0170] According to the present technology, it is possible to save such a trouble and time, and to collectively update all of the medical apparatuses **10**.
[0171] In addition, when assuming a case of managing an application for each medical apparatus **10**, it is necessary to manage any one of the digestive application **211**, the urological application **212**, and the orthopedic-surgical application **213** or these applications.
[0172] In a case of managing an application for any one of the digestive application **211**, the urological application **212**, and the orthopedic-surgical application **213**, it is only possible to perform processing with the managed application, which is likely to prevent an efficient use of the medical apparatus **10**.
[0173] In addition, in a case of managing the digestive application **211**, the urological application **212**, and the orthopedic-surgical application **213** for each medical apparatus **10**, it is necessary for the medical apparatus **10** to manage a plurality of applications. This is likely to cause an increase in a storage capacity to store the plurality of applications, cause an increase in functionality, etc. to manage and select a desired application from among the plurality of applications, cause a configuration in the medical apparatus **10** to be complicated, and result in an increase in cost and development expenditure.
[0174] However, according to the present technology, as described above, no application is managed on the side of the medical apparatus **10**, thus making it possible to prevent an increase in storage capacity and an increase in cost and development expenditure.
Processing in Second Embodiment
[0175] FIG. **9** is a flowchart that describes processing by a medical system in a second embodiment. The processing illustrated in FIG. **9** is started after a power supply for a medical apparatus is turned on.

[0176] The processing by the medical system in the second embodiment is different from the processing in the first embodiment in that the monitoring apparatus **11** performs a portion of the processing that is performed by the medical apparatus **10** in the medical system in the first embodiment. In the medical system according to the second embodiment, the monitoring apparatus **11** accepts a selection of a function or clinical department for the medical apparatus **10**.
[0177] In Step S**231**, the monitoring apparatus **11** accepts a selection of a function and a clinical department for the medical apparatus **10** monitored by the monitoring apparatus **11**. It is possible to perform this processing in a manner similar to the processing performed by the medical apparatus **10** in Step S**101** in the flowchart illustrated in FIG. **6**.
[0178] In the second embodiment, as illustrated in FIG. **1**, the monitoring apparatus **11** is provided in the monitoring room G, and an observer monitors the operating room A, for example. In addition, the observer performs setting of the medical apparatus **10-1** that is provided in the operating room A. On the basis of this setting, the function or clinical department that corresponds to a surgery (examination) performed using the medical apparatus **10** is selected.
[0179] In Step S**231**, an application corresponding to the function or clinical department that is selected by the monitoring apparatus **11** is selected in Step S**232**. The processing in Steps S**232** and S**233** is performed in a manner similar to the Steps S**132** and S**133** (FIG. **6**), and therefore the description thereof is omitted here.
[0180] In Step S**201**, the medical apparatus **10** receives an application transmitted from the monitoring apparatus **11**. The medical apparatus **10** may constantly wait for the application to be transmitted from the monitoring apparatus **11**, or may accept the application only when the surgeon issues a standby instruction to the medical apparatus **10**.
[0181] The processing in Steps S**201** to S**205** after downloading the application on the side of the medical apparatus **10** is performed in a manner similar to the processing in Steps S**103** to S**107** (FIG. **6**) in the first embodiment, and therefore the description thereof is omitted here.
[0182] As in the second embodiment, it is possible to set, on side of the monitoring apparatus **11**, in other words, using an apparatus other than the medical apparatus **10**, an application suitable for the examination or surgery that is desired to be performed by the medical apparatus **10**.
[0183] In the second embodiment as well, it is possible to achieve an effect similar to the effect in the first embodiment.

Processing in Third Embodiment

[0184] FIG. **10** is a flowchart that illustrates processing by a medical system in a third embodiment. The processing based on the flowchart illustrated in FIG. **10** is started after a power supply of a medical apparatus is turned on.
[0185] The processing performed by the medical system in the third embodiment is different from the processing in the first embodiment in that a portion of the processing performed by the medical apparatus **10** in the medical system in the first embodiment is performed on the side of the medical apparatus **10** without bothering a surgeon. In the medical system in the third embodiment, the medical apparatus **10** recognizes an apparatus that has been coupled and downloads an application corresponding to a result of the recognition.
[0186] In Step S**301**, the coupled apparatus recognition section **106** in the medical apparatus **10** recognizes the coupled apparatus **131** that has been coupled. In Step S**302**, on the basis of a result of the recognition, a request to download an application is issued to the monitoring apparatus **11**.
[0187] For example, the coupled apparatus **131** is a camera head in an endoscopic surgery system (for example, the camera head **23** illustrated in FIGS. **2** and **3**). The camera head differs in scope diameter and lens depending on each clinical department, and therefore it is possible to recognize, by the difference, the coupled apparatus **131** that has been coupled. In addition, model number information may be acquired from the coupled apparatus **131** to recognize the coupled apparatus **131** that has been coupled.
[0188] A result of the recognition in which the coupled apparatus **131** is recognized by the coupled

apparatus recognition section **106** may be transmitted to the monitoring apparatus **11** via the communication control section **105**, to cause an application to be selected on the side of the monitoring apparatus **11** on the basis of the result of the received recognition.

[0189] Alternatively, on the basis of the result of the recognition in which the coupled apparatus **131** is recognized by the coupled apparatus recognition section **106**, the application selection section **103** may select an application and transmit a result of the selection to the monitoring apparatus **11** via the communication control section **105**, to cause the application to be selected on the side of the monitoring apparatus **11** on the basis of the received result of the selection.

[0190] In Step S**302**, the medical apparatus **10** transmits, to the side of the monitoring apparatus **11**, the result of the recognition from the coupled apparatus recognition section **106** or the result of the selection from the application selection section **103**, as a request to download an application.

[0191] The processing after the transmission is performed in a manner similar to the first embodiment. In other words, the processing performed in the medical apparatus **10** in Steps S**303** to S**307** is performed in a manner similar to Steps S**103** to S**107** (FIG. **6**), and therefore the description thereof is omitted. In addition, the processing performed in the monitoring apparatus **11** in Steps S**331** to S**333** is performed in a manner similar to Steps S**131** to S**133** (FIG. **6**), and therefore the description thereof is omitted.

[0192] As in the third embodiment, selecting an application from the apparatus coupled to the medical apparatus **10** makes it possible to set, without bothering a user, an application suitable for the examination or surgery that is desired to be performed in the medical apparatus **10**.

[0193] In the third embodiment as well, it is possible to achieve an effect similar to the effect in the first embodiment.

[0194] It is to be noted that it is naturally possible to perform each of the first, the second, and the third embodiments, but it is also possible to perform the embodiments in combination.

[0195] According to the present technology, it is possible to simplify an internal system of the medical apparatus and achieve a reduction in the system cost and development expenditure for the medical apparatus. It is possible to share the medical apparatus to which the present technology is applied among a plurality of clinical departments, thus achieving an efficient use of an operating room and the medical apparatus, a reduction in storage area for the medical apparatus, and a reduction in the number of processes in an installation work for the medical apparatus.

[0196] In addition, according to the present technology, it is also possible to provide a medical apparatus to which the present technology is applied in each of a plurality of operating rooms and laboratories, and provide a monitoring apparatus (server) outside the operating room as a shared server. Enabling such a configuration also makes it possible to, when updating a new function, omit an update work for the medical apparatus in each operating room (laboratory) by updating only an application in the server, thus making it possible to reduce the number of processes in a maintenance work for the medical apparatus.

[0197] In addition, according to the present technology, there is a case where the medical apparatus and the server achieve, in cooperation with each other, a new function to be updated. For example, in the endoscopic surgery system, it is possible to consider an application in which preprocessing such as compression is performed on an image acquired from the camera head, a result of which is subsequently transmitted to the server, and after the server expands the image again, main processing to extract a characteristic point, etc. is performed using a high-performance processing engine.

[0198] When performing such processing, when a person in charge of the maintenance of the medical apparatus only performs updating of the server and forgets to update the medical apparatus, the preprocessing becomes obsolete processing, which is likely to lead to an unfavorable result as a whole. According to the present technology, the server is the only target of updating, it is possible to prevent an occurrence of such an inconvenience.

<Regarding Recording Medium>

[0199] It is possible to execute the above-described series of processing by hardware or by software. In a case of executing the series of processing by software, a program included in the software is installed in a computer. Here, the computer includes a computer integrated in dedicated hardware, and includes, for example, a general-purpose personal computer that is able to execute various functions by installing various programs.

[0200] FIG. **11** is a block diagram that illustrates an example of a configuration of computer hardware that executes the above-described series of processing by a program. In the computer, a CPU (Central Processing Unit) **501**, a ROM (Read Only Memory) **502**, and a RAM (Random Access Memory) **503** are coupled to one another by a bus **504**. To the bus **504**, an input/output interface **505** is further coupled. To the input/output interface **505**, an input unit **506**, an output unit **507**, a storage unit **508**, a communication unit **509**, and a drive **510** are coupled.

[0201] The input unit **506** includes a keyboard, a mouse, and a microphone. The output unit **507** includes a display and a speaker. The storage unit **508** includes a hard disk and a non-volatile memory. The communication unit **509** includes a network interface. The drive **510** drives a removable medium **511** such as a magnetic disk, an optical disk, a magneto-optical disk, or a semiconductor memory.

[0202] In the computer configured as above, for example, the CPU **501** loads a program stored in the storage unit **508** to the RAM **503** via the input/output interface **505** and the bus **504**, and executes the program, thus performing the above-described series of processing.

[0203] For example, it is possible to record and provide the program to be executed by the computer (CPU **501**) in the removable medium **511** as a package medium or the like. In addition, it is possible to provide the program via a wired or wireless transmission medium such as a local area network, the Internet, or digital satellite broadcasting.

[0204] In the computer, it is possible to install a program in the storage unit **508** via the input/output interface **505** by mounting the removable medium **511** on the drive **510**. In addition, it is possible to receive the program at the communication unit **509** via the wired or wireless transmission medium, and install the program in the storage unit **508**. Alternatively, it is possible to install the program in advance in the ROM **502** or the storage unit **508**.

[0205] It is to be noted that the program executed by the computer may be a program that causes processing to be performed in chronological order in accordance with an order described in the present specification, or may be a program that causes processing to be performed in parallel or at a necessary timing when a call is made, etc.

[0206] In addition, in the present specification, the system represents an entire apparatus that includes a plurality of apparatuses.

[0207] It is to be noted that effects described herein are merely illustrative and are not limitative, and may have other effects.

[0208] It is to be noted that embodiments according to the present technology are not limited to those described above, and various modifications are possible without departing from the gist of the present technology.

[0209] It is to be noted that the present technology may also have the following configurations.

(1)

[0210] A surgery system including: [0211] an information processor; and [0212] a surgical apparatus, [0213] the information processor including [0214] a storage section storing an application, and [0215] a transmission section transmitting, in response to a request from the surgical apparatus, the application stored in the storage section, and [0216] the surgical apparatus including [0217] a reception section receiving the application transmitted by the transmission section, and [0218] an execution section executing the application received by the reception section.

(2)

[0219] The surgery system according to (1), in which [0220] the storage section stores an

application per clinical department, and [0221] the execution section executes the application, to thereby be used as the surgical apparatus having a function suitable for the clinical department.
(3)
[0222] The surgery system according to (2), in which the surgical apparatus accepts a selection of the clinical department, and requests the information processor to transmit an application corresponding to the accepted clinical department.
(4)
[0223] The surgery system according to (2), in which the information processor accepts a selection of the clinical department, and transmits, to the surgical apparatus, an application corresponding to the accepted clinical department.
(5)
[0224] The surgery system according to (2), in which [0225] the surgical apparatus recognizes an apparatus that is coupled, and transmits information regarding the recognized apparatus to the information processor, and [0226] the information processor transmits, to the surgical apparatus, an application for the clinical department corresponding to the information regarding the apparatus.
(6)
[0227] The surgery system according to any one of (1) to (5), in which the surgical apparatus includes a rigid endoscope.
(7)
[0228] The surgery system according to any one of (1) to (6), in which the information processor is provided outside an operating room in which the surgical apparatus is disposed.
(8)
[0229] A control method, for a surgery system that includes an information processor and a surgical apparatus, the method including: [0230] causing the information processor to [0231] store an application per clinical department, and [0232] transmit the stored application in response to a request from the surgical apparatus; and [0233] causing the surgical apparatus to [0234] receive the application transmitted by the information processor, and [0235] execute the received application.
(9)
[0236] A surgical apparatus, including: [0237] an acquisition section that acquires an application per clinical department from an information processor that stores the application; and [0238] an execution section that executes the application acquired by the acquisition section.
(10)
[0239] The surgical apparatus according to (9), in which the execution section executes the application, to thereby be used as the surgical apparatus having a function suitable for the clinical department.
(11)
[0240] The surgical apparatus according to (9) or (10), in which the surgical apparatus accepts a selection of the clinical department, and requests the information processor to transmit an application corresponding to the accepted clinical department.
(12)
[0241] The surgical apparatus according to (9) or (10), in which the surgical apparatus acquires an application corresponding to the accepted clinical department, in the information processor.
(13)
[0242] The surgical apparatus according to (9) or (10), further including a coupled apparatus recognition section that recognizes an apparatus that is coupled and acquires information regarding the recognized apparatus, in which [0243] the surgical apparatus transmits, to the information processor, the information regarding the apparatus acquired by the coupled apparatus recognition section.
(14)
[0244] The surgical apparatus according to any one of (9) to (13), further including an image

pickup unit that captures an image of an affected area.
(15)
[0245] A control method, including: [0246] acquiring an application per clinical department from an information processor that stores the application; and [0247] executing the acquired application to thereby execute processing suitable for the clinical department.
(16)
[0248] A program that causes a computer, which controls a medical apparatus, to execute processing, the processing including: [0249] acquiring an application per clinical department from an information processor that stores the application; and [0250] executing the acquired application to thereby execute processing suitable for the clinical department.
REFERENCE NUMERALS LIST
[0251] **10** medical apparatus [0252] **11** monitoring apparatus [0253] **101** application execution section [0254] **102** user interface [0255] **103** application selection section [0256] **104** application acquisition section [0257] **105** communication control section [0258] **106** coupled apparatus recognition section [0259] **107** storage unit [0260] **111** common application [0261] **131** coupled apparatus [0262] **201** user interface [0263] **202** application managing section [0264] **203** communication control section [0265] **204** storage unit [0266] **211** digestive application [0267] **212** urological application [0268] **213** orthopedic-surgical application [0269] **301** display [0270] **321** to **324** option [0271] **341** to **344** option

Claims

1. A surgical system comprising: an information processor; and a surgical apparatus, wherein the surgical apparatus is configured to be coupled to different apparatuses and to recognize a coupled apparatus, and transmits information regarding the coupled apparatus to the information processor, and the information processor transmits, to the surgical apparatus, an application for a clinical department corresponding to the information regarding the coupled apparatus to the surgical apparatus, the information processor including a memory storing a program to operate a medical apparatus, and transmission circuitry configured to transmit, in response to a request from the surgical apparatus, the application stored in the memory based on the coupled apparatus, and the surgical apparatus including processing circuitry configured to receive the program transmitted by the transmission circuitry, receive the application transmitted by the transmission circuitry, and execute the application, to thereby be used as the surgical apparatus having a function suitable for the clinical department.