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Medical image processing device and medical observation system

Abstract

A medical image processing device includes an image processing unit configured to perform image processing on a captured image obtained by capturing a subject image. The image processing unit includes: a memory configured to store the captured image; and a noise processing unit configured to enable execution of writing of the captured image into the memory and readout of the captured image from the memory individually, and execute noise reduction processing of reducing noise of the captured image of the current frame based on the input captured image of the current frame and the captured image of the past frame read out from the memory, the noise processing unit being configured to execute readout stop processing of stopping readout of the past frame from the memory at a predetermined timing and writing the captured image of the current frame into the memory without executing the noise reduction processing.

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Background/Summary

(1) This application claims priority from Japanese Application No. 2022-035566, filed on Mar. 8, 2022, the contents of which are incorporated by reference herein in its entirety.

BACKGROUND

(2) The present disclosure relates to a medical image processing device and a medical observation system.

(3) In the medical field, there has been known a medical observation system that observes the inside of a subject (inside of a living body) (refer to JP 2007-312832 A, for example).

(4) The medical observation system described in JP 2007-312832 A includes a noise processing unit that executes noise reduction processing, being processing of reducing noise of an input captured image of a current frame. Specifically, the noise processing unit executes noise reduction processing, being processing of reducing noise of the captured image of the current frame, based on the input captured image of the current frame and a captured image of the past frame read out from the memory.

SUMMARY

(5) According to the technique described in JP 2007-312832 A, for example, in a case where the memory includes data of an indefinite value at the time of power startup or the like, the noise

processing unit executes noise reduction processing across the input captured image of the current frame and the data of the indefinite value stored in the memory. In such a case, since appropriate data is not stored in the memory as the captured image of the past frame, the noise reduction processing, when being executed, would be inappropriate processing, leading to a failure in noise reduction and in the acquisition of an image suitable for observation.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
(1) FIG. **1** is a diagram illustrating a medical observation system according to an embodiment;
(2) FIG. **2** is a block diagram illustrating a configuration of a camera head and a control device;
(3) FIG. **3** is a block diagram illustrating a function of executing noise reduction processing performed in a post-processing unit;
(4) FIG. **4** is a diagram illustrating an execution timing of readout stop processing;
(5) FIG. **5** is a diagram illustrating an execution timing of readout stop processing;
(6) FIG. **6** is a diagram illustrating an execution timing of readout stop processing; and
(7) FIG. **7** is a diagram illustrating a modification of the embodiment.
DETAILED DESCRIPTION
(8) Hereinafter, modes for carrying out the present disclosure (hereinafter referred to as embodiments) will be described with reference to the drawings. Note that the present disclosure is not limited to the embodiments described below. In the drawings, same reference signs are attached to the same components.
(9) Schematic configuration of medical observation system FIG. **1** is a diagram illustrating a configuration of a medical observation system **1** according to an embodiment.
(10) The medical observation system **1** is a system that is used in the medical field and observes the inside of a subject (living body). As illustrated in FIG. **1**, the medical observation system **1** includes an insertion unit **2**, a light source device **3**, a light guide **4**, a camera head **5**, a first transmission cable **6**, a display device **7**, a second transmission cable **8**, a control device **9**, and a third transmission cable **10**.
(11) In the present embodiment, the insertion unit **2** is implemented by a rigid endoscope. That is, the insertion unit **2** has an elongated shape that is entirely rigid, or partially rigid with a partially flexible portion, so as to be inserted into a living body. The insertion unit **2** includes an optical system (not illustrated) having one or more lenses and configured to collect light (subject image) from the living body.
(12) The light source device **3** is connected to one end of the light guide **4**, and supplies illumination light of a light amount designated by the control device **9** to the one end of the light guide **4** under the control of the control device **9**. In the present embodiment, the light source device **3** is separated from the control device **9**. However, the configuration is not limited to this, and it is allowable to employ a configuration in which the light source device **3** is provided inside the control device **9**.
(13) The light guide **4** has one end detachably connected to the light source device **3** and the other end detachably connected to the insertion unit **2**. The light guide **4** transmits the light supplied from the light source device **3** from one end to the other end and supplies the light to the insertion unit **2**. The light supplied to the insertion unit **2** is emitted from a distal end of the insertion unit **2** and directed into the living body. The light (subject image) applied to internal portions of the living body is condensed by the optical system in the insertion unit **2**.
(14) The camera head **5** corresponds to a medical observation device according to the present disclosure. The camera head **5** is detachably connected to an eyepiece **21** of the insertion unit **2**. In addition, the camera head **5** captures a subject image condensed by the insertion unit **2** and

generates an image signal (hereinafter, referred to as a captured image) under the control of the control device **9**.
(15) Note that a detailed configuration of the camera head will be described in “Configuration of camera head” described below.
(16) The first transmission cable **6** has one end detachably connected to the control device **9** via a connector CN**1** (FIG. **1**), and has the other end detachably connected to the camera head **5** via a connector CN**2** (FIG. **1**). The first transmission cable **6** transmits the captured image or the like output from the camera head **5** to the control device **9**, and transmits a control signal, a synchronization signal, a clock, power, or the like output from the control device **9** to the camera head **5** individually.
(17) Note that the captured image or the like transmitted from the camera head **5** to the control device **9** via the first transmission cable **6** may be transmitted in an optical signal or in an electrical signal. The similar applies to transmission of the control signal, the synchronization signal, and the clock from the control device **9** to the camera head **5** via the first transmission cable **6**.
(18) The display device **7** is implemented by a display using liquid crystal, organic Electro Luminescence (EL), or the like, and displays an image based on a video signal from the control device **9** under the control of the control device **9**.
(19) The second transmission cable **8** has one end detachably connected to the display device **7** and the other end detachably connected to the control device **9**. The second transmission cable **8** transmits the video signal processed by the control device **9** to the display device **7**.
(20) The control device **9** corresponds to the medical image processing device according to the present disclosure. The control device **9** is implemented by a central processing unit (CPU), a Field-Programmable Gate Array (FPGA), or the like, and comprehensively controls operation of the light source device **3**, the camera head **5**, and the display device **7**.
(21) A detailed configuration of the control device **9** will be described in “Configuration of control device” described below.
(22) The third transmission cable **10** has one end detachably connected to the light source device **3** and the other end detachably connected to the control device **9**. The third transmission cable **10** transmits the control signal from the control device **9** to the light source device **3**.
(23) Configuration of camera head FIG. **2** is a block diagram illustrating a configuration of the camera head **5** and the control device **9**.
(24) Next, a configuration of the camera head **5** will be described with reference to FIG. **2**.
(25) As illustrated in FIG. **2**, the camera head **5** includes a lens unit **51**, an imaging unit **52**, a storage unit **53**, and a communication unit **54**.
(26) The lens unit **51** includes one or more lenses, and forms a subject image condensed by the insertion unit **2** on an imaging surface of the imaging unit **52** (an image sensor **521**).
(27) The imaging unit **52** captures the inside of the living body under the control of the control device **9**. As illustrated in FIG. **2**, the imaging unit **52** includes the image sensor **521** and a signal processing unit **522**.
(28) The image sensor **521** is implemented by a Charge Coupled Device (CCD), Complementary Metal Oxide Semiconductor (CMOS) or the like that receives the subject image formed by the lens unit **51** and converts the image into an electrical signal (analog signal).
(29) The signal processing unit **522** performs signal processing on a captured image of an analog signal generated by the image sensor **522** and outputs a captured image of a digital signal.
(30) The storage unit **53** stores a camera head identifier (ID) for uniquely identifying the type of the camera head **5**. The camera head ID corresponds to identification information according to the present disclosure.
(31) The communication unit **54** is an interface that communicates with the control device **9** via a first transmission cable **6**. The communication unit **54** transmits the captured image (digital signal) output from the imaging unit **52** and the camera head ID stored in the storage unit **53** to the control

device **9**, and receives a control signal and the like from the control device **9**.
(32) Configuration of Control Device
(33) Next, the configuration of the control device **9** will be described with reference to FIG. **2**.
(34) As illustrated in FIG. **2**, the control device **9** includes a communication unit **91**, an image processing unit **92**, a display control unit **93**, a control unit **94**, an input unit **95**, an output unit **96**, and a storage unit **97**.
(35) The communication unit **91** is an interface that communicates with the camera head **5** (communication unit **54**) via the first transmission cable **6**. Subsequently, the communication unit **91** receives the captured image (digital signal) and the camera head ID output from the communication unit **54**, and transmits a control signal and the like from the control unit **94**.
(36) Under the control of the control unit **94**, the image processing unit **92** executes image processing on the captured image (digital signal) output from the camera head and received by the communication unit **91**.
(37) Specific examples of the image processing include optical black subtraction processing, demosaic processing, white balance adjustment processing, noise reduction processing, color correction processing, color enhancement processing, and contour enhancement processing.
(38) As illustrated in FIG. **2**, the image processing unit **92** includes a synchronization generation unit **921**, a pre-processing unit **922**, and a post-processing unit **923**.
(39) The synchronization generation unit **921** is a unit that generates a synchronization signal under the control of the control unit **94**.
(40) Based on the synchronization signal generated by the synchronization generation unit **921**, the pre-processing unit **922** performs some image processing of the image processing except for the noise reduction processing on the captured image (digital signal) received by the communication unit **91**.
(41) Based on the synchronization signal generated by the synchronization generation unit **921**, the post-processing unit **923** executes image processing such as noise reduction processing, which is not executed by the pre-processing unit **922** among the above-described image processing, on the captured image (digital signal) after the image processing is executed by the pre-processing unit **922**.
(42) The function of executing the noise reduction processing in the post-processing unit **923** will be described in “Function of executing noise reduction processing in post-processing unit” described below.
(43) The display control unit **93** generates a display video signal for displaying a captured image after image processing is executed by the image processing unit **92**. Subsequently, the display control unit **93** outputs the video signal to the display device **7**. With this operation, the captured image is displayed on the display device **7**.
(44) The control unit **94** is implemented by executing various programs stored in the storage unit **97** by a controller such as a CPU or a micro processing unit (MPU). The control unit **94** controls the operations of the light source device **3**, the camera head **5**, and the display device **7** and controls the entire operation of the control device **9**. The control unit **94** may be constituted with an integrated circuit such as an application specific integrated circuit (ASIC) or an FPGA, not limited to the CPU or the MPU. The control unit **94** has the function of a processing control unit **941** (refer to FIG. **3**) according to the present disclosure. The function will be described in “Execution timing of readout stop processing” described below.
(45) The input unit **95** is constituted with an operation device such as a mouse, a keyboard, and a touch panel, and receives user operations performed by a user such as a doctor. Subsequently, the input unit **95** outputs an operation signal corresponding to the user operation to the control unit **94**.
(46) The output unit **96** is constituted with a speaker, a printer, or the like, and outputs various types of information.
(47) The storage unit **97** stores a program executed by the control unit **94**, information needed for

processing performed by the control unit **94**, or the like.
(48) Function of Executing Noise Reduction Processing in Post-Processing Unit
(49) Next, a function of executing the noise reduction processing in the post-processing unit **923** will be described.
(50) FIG. **3** is a block diagram illustrating a function of executing the noise reduction processing in the post-processing unit **923**.
(51) As illustrated in FIG. **3**, the post-processing unit **923** includes a memory **9231** and a noise processing unit **9232** as functions of executing the noise reduction processing.
(52) The memory **9231** is frame memory that stores a captured image of one frame.
(53) As illustrated in FIG. **3**, the noise processing unit **9232** includes a memory access control unit **9233** and a noise reduction processing unit **9234** (hereinafter, referred to as the NR processing unit **9234**).
(54) The memory access control unit **9233** executes writing of the captured image to the memory **9231** and reading of the captured image from the memory **9231** individually based on the synchronization signal generated by the synchronization generation unit **921**.
(55) The NR processing unit **9234** executes known noise reduction processing of blending a captured image of a current frame input from the pre-processing unit **922** and a captured image of a past frame read out from the memory **9231** at a predetermined blending ratio. For example, the NR processing unit **9234** obtains a correlation between the captured image of the current frame and the captured image of the past frame. When having determined that the correlation is low (for example, in a case where the motion of the subject is large), the NR processing unit **9234** decreases the blending ratio of the captured image of the past frame. In contrast, when having determined that the correlation is high, the NR processing unit **9234** increases the blending ratio of the captured image of the past frame.
(56) Furthermore, the noise processing unit **9232** executes readout stop processing, which is processing of stopping reading the captured image of the past frame from the memory **9231** and writing the captured image of the current frame input from the pre-processing unit **922** to the memory **9231** at a predetermined timing without executing the noise reduction processing described above.
(57) The noise processing unit **9232** described above may be implemented by hardware, software, or a combination of hardware and software.
(58) Execution Timing of Readout Stop Processing
(59) Next, the execution timing of the readout stop processing performed by the noise processing unit **9232** will be described.
(60) FIGS. **4** to **6** are diagrams illustrating an execution timing of the readout stop processing.
(61) First, the processing control unit **941** determines whether a captured image to be input to the noise processing unit **9232** is to be a stable image.
(62) For example, in a case where a link-up state is established between the camera head **5** (communication unit **54**) and the control device **9** (communication unit **91**), the processing control unit **941** determines that the captured image input to the noise processing unit **9232** is to be a stable image. In contrast, in a case where a link-up state is not established between the camera head **5** (communication unit **54**) and the control device **9** (communication unit **91**), the processing control unit **941** determines that the captured image input to the noise processing unit **9232** is not to be a stable image.
(63) Furthermore, for example, in a case where camera head ID is detected via the communication unit **91**, the processing control unit **941** determines that the captured image input to the noise processing unit **9232** is to be a stable image. In contrast, in a case where the camera head ID is not detected via the communication unit **91**, the processing control unit **941** determines that the captured image input to the noise processing unit **9232** is not to be a stable image.
(64) Subsequently, when having determined that the captured image input to the noise processing

unit **9232** is not to be a stable image, as illustrated in FIG. **4**, the processing control unit **941** prohibits input of the captured image to the noise processing unit **9232**.
(65) Specifically, the processing control unit **941** turns off the function of the pre-processing unit **922**. With this operation, the output of the captured image from the pre-processing unit **922** to the noise processing unit **9232** is stopped. FIG. **4** represents a state of stopping the output of the captured image from the pre-processing unit **922** to the noise processing unit **9232** by a “x” mark.
(66) On the other hand, the processing control unit **941** turns on the function of the pre-processing unit **922** at the timing when having determined that the captured image input to the noise processing unit **9232** is to be a stable image. This operation starts output of the captured image from the pre-processing unit **922** to the noise processing unit **9232** as illustrated in FIG. **5**. In FIG. **5**, a state in which the output of the captured image from the pre-processing unit **922** to the noise processing unit **9232** is started is expressed by deleting the “x” mark illustrated in FIG. **4**.
(67) Furthermore, the processing control unit **941** controls the noise processing unit **9232** to execute the readout stop processing at a timing when having determined that the captured image input to the noise processing unit **9232** is to be a stable image.
(68) Specifically, as illustrated in FIG. **5**, the noise processing unit **9232** stops readout of the captured image of the past frame from the memory **9231** and writes a normal image A, which is a captured image of the current frame input from the pre-processing unit **922**, into the memory **9231** based on the synchronization signal generated by the synchronization generation unit **921** without executing the above-described noise reduction processing. With this operation, even when an indefinite value is stored in the memory **9231**, the indefinite value is rewritten by the normal image A. In FIG. **5**, a state of stopping the readout of the captured image of the past frame from the memory **9231** is represented by a “x” mark.
(69) Subsequently, under the control of the processing control unit **941**, the noise processing unit **9232** executes readout stop processing and thereafter starts execution of noise reduction processing.
(70) Specifically, as illustrated in FIG. **6**, the noise processing unit **9232** reads out the normal image A, which is the captured image of the past frame, from the memory **9231** based on the synchronization signal generated by the synchronization generation unit **921**, and executes noise reduction processing based on the normal image A and a normal image B, which is a captured image of the current frame input from the pre-processing unit **922**. Furthermore, the noise processing unit **9232** reads out the normal image A from the memory **9231** based on the synchronization signal generated by the synchronization generation unit **921**, and writes a normal image A+B, which is a captured image that has undergone noise reduction processing.
(71) The present embodiment described above achieves the following effects.
(72) In the control device **9** according to the present embodiment, the noise processing unit **9232** executes the readout stop processing at a predetermined timing.
(73) Therefore, even when an indefinite value is stored in the memory **9231**, the indefinite value is rewritten to the captured image, which has been written as the current frame (normal image A illustrated in FIG. **5**) into the memory **9231**.
(74) By the way, in a case where the noise reduction processing is executed across the input captured image of the current frame and the data of the indefinite value stored in the memory **9231**, the following problem might occur.
(75) That is, the noise processing unit **9232** might determine that the correlation between the captured image of the current frame and the data of the indefinite value is high. In this case, the noise processing unit **9232** would increase the blending ratio of the captured image of the past frame by determining the data of the indefinite value as an appropriate captured image of the past frame, leading to a failure in reduction of the noise of the captured image of the current frame, and a failure in obtaining an image suitable for observation.
(76) In view of this, in the present embodiment, the noise processing unit **9232** executes noise reduction processing across the input captured image of the current frame (normal image B

illustrated in FIG. **5**) and the captured image of the past frame (normal image A illustrated in FIG. **5**) which is not the data of the indefinite value stored in the memory **9231**.
(77) Accordingly, with the control device **9** of the present embodiment, the noise reduction processing may be executed using the captured image of the appropriate past frame, leading to acquisition of an image suitable for observation.
(78) By the way, when the noise processing unit **9232** executes the readout stop processing in a case where the captured image input to the noise processing unit **9232** is an unstable image, the result on the memory **9231** would be such that indefinite value data is only rewritten into the captured image being an unstable image. That is, in a case where the noise reduction processing is executed across the input captured image of the current frame and the captured image which is the unstable image stored in the memory **9231**, there is a possibility of occurrence of a problem similar to the above-described problem occurring when the data of the indefinite value is stored in the memory **9231**.
(79) In this regard, the execution timing of the readout stop processing is a timing at which the captured image input to the noise processing unit **9232** is to be a stable image.
(80) Therefore, when the noise processing unit **9232** executes the readout stop processing, data of an indefinite value is rewritten into the captured image being a stable image in the memory **9231**. That is, the above-described problem may be effectively solved.
(81) Other Embodiments
(82) While the above is description of the modes for carrying out the present disclosure, the present disclosure should not be limited by only the embodiment described above.
(83) FIG. **7** is a diagram illustrating a modification of the embodiment. Specifically, FIG. **7** is a diagram corresponding to FIG. **4**.
(84) In the above embodiment, when having determined that the captured image input to the noise processing unit **9232** is not to be a stable image, as illustrated in FIG. **4**, the processing control unit **941** prohibits input of the captured image to the noise processing unit **9232**. However, the configuration is not limited to this. For example, when having determined that the captured image input to the noise processing unit **9232** is not to be a stable image, the processing control unit **941** may execute the control according to the present modification illustrated in FIG. **7**.
(85) Specifically, when having determined that the captured image input to the noise processing unit **9232** is not to be a stable image, the processing control unit **941** controls the synchronization generation unit **921** to prohibit the synchronization signal from being output from the synchronization generation unit **921** to the noise processing unit **9232**. With this configuration, as illustrated in FIG. **7**, the noise processing unit **9232** does not execute either writing of the captured image to the memory **9231** or reading of the captured image from the memory **9231**. In FIG. **7**, a state in which the output of the synchronization signal from the synchronization generation unit **921** to the noise processing unit **9232** is prohibited, and a state in which neither the writing of the captured image to the memory **9231** nor the reading of the captured image from the memory **9231** is to be executed is represented by using “x” marks.
(86) In the above-described embodiment, the function of the processing control unit **941** may be provided in the noise processing unit **9232**.
(87) In the above-described embodiment, the noise processing unit **9232** executes processing referred to as temporal noise reduction processing of reducing noise of the captured image of the current frame based on the captured image of the current frame and the captured image of the past frame. However, the configuration is not limited to this. For example, the noise processing unit **9232** may also execute processing referred to as spatial noise reduction processing, being processing of reducing noise of the captured image based on only the captured image of the current frame.
(88) In the above-described embodiments, the medical image processing device according to the present disclosure is mounted on the medical observation system **1** having the insertion unit **2**

formed with a rigid endoscope, but the configuration is not limited thereto. For example, the medical image processing device according to the present disclosure may be mounted on a medical observation system having the insertion unit **2** formed with a flexible endoscope. In addition, the medical image processing device according to the present disclosure may be mounted on a medical observation system such as a surgical microscope (refer to JP 2016-42981 A, for example) that enlarges and observes a predetermined field of view inside a living body or on a surface of a living body.

(89) The following configurations also belong to the technical scope of the present disclosure. (1) A medical image processing device including an image processing unit configured to perform image processing on a captured image obtained by capturing a subject image, the image processing unit including: a memory configured to store the captured image; and a noise processing unit configured to enable execution of writing of the captured image into the memory and readout of the captured image from the memory individually, and execute noise reduction processing of reducing noise of the captured image of the current frame based on the captured image of the current frame that has been input and the captured image of the past frame that has been read out from the memory, the noise processing unit being configured to execute readout stop processing of stopping readout of the past frame from the memory at a predetermined timing and writing the captured image of the current frame into the memory without executing the noise reduction processing. (2) The medical image processing device according to (1), wherein the predetermined timing is a timing at which the captured image input to the noise processing unit is to be a stable image. (3) The medical image processing device according to (2), further including a processing control unit configured to determine whether the captured image input to the noise processing unit is to be a stable image, execute the readout stop processing at a timing when it is determined that the captured image is to be a stable image, and start execution of the noise reduction processing after executing the readout stop processing. (4) The medical image processing device according to (3), wherein in a case where a link-up state is established between a medical observation device that captures a subject image and generates the captured image and the medical image processing device, the processing control unit is configured to determine that the captured image input to the noise processing unit is to be a stable image. (5) The medical image processing device according to (3), wherein a medical observation device that captures a subject image and generates the captured image is connected to the medical image processing device, and when identification information that is output from the medical observation device and uniquely identifies the medical observation device has been detected, the processing control unit is configured to determine that the captured image input to the noise processing unit is to be a stable image. (6) The medical image processing device according to (3), wherein when the processing control unit has determined that the captured image input to the noise processing unit is not to be a stable image, the processing control unit is configured to prohibit input of the captured image to the noise processing unit. (7) The medical image processing device according to (3), wherein, when the processing control unit has determined that the captured image input to the noise processing unit is not to be a stable image, the noise processing unit does not allow the processing control unit to execute writing of the captured image into the memory or readout of the captured image from the memory. (8) A medical observation system including: a medical observation device configured to capture a subject image to generate a captured image; and a medical image processing device including an image processing unit configured to perform image processing on the captured image, the image processing unit including: a memory configured to store the captured image; and a noise processing unit configured to enable execution of writing of the captured image into the memory and readout of the captured image from the memory individually, and execute noise reduction processing of reducing noise of the captured image of the current frame based on the captured image of the current frame that has been input and the captured image of the past frame that has been read out from the memory, wherein the noise processing unit is configured to execute readout stop processing of stopping readout of the

past frame from the memory at a predetermined timing and writing the captured image of the current frame into the memory without executing the noise reduction processing.
(90) According to the medical image processing device and the medical observation system, it is possible to obtain a captured image suitable for observation.
(91) Although the disclosure has been described with respect to specific embodiments for a complete and clear disclosure, the appended claims are not to be thus limited but are to be construed as embodying all modifications and alternative constructions that may occur to one skilled in the art that fairly fall within the basic teaching herein set forth.

Claims

1. A medical image processing device comprising an image processing unit configured to perform image processing on a captured image obtained by capturing a subject image, the image processing unit including: a memory configured to store the captured image; and a noise processing unit configured to enable execution of writing of the captured image into the memory and readout of the captured image from the memory individually, and execute noise reduction processing of reducing noise of the captured image of the current frame based on the captured image of the current frame that has been input and the captured image of the past frame that has been read out from the memory, the noise processing unit being configured to execute readout stop processing of stopping readout of the past frame from the memory at a predetermined timing and writing the captured image of the current frame into the memory without executing the noise reduction processing.
2. The medical image processing device according to claim 1, wherein the predetermined timing is a timing at which the captured image input to the noise processing unit is to be a stable image.
3. The medical image processing device according to claim 2, further comprising a processing control unit configured to determine whether the captured image input to the noise processing unit is to be a stable image, execute the readout stop processing at a timing when it is determined that the captured image is to be a stable image, and start execution of the noise reduction processing after executing the readout stop processing.
4. The medical image processing device according to claim 3, wherein in a case where a link-up state is established between a medical observation device that captures a subject image and generates the captured image and the medical image processing device, the processing control unit is configured to determine that the captured image input to the noise processing unit is to be a stable image.
5. The medical image processing device according to claim 3, wherein a medical observation device that captures a subject image and generates the captured image is connected to the medical image processing device, and when identification information that is output from the medical observation device and uniquely identifies the medical observation device has been detected, the processing control unit is configured to determine that the captured image input to the noise processing unit is to be a stable image.
6. The medical image processing device according to claim 3, wherein when the processing control unit has determined that the captured image input to the noise processing unit is not to be a stable image, the processing control unit is configured to prohibit input of the captured image to the noise processing unit.
7. The medical image processing device according to claim 3, wherein, when the processing control unit has determined that the captured image input to the noise processing unit is not to be a stable image, the noise processing unit does not allow the processing control unit to execute writing of the captured image into the memory or readout of the captured image from the memory.
8. A medical observation system comprising: a medical observation device configured to capture a subject image to generate a captured image; and a medical image processing device including an image processing unit configured to perform image processing on the captured image, the image

processing unit including: a memory configured to store the captured image; and a noise processing unit configured to enable execution of writing of the captured image into the memory and readout of the captured image from the memory individually, and execute noise reduction processing of reducing noise of the captured image of the current frame based on the captured image of the current frame that has been input and the captured image of the past frame that has been read out from the memory, wherein the noise processing unit is configured to execute readout stop processing of stopping readout of the past frame from the memory at a predetermined timing and writing the captured image of the current frame into the memory without executing the noise reduction processing.