United States Patent Application Publication 20250267358
Kind Code A1
Publication Date August 21, 2025
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IMAGING DEVICE, IMAGING METHOD, AND PROGRAM

Abstract

One embodiment according to the technology of the present disclosure provides an imaging device, an imaging method, and a program that allow a user to easily visually discriminate a difference between setting conditions by displaying video image data indicating the difference. An imaging device (**1**) is an imaging device **1** including a connection unit (**109**) that is connectable to an external device (**3**), and a processor (**107**). The processor (**107**) performs processing of generating first video image data from captured video image data on the basis of a first setting condition, processing of generating second video image data from the captured video image data on the basis of a second setting condition, processing of generating third video image data indicating a difference between the first setting condition and the second setting condition on the basis of the first video image data and the second video image data, and processing of outputting the third video image data to the external device (**3**) via the connection unit.

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Appl. No.: **19/197147**

Filed: **May 02, 2025**

Foreign Application Priority Data

JP	2020-112549	Jun. 30, 2020

Related U.S. Application Data

parent US continuation 18064572 20221212 parent-grant-document US 12316958 child US 19197147
parent WO continuation PCT/JP2021/024053 20210625 PENDING child US 18064572

Publication Classification

Int. Cl.: **H04N23/60** (20230101); **G06T5/50** (20060101); **G06V10/74** (20220101)

U.S. Cl.:

CPC **H04N23/64** (20230101); **G06T5/50** (20130101); **G06V10/761** (20220101); G06T2207/20221 (20130101)

Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS [0001] This application is a Continuation of copending application Ser. No. 18/064,572, filed on Dec. 12, 2022, which is a Continuation of PCT International Application No. PCT/JP2021/024053 filed on Jun. 25, 2021, claiming priority under 35 U.S.C § 119 (a) to Japanese Patent Application No. 2020-112549 filed on Jun. 30, 2020. Each of the above applications is hereby expressly incorporated by reference, in its entirety, into the present application.

BACKGROUND OF THE INVENTION
1. Field of the Invention
[0002] The present invention relates to an imaging device, an imaging method, and a program.
2. Description of the Related Art
[0003] In capturing a video image with an imaging device (for example, a digital camera), the imaging device and an external recorder may be connected to each other, and video image data may be recorded in a storage area of the external recorder. At that time, in general, a live view image captured by the imaging device is displayed on a display unit (monitor) of the external recorder.
[0004] JP2019-205062A discloses a technique of showing a relationship before and after conversion of image signals by displaying a relationship diagram. In the relationship diagram of JP2019-205062A, a relationship between scales of signals before and after the conversion of the image signals and a relationship between signal values before and after the conversion of the image signals are shown by a bar graph displayed on the left and right. A user can know the relationship before and after the conversion of the image signals from this relationship diagram.
SUMMARY OF THE INVENTION
[0005] One embodiment according to the technology of the present disclosure provides an imaging device, an imaging method, and a program that allow a user to easily visually discriminate a difference between setting conditions by displaying video image data indicating the difference.
[0006] According to an aspect of the present invention, there is provided an imaging device comprising: a connection unit that is connectable to an external device; and a processor, in which the processor performs processing of generating first video image data from captured video image data on the basis of a first setting condition, processing of generating second video image data from the captured video image data on the basis of a second setting condition, processing of generating third video image data indicating a difference between the first setting condition and the second setting condition on the basis of the first video image data and the second video image data, and processing of outputting the third video image data to the external device via the connection unit.
[0007] Preferably, the first setting condition is a condition set in the imaging device, and the second

setting condition is a condition set in the external device.
[0008] Preferably, the processor generates the third video image data by alternately arranging a frame constituting the first video image data and a frame constituting the second video image data.
[0009] Preferably, the processor generates the third video image data by alternately arranging a plurality of frames constituting the first video image data and a plurality of frames constituting the second video image data.
[0010] Preferably, the processor generates the third video image data by combining a frame constituting the first video image data and a frame constituting the second video image data.
[0011] Preferably, the processor generates the third video image data by combining the frame constituting the first video image data and the frame constituting the second video image data side by side.
[0012] Preferably, the processor generates the third video image data by superimposing and combining the frame constituting the first video image data and the frame constituting the second video image data.
[0013] Preferably, the processor generates the third video image data by combining a part of the frame constituting the first video image data and a part of the frame constituting the second video image data.
[0014] Preferably, a display unit that displays display data under control of the processor is further provided, and the processor compares the first setting condition with the second setting condition and displays a comparison result on the display unit.
[0015] Preferably, the processor compares the first setting condition with the second setting condition and displays the difference between the first setting condition and the second setting condition on the display unit as the comparison result.
[0016] Preferably, the processor outputs the first video image data instead of the third video image data in a case where a signal of a recording start instruction for the external device is received via the connection unit.
[0017] Preferably, the processor generates the third video image data after generating the first video image data and the second video image data.
[0018] Preferably, the processor alternately generates the first video image data and the second video image data in conformity with the third video image data.
[0019] Preferably, the connection unit is wirelessly connected to the external device.
[0020] According to another aspect of the present invention, there is provided an imaging method using an imaging device that includes a connection unit, which is connectable to an external device, and a processor, the imaging method comprising: causing the processor to execute: a step of generating first video image data from captured video image data on the basis of a first setting condition; a step of generating second video image data from the captured video image data on the basis of a second setting condition; a step of generating third video image data indicating a difference between the first setting condition and the second setting condition on the basis of the first video image data and the second video image data; and a step of outputting the third video image data to the external device via the connection unit.
[0021] According to still another aspect of the present invention, there is provided a program for performing an imaging method using an imaging device that includes a connection unit, which is connectable to an external device, and a processor, the program causing the processor to execute: a step of generating first video image data from captured video image data on the basis of a first setting condition; a step of generating second video image data from the captured video image data on the basis of a second setting condition; a step of generating third video image data indicating a difference between the first setting condition and the second setting condition on the basis of the first video image data and the second video image data; and a step of outputting the third video image data to the external device via the connection unit.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] FIG. **1** is a diagram conceptually showing an imaging device and an external recorder connected to the imaging device.

[0023] FIG. **2** is a block diagram showing main functions of the imaging device and of the external recorder.

[0024] FIG. **3** is a block diagram showing a processing function of video image data realized by a CPU.

[0025] FIG. **4** is a schematic diagram showing an example of third video image data.

[0026] FIG. **5** is a flowchart illustrating an imaging method.

[0027] FIG. **6** is a flowchart illustrating an imaging method.

[0028] FIG. **7** is a schematic diagram showing an example of the third video image data.

[0029] FIG. **8** is a schematic diagram showing an example of the third video image data.

[0030] FIG. **9** is a schematic diagram showing an example of the third video image data.

[0031] FIG. **10** is a flowchart illustrating an imaging method.

[0032] FIG. **11** is a diagram showing a comparison result displayed on a rear monitor of the imaging device.

[0033] FIG. **12** is a block diagram showing functions of the imaging device and of the external recorder.

[0034] FIG. **13** is a flowchart illustrating an imaging method.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0035] Hereinafter, preferred embodiments of an imaging device, an imaging method, and a program according to the embodiment of the present invention will be described with reference to accompanying drawings.

[0036] FIG. **1** is a diagram conceptually showing the imaging device and an external recorder connected to the imaging device.

[0037] An imaging device (digital camera) **1** is connected to an external recorder **3** through a High-Definition Multimedia Interface (HDMI (registered trademark)) cable **5**. The imaging device **1** captures a video (video image data) and a still image in response to a command from an operation unit, such as a shutter button. Further, in an imaging preparation state, a live view image, which is display data, is displayed on a rear monitor (not shown) provided on a rear surface of the imaging device **1** and/or on a viewfinder (not shown) of the imaging device **1**. The imaging device **1** has an HDMI output terminal, which is an example of a connection unit **109** (FIG. **2**), and is connected to the external recorder **3** via the HDMI cable **5**. The imaging device **1** outputs the captured video image data to the external recorder **3** via the HDMI cable **5**.

[0038] The external recorder **3** is an example of an external device that is connectable to the imaging device **1**. Another example of the external device includes an external monitor. The external recorder **3** has an HDMI input terminal, which is an example of a connection unit **203** (FIG. **2**), and is connected to the imaging device **1** through the HDMI cable **5**. The external recorder **3** acquires the video image data captured by the imaging device **1** via the HDMI cable **5** and records the acquired video image data in a recording unit **209**. Further, the external recorder **3** acquires the video image data captured by the imaging device **1** via the HDMI cable **5** and displays the acquired video image data on a display unit **207**. In this example, an example is described in which the imaging device **1** and the external recorder **3** are connected to each other through the HDMI cable **5**, but the present invention is not limited to this example. For example, the imaging device **1** and the external recorder **3** may be connected through a Universal Serial Bus (USB) cable, or may be wirelessly connected using, for example, Wi-Fi as described later.

[0039] Here, a type (standard) and a setting for processing video image data will be described.

There are many types and settings for processing video image data. For example, there is BT.709 or BT.2100 as recommended by International Telecommunication Union-Radiocommunication Sector (ITU-R), Log video or video RAW that is independently defined by each camera manufacturer, or the like. Therefore, in order to display the video image data captured by the imaging device **1** on the display unit (monitor) **207** of the external recorder **3** with the correct color and brightness, it is necessary to change the monitor image quality setting of the external recorder **3** according to the video image quality setting of the imaging device **1**. The “video image quality setting” and the “monitor image quality setting” are at least one of a color gamut, a gamma, a video range, a lookup table, or a brightness setting.

[0040] Meanwhile, the video image quality setting of the imaging device **1** and the monitor image quality setting of the external recorder **3** may not match with each other. For example, while the video image quality setting of the imaging device **1** is BT.2100, the monitor image quality setting of the external recorder **3** may be BT.709. In this case, there is a large difference in processing in the gamma and the color gamut between BT.2100 and BT.709. Therefore, the live view image displayed on the external recorder **3** that performs processing using BT.709 may become a picture having a darker exposure and a lower chroma saturation than the video image data of the imaging device **1** that performs processing using BT.2100. It is conceivable that the user may perform imaging by changing the video image quality setting of the imaging device **1** while viewing the live view image displayed on the display unit **207** of the external recorder **3**. Specifically, the user may perform imaging with a video image quality setting in which the chroma saturation is increased or the exposure is increased. In that case, in the imaging device **1** in which the video image data is generated by the setting of BT.2100, the video image data may have a too high chroma saturation or a too high exposure.

[0041] Therefore, the user needs to confirm whether or not the image quality setting of the display unit **207** of the external recorder **3** is correctly set with respect to the video image quality setting of the imaging device **1**. In that respect, in the present embodiment, it is possible to easily visually discriminate whether or not the monitor image quality setting of the display unit **207** of the external recorder **3** is correctly set with respect to the video image quality setting of the imaging device **1**.

[0042] FIG. **2** is a block diagram showing the main functions of the imaging device **1** and of the external recorder **3**.

[0043] The imaging device **1** mainly comprises a lens **103**, an imaging element **105**, a central processing unit (CPU) (processor) **107**, a display unit **113**, a memory **111**, and the connection unit **109**. Further, the external recorder **3** mainly comprises the connection unit **203**, a CPU **205**, the display unit **207**, and the recording unit **209**.

[0044] The lens **103** forms a subject image (optical image) on the imaging element **105**. Although not shown, the lens **103** has a control mechanism, such as a stop, and the imaging device **1** has, for example, a shutter for controlling the formation of the subject image on the imaging element **105**.

[0045] The imaging element **105** comprises a light-receiving surface in which a large number of light-receiving elements are arranged in a matrix form. Light corresponding to the subject image formed on the light-receiving surface of the imaging element **105** is received by each light-receiving element and is converted into an electrical signal. A color filter of red (R), green (G), or blue (B) is provided on the light-receiving surface of the imaging element **105**, and a color image of the subject can be acquired on the basis of a signal of each color. Various imaging elements, such as a complementary metal-oxide semiconductor (CMOS) and a charge-coupled device (CCD), can be used as the imaging element **105**. The imaging element **105** performs noise removal, amplification, and the like of an analog image signal via an internal analog front-end (AFE) (not shown), and converts the analog image signal into a digital image signal with a gradation width via an internal analog/digital converter (A/D converter) (not shown) provided in the same manner. Here, the AFE and the A/D converter may be externally connected. The video image data captured by the imaging device **1** is composed of data consisting of a plurality of frames, and each frame is

generated as the digital image signal as described above.
[0046] The CPU **107** performs image processing on the digital image signal (a signal composed of the frame constituting the video image data). The CPU **107** performs image processing, such as color signal separation, white balance adjustment, and gamma correction, on the digital image signal. The CPU **107** performs each image processing on the digital image signal according to the type and the setting of the video described above. The image processing performed by the CPU **107** will be described later.
[0047] In addition, the CPU **107** performs other general control for the imaging device **1**. The CPU **107** reads out necessary programs and information used to perform various types of control, from the memory **111**, to perform various types of processing and various types of control. The memory **111** is an internal memory of the imaging device **1**, and stores programs necessary for various types of imaging of the imaging device **1**. Further, the CPU **107** controls the display of the display unit **113**. Specific examples of the display unit **113** include a rear monitor and an electronic viewfinder of the imaging device **1**.
[0048] The connection unit **109** of the imaging device **1** and the connection unit **203** of the external recorder **3** are connected to each other by the HDMI cable **5**. The video image data is input from the imaging device **1** to the connection unit **203** of the external recorder **3**. The external recorder **3** records the input video image data in the recording unit **209**. Further, the CPU **205** displays the input video image data on the display unit **207**. Here, the connection unit is connected to the display unit **207** by way of the CPU **205**, but the display unit **207** may be connected to the connection unit **203**, and, for example, the CPU **205** may control the display unit. The CPU **205** performs general control including recording control of the external recorder **3** to the recording unit **209** described above. The CPU **205** reads out necessary programs and information used to perform various types of control, from a memory (not shown) of the external recorder **3**, to perform various types of processing and various types of control performed by the CPU **205**.
[0049] The hardware structures of the CPU **107** and the CPU **205** are various processors as described below. The various processors include, for example, a CPU which is a general-purpose processor that executes software (programs) to act as various functional units, a programmable logic device (PLD) which is a processor having a changeable circuit configuration after manufacture, such as a field programmable gate array (FPGA), and a dedicated electric circuit which is a processor having a dedicated circuit configuration designed to execute specific processing, such as an application specific integrated circuit (ASIC).
[0050] One functional unit may be composed of one of these various processors or may be composed of a combination of two or more processors of the same type or different types (for example, a plurality of FPGAs or a combination of the CPU and the FPGA). Alternatively, the plurality of functional units may be composed of one processor. A first example in which the plurality of functional units are composed of one processor is an aspect in which one or more CPUs and software are combined to constitute one processor and the processor acts as the plurality of functional units, as typified by a computer used for a client, a server, or the like. A second example is an aspect in which a processor that realizes the functions of the entire system including a plurality of functional units with one integrated circuit (IC) chip is used, as typified by system on chip (SoC) and the like. As described above, various functional units are composed of one or more of the various processors described above as the hardware structure.
[0051] FIG. **3** is a block diagram showing a processing function of the video image data realized by the CPU **107**.
[0052] The CPU **107** comprises a first video image data processing unit **121**, a second video image data processing unit **123**, and a third video image data processing unit **125**.
[0053] The first video image data processing unit **121** processes video image data (RAW) on the basis of the video image quality setting (first setting condition). Here, the video image data (RAW) is video image data that has not yet been subjected to image processing, and is data that has the

information of the subject image captured by the imaging element **105** as it is. The video image quality setting is a condition set in the imaging device **1**, and the first video image data processed with the video image quality setting is used for the video image data to be recorded or for the live view image. For example, the video image quality setting is hybrid log-gamma (HLG) or perceptual quantization (PQ) of BT.2100.

[0054] The second video image data processing unit **123** processes the video image data (RAW) on the basis of the monitor image quality setting (second setting condition). The monitor image quality setting is a condition set in the external recorder **3**, and the second video image data processed with the monitor image quality setting is displayed on the display unit **207** of the external recorder **3**. For example, in a case where the monitor image quality setting of the display unit **207** of the external recorder **3** is BT.709, the second video image data processing unit **123** processes the video image data (RAW) on the basis of BT.709.

[0055] The third video image data processing unit **125** generates third video image data indicating a difference between the video image quality setting and the monitor image quality setting, on the basis of the first video image data and the second video image data. The user can visually easily discriminate the difference between the video image quality setting and the monitor image quality setting by viewing the third video image data.

[0056] For example, in a case where the video image quality setting of the imaging device **1** and the monitor image quality setting of the display unit **207** of the external recorder **3** are different from each other, the first video image data and the second video image data have a different image quality therebetween. Therefore, the user can easily visually discriminate the different image quality by viewing the third video image data displayed on the display unit **207**. On the other hand, in a case where the video image quality setting of the imaging device **1** and the monitor image quality setting of the display unit **207** of the external recorder **3** match with each other, the first video image data and the second video image data have the same image quality. Therefore, the user can easily visually discriminate the same image quality by viewing the third video image data displayed on the display unit **207**.

[0057] FIG. **4** is a schematic diagram showing an example of the third video image data. Third video image data V**3**(**1**) is generated by alternately arranging a plurality of first frames VF**1** constituting first video image data V**1** and a plurality of second frames VF**2** constituting second video image data V**2** in chronological order. In the third video image data V**3**(**1**), the first frame VF**1** and the second frame VF**2** are arranged every 5 frames in chronological order. The first frame VF**1** is processed by the video image quality setting, and the second frame VF**2** is processed by the monitor image quality setting.

[0058] In a case where the video image quality setting and the monitor image quality setting are different from each other, the first frame VF**1** and the second frame VF**2** have a different image quality therebetween. In such a case, in a case where the third video image data V**3**(**1**) is displayed on the display unit **207**, the first frame VF**1** and the second frame VF**2** having a different image quality are repeatedly displayed at a predetermined interval. Therefore, since the image quality of the displayed third video image data V**3**(**1**) is repeatedly changed, the user can easily visually discriminate that the video image quality setting and the monitor image quality setting are different from each other. On the other hand, in a case where the video image quality setting and the monitor image quality setting are the same, the first frame VF**1** and the second frame VF**2** have the same image quality. Therefore, since the image quality of the third video image data V**3**(**1**) is stably displayed without being changed, the user can easily visually discriminate that the video image quality setting and the monitor image quality setting are the same.

[0059] In the third video image data V**3**(**1**), the plurality of first frames VF**1** and the plurality of second frames VF**2** are alternately arranged in chronological order as shown in FIG. **4**. For example, in the third video image data V**3**(**1**), the first video image data (the plurality of first frames VF**1**) and the second video image data (the plurality of second frames VF**2**) may be alternately arranged every second. Alternately, the third video image data V**3**(**1**) may be formed by alternately arranging the first frame VF**1** and the second frame VF**2** every single frame.

[0060] FIG. **5** is a flowchart illustrating an imaging method (and a program for executing the imaging method) using the imaging device **1** to which the external recorder **3** is connected.

[0061] First, the first video image data processing unit **121** of the imaging device **1** acquires a video image quality setting "MV_SET" of the imaging device **1** (step S**101**). Next, a monitor image quality setting "MON_SET" of the external recorder **3** is transmitted from the external recorder **3** (CPU **205**) to the imaging device **1** via the HDMI cable **5**, and the second video image data processing unit **123** of the imaging device **1** acquires the monitor image quality setting "MON_SET" (step S**102**).

[0062] Next, the CPU **107** acquires the video image data (RAW) from the imaging element **105** (step S**103**). Specifically, the frames constituting the video image data (RAW) are acquired in the order of frame numbers in chronological order. After that, the CPU **107** receives the signal of the recording start instruction and determines whether or not video recording is being performed (step S**104**). In a case where the CPU **107** determines that the video recording is being performed, the first video image data processing unit **121** of the imaging device **1** generates the first video image data corresponding to the "MV_SET" and transmits the first video image data to the external recorder **3** (step S**105**). On the other hand, in a case where the CPU **107** determines that the video recording is not being performed, the third video image data processing unit **125** determines whether or not the number calculated by the following expression is an even number (step S**111**).

Expression: Int (Frame/n)

[0063] Here, Int (α) in the expression means truncating a decimal fraction of the number a in parentheses, Frame means a frame number of the video image data (RAW), and n means a frame period of processing switching. The user can arbitrarily decide the frame period n of the processing switching.

[0064] In a case where the CPU **107** determines that the number calculated by the expression is an even number, the first video image data processing unit **121** generates the first video image data corresponding to the "MV_SET" and transmits the first video image data to the third video image data processing unit **125** (step S**112**). On the other hand, in a case where the CPU **107** determines that the number calculated by the expression is not an even number, the second video image data processing unit **123** generates the second video image data corresponding to the "MON_SET", and transmits the second video image data to the third video image data processing unit **125** (step S**113**). Then, the third video image data processing unit **125** generates the third video image data by using the generated first and second video image data, and transmits the third video image data to the external recorder **3** (step S**114**). As described above, in the present embodiment, the first video image data and the second video image data are generated by being switched therebetween according to the number of Frame (frame number)/n (frame period of processing switching), and then the third video image data is generated. As a result, it is possible to efficiently perform processing of generating the first video image data and processing of generating the second video image data with respect to the video image data (RAW).

[0065] After that, the CPU **107** determines whether or not the video image quality setting of the imaging device **1** has been updated (step S**106**). In a case where the video image quality setting of the imaging device **1** has been updated, the CPU **107** updates the "MV_SET" of the imaging device **1** (step S**107**).

[0066] Next, the CPU **107** determines whether or not the monitor image quality setting of the external recorder **3** has been updated (step S**108**). After that, the updated "MON_SET" is transmitted from the external recorder **3** to the imaging device **1** (step S**109**). After that, the CPU **107** determines whether or not the video mode has ended (step S**110**), and in a case where the video mode has not ended, the process returns to step S**103**, and the next frame of the video image data (RAW) is processed.

[0067] As described above, in the present embodiment, the third video image data processing unit **125** generates the third video image data in which the plurality of first frames VF**1** and the plurality of second frames VF**2** are alternately arranged. Then, the user can easily visually discriminate whether or not the video image quality setting and the monitor image quality setting are correctly set by viewing the third video image data displayed on the display unit **207** of the external recorder **3**.

[0068] Each of the above-mentioned configurations and functions can be appropriately realized by using any hardware, software, or a combination of both. Further, the CPU **107** may perform the video image data processing instead of each video image data processing unit. For example, the present invention can also be applied to a program causing a computer to execute the above-mentioned processing steps (processing procedures), a computer-readable recording medium (non-transitory recording medium) on which such a program is recorded, or a computer on which such a program can be installed.

Modification Example of First Embodiment

[0069] Next, a modification example of the first embodiment will be described. In the first embodiment, the first video image data or the second video image data is generated in conformity with the frame numbers of the frames constituting the video image data (RAW) (see steps S**111** to S**113** of FIG. **5**). In this example, the first video image data and the second video image data are generated together for the frames constituting the video image data (RAW).

[0070] FIG. **6** is a flowchart illustrating an imaging method (and a program for executing the imaging method) using the imaging device **1** to which the external recorder **3** is connected.

[0071] First, the first video image data processing unit **121** of the imaging device **1** acquires the video image quality setting “MV_SET” of the imaging device **1** (step S**201**). Next, the monitor image quality setting “MON_SET” of the external recorder **3** is transmitted from the external recorder **3** (CPU **205**) to the imaging device **1** via the HDMI cable **5**, and the second video image data processing unit **123** of the imaging device **1** acquires the monitor image quality setting “MON_SET” (step S**202**).

[0072] Next, the CPU **107** acquires the video image data (RAW) from the imaging element **105** (step S**203**). After that, the first video image data processing unit **121** generates the first video image data of the “MV_SET” (step S**204**). In addition, the second video image data processing unit **123** generates the second video image data of the “MON_SET” (step S**205**).

[0073] After that, the CPU **107** receives the signal of the recording start instruction and determines whether or not video recording is being performed (step S**206**). In a case where the CPU **107** determines that the video recording is being performed, the first video image data processing unit **121** generates the first video image data corresponding to the “MV_SET” and transmits the first video image data to the external recorder **3** (step S**207**). On the other hand, in a case where the CPU **107** determines that the video recording is not being performed, the third video image data processing unit **125** determines whether or not the number calculated by the above-mentioned expression (see step S**111** of FIG. **5**) is an even number (step S**213**).

[0074] Then, in a case where the CPU **107** determines that the number calculated by the expression is an even number, the first video image data processing unit **121** of the imaging device **1** transmits the first video image data corresponding to the “MV_SET” to the third video image data processing unit **125** (step S**214**). On the other hand, in a case where the CPU **107** determines that the number calculated by the expression is not an even number, the second video image data processing unit **123** of the imaging device **1** transmits the second video image data corresponding to the “MON_SET” to the third video image data processing unit **125** (step S**215**). After that, the third video image data processing unit **125** generates the third video image data by using the generated first and second video image data, and transmits the third video image data to the external recorder **3** (step S**216**). As described above, in this example, the first video image data and the second video image data are generated together for the frames constituting the video image data (RAW). As a result, the first video image data and the second video image data are provided for all the frames constituting the video image data (RAW).

[0075] Since subsequent steps S**208** to S**212** correspond to steps S**106** to S**110** illustrated in FIG. **5**, the description thereof will be omitted.

[0076] As described above, in this example, the third video image data processing unit **125** also generates the third video image data in which the plurality of first frames VF**1** constituting the first video image data V**1** and the plurality of second frames VF**2** constituting the second video image data V**2** are alternately arranged. Since the third video image data is displayed on the display unit **207** of the external recorder **3**, the user can easily visually discriminate whether or not the video image quality setting of the imaging device **1** and the monitor image quality setting of the display unit **207** of the external recorder **3** are correctly set.

Second Embodiment

[0077] Next, a second embodiment will be described. In the second embodiment, the third video image data (third frame VF**3**) is generated by combining the first frame VF**1** and the second frame VF**2**. That is, in the present embodiment, the third video image data indicating the difference between the video image quality setting and the monitor image quality setting is generated by combining the first frame and the second frame.

[0078] A specific example of the third video image data of the present embodiment will be described with reference to FIGS. **7** to **9**.

[0079] FIG. **7** is a schematic diagram showing an example of the third video image data of the present embodiment. A third frame VF**3**(**2**) constituting the third video image data shown in FIG. **7** is obtained by combining the first frame VF**1** constituting the first video image data and the second frame VF**2** constituting the second video image data side by side. Specifically, the third frame VF**3**(**2**) is formed by disposing the first frame VF**1** on a left side and the second frame VF**2** on a right side side by side when facing the third frame VF**3**(**2**) to combine the first frame VF**1** and the second frame VF**2**. In this way, the first frame VF**1** and the second frame VF**2** are arranged, so that the user can easily visually discriminate the difference between the video image quality setting and the monitor image quality setting.

[0080] FIG. **8** is a schematic diagram showing an example of the third video image data of the present embodiment. A third frame VF**3**(**3**) constituting the third video image data shown in FIG. **8** is obtained by superimposing and combining the first frame VF**1** constituting the first video image data and the second frame VF**2** constituting the second video image data. Specifically, as shown in FIG. **8**, the third frame VF**3**(**3**) is formed by superimposing and displaying the second frame VF**2** on a part of a region of the first frame VF**1**. In this way, the second frame VF**2** is superimposed and displayed on a part of the region of the first frame VF**1**, so that the user can easily visually discriminate the difference between the video image quality setting and the monitor image quality setting.

[0081] FIG. **9** is a schematic diagram showing an example of the third video image data of the present embodiment. A third frame VF**3**(**4**) constituting the third video image data shown in FIG. **9** is obtained by combining a part of the first frame VF**1** constituting the first video image data and a part of the second frame VF**2** constituting the second video image data. Specifically, the third frame VF**3**(**4**) is formed by combining an image of a left half of the first frame VF**1** and an image of a right half of the second frame VF**2** side by side when facing the third frame VF**3**(**4**). In this way, the image of the left half of the first frame VF**1** and the image of the right half of the second frame VF**2** are combined, so that the user can easily visually discriminate the difference between the video image quality setting and the monitor image quality setting.

[0082] FIG. **10** is a flowchart illustrating an imaging method (and a program for executing the imaging method) according to the present embodiment.

[0083] First, the first video image data processing unit **121** of the imaging device **1** acquires the video image quality setting “MV_SET” of the imaging device **1** (step S**301**). Next, the monitor image quality setting "MON_SET" of the external recorder **3** is transmitted from the external recorder **3** (CPU **205**) to the imaging device **1** via the HDMI cable **5**, and the second video image data processing unit **123** of the imaging device **1** acquires the monitor image quality setting "MON_SET" (step S**302**).

[0084] Next, the CPU **107** acquires the video image data (RAW) from the imaging element **105** (step S**303**). Then, the first video image data processing unit **121** generates the first video image data corresponding to the "MV_SET" (step S**304**). In addition, the second video image data processing unit **123** generates the second video image data corresponding to the "MON_SET" (step S**305**).

[0085] After that, the CPU **107** receives the signal of the recording start instruction and determines whether or not video recording is being performed (step S**306**). In a case where the CPU **107** determines that the video recording is being performed, the first video image data processing unit **121** transmits the first video image data to the external recorder **3** (step S**307**). On the other hand, in a case where the CPU **107** determines that the video recording is not being performed, the third video image data processing unit **125** generates the third video image data in which the first video image data and the second video image data are combined (step S**313**). After that, the third video image data is transmitted from the imaging device **1** to the external recorder **3** (step S**314**).

[0086] Since subsequent steps S**308** to S**312** correspond to steps S**106** to S**110** illustrated in FIG. **5**, the description thereof will be omitted.

[0087] As described above, in the present embodiment, the third video image data processing unit **125** generates the third video image data in which the first frame VF**1** and the second frame VF**2** are combined. Then, the user checks the third video image data displayed on the display unit **207** of the external recorder **3**, so that the user can easily visually discriminate whether or not the video image quality setting of the imaging device **1** and the monitor image quality setting of the display unit **207** of the external recorder **3** are correctly set.

Another Example 1

[0088] Next, another example 1 will be described.

[0089] In another example 1, the CPU **107** displays a comparison result between the video image quality setting and the monitor image quality setting on the display unit (the rear monitor or the electronic viewfinder) **113** of the imaging device **1**.

[0090] FIG. **11** is a diagram showing the comparison result displayed on the rear monitor of the imaging device **1**. The CPU **107** displays a comparison result **7** between the video image quality setting and the monitor image quality setting on the rear monitor. In the case shown in FIG. **11**, the video mode is "BT.2100", and the video range is "Limited", in the video image quality setting of the imaging device **1**. Further, the video mode is "BT.709", and the video range is "Limited", in the monitor image quality setting of the external recorder **3**. Further, "match" (or "OK") is displayed in a case where the video image quality setting of the imaging device **1** and the monitor image quality setting of the external recorder **3** match with each other, and "no match" (or "NG") is displayed in a case where the video image quality setting of the imaging device **1** and the monitor image quality setting of the external recorder **3** do not match with each other. In this way, whether or not the setting conditions match with each other, that is, the difference between the setting conditions, is shown, so that the user can easily discriminate which setting of the external recorder **3** should be changed to match with the video image quality setting of the imaging device **1**.

Another Example 2

[0091] Next, another example 2 will be described.

[0092] In another example 2, the imaging device **1** and the external recorder **3** are wirelessly connected to each other.

[0093] FIG. **12** is a block diagram showing the functions of the imaging device **1** and of the external recorder **3** of this example. The parts already illustrated in FIG. **2** are designated by the same reference numerals, and the description thereof will be omitted.

[0094] The imaging device **1** and the external recorder **3** are wirelessly connected to each other. Specifically, in the imaging device **1**, the connection unit **109** has a communication unit (antenna) **110**A and is wirelessly connected to a communication unit (antenna) **110**B to transmit the captured video image data to the external recorder **3**. Specific examples of the wireless connection include connection through Wi-Fi, ultra-wideband (UWB), wireless HDMI, and a wireless serial digital interface (SDI).

Another Example 3

[0095] Next, another example 3 will be described.

[0096] In another example 3, control is performed on the imaging device **1** side such that a live view image that enables checking of the exposure and the color is obtained even in a case where the monitor image quality setting of the external recorder **3** and the video image quality setting of the imaging device **1** are different from each other. For example, this example is effective in a case where the monitor image quality setting of the external recorder **3** that matches with the video image quality setting of the imaging device **1** does not exist.

[0097] FIG. **13** is a flowchart illustrating the imaging method of this example (and a program for executing the imaging method).

[0098] First, the first video image data processing unit **121** of the imaging device **1** acquires the video image quality setting “MV_SET” of the imaging device **1** (step S**401**). After that, the monitor image quality setting “MON_SET” of the external recorder **3** is transmitted from the external recorder **3** to the imaging device **1**, and the second video image data processing unit **123** of the imaging device **1** acquires the monitor image quality setting “MON_SET” (step S**402**).

[0099] After that, the imaging device **1** acquires the video image data (RAW) from the imaging element **105** (step S**403**). After that, the first video image data processing unit **121** generates the first video image data through first image processing corresponding to the “MV_SET” (step S**404**). Next, the second video image data processing unit **123** generates the second video image data through second image processing corresponding to the “MON_SET” (step S**405**). Next, the first video image data is transmitted from the imaging device **1** to the external recorder **3** (step S**406**). After that, the second video image data is transmitted from the imaging device **1** to the external recorder **3** (step S**407**).

[0100] After that, the CPU **107** determines whether or not video recording is being performed (step S**408**). In a case where the CPU **107** determines that the video recording is being performed, the external recorder **3** records the first video image data (step S**409**). On the other hand, in a case where the CPU **107** determines that the video recording is not being performed, the external recorder **3** displays the second video image data on the display unit (monitor) **207** (step S**410**).

[0101] Since subsequent steps S**411** to S**415** correspond to steps S**106** to S**110** illustrated in FIG. **5**, the description thereof will be omitted.

[0102] As described above, the imaging device **1** generates the first video image data of the video image quality setting and the second video image data of the monitor image quality setting and transmits the first and second video image data to the external recorder **3**. The external recorder **3** records the first video image data in a case of performing video recording, and displays the second video image data on the display unit (monitor) **207**. As a result, the live view image that enables checking of the exposure and the color can be displayed on the display unit **207** even in a case where the monitor image quality setting of the external recorder **3** that matches with the video image quality setting of the imaging device **1** does not exist.

[0103] Although the examples of the present invention have been described above, the present invention is not limited to the above-mentioned embodiments, and it goes without saying that various modifications can be made without departing from the gist of the present invention.

EXPLANATION OF REFERENCES

[0104] **1**: imaging device [0105] **3**: external recorder [0106] **5**: HDMI cable [0107] **103**: lens [0108] **105**: imaging element [0109] **107**: CPU [0110] **109**: connection unit [0111] **111**: memory

[0112] **113**: display unit [0113] **121**: first video image data processing unit [0114] **123**: second video image data processing unit [0115] **125**: third video image data processing unit [0116] **203**: connection unit [0117] **205**: CPU [0118] **207**: display unit [0119] **209**: recording unit

Claims

1. An imaging device comprising a processor configured to: receive a first setting condition of a video image quality setting for captured video image data; receive a second setting condition of a monitor image quality setting for the captured video image data; and output information indicating a difference between the first setting condition and the second setting condition.
2. The imaging device according to claim 1, wherein the processor is configured to: generate first video image data on the basis of the first setting condition; and generate second video image data on the basis of the second setting condition.
3. The imaging device according to claim 2, wherein the processor is configured to: generate third video image data by alternately arranging a frame constituting the first video image data and a frame constituting the second video image data; and output the third video image data as the information indicating the difference between the first setting condition and the second setting condition.
4. The imaging device according to claim 2, wherein the processor is configured to: generate third video image data by alternately arranging a plurality of frames constituting the first video image data and a plurality of frames constituting the second video image data; and output the third video image data as the information indicating the difference between the first setting condition and the second setting condition.
5. The imaging device according to claim 2, wherein the processor is configured to: generate third video image data by combining a frame constituting the first video image data and a frame constituting the second video image data; and output the third video image data as the information indicating the difference between the first setting condition and the second setting condition.
6. The imaging device according to claim 5, wherein the processor is configured to generate the third video image data by combining the frame constituting the first video image data and the frame constituting the second video image data side by side.
7. The imaging device according to claim 5, wherein the processor is configured to generate the third video image data by superimposing and combining the frame constituting the first video image data and the frame constituting the second video image data.
8. The imaging device according to claim 5, wherein the processor is configured to generate the third video image data by combining a part of the frame constituting the first video image data and a part of the frame constituting the second video image data.
9. The imaging device according to claim 1, further comprising a connection unit connectable to an external device, wherein the processor is configured to receive the second setting condition through the connection unit.
10. The imaging device according to claim 2, further comprising a connection unit connectable to an external device, wherein the processor is configured to receive the second setting condition through the connection unit.
11. The imaging device according to claim 3, further comprising a connection unit connectable to an external device, wherein the processor is configured to receive the second setting condition through the connection unit.
12. The imaging device according to claim 4, further comprising a connection unit connectable to an external device, wherein the processor is configured to receive the second setting condition through the connection unit.
13. The imaging device according to claim 5, further comprising a connection unit connectable to an external device, wherein the processor is configured to receive the second setting condition

through the connection unit.

14. The imaging device according to claim 6, further comprising a connection unit connectable to an external device, wherein the processor is configured to receive the second setting condition through the connection unit.

15. The imaging device according to claim 7, further comprising a connection unit connectable to an external device, wherein the processor is configured to receive the second setting condition through the connection unit.

16. The imaging device according to claim 8, further comprising a connection unit connectable to an external device, wherein the processor is configured to receive the second setting condition through the connection unit.