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Image pickup apparatus capable of, when manual focus operation is performed during photographing, performing photographing with subject desired by user in focus while maintaining entire video image in composition intended by user, control method for image pickup apparatus, and storage medium

Abstract

An image pickup apparatus capable of, when a manual focus operation is performed during photographing, performing photographing with a subject desired by a user in focus is provided. The image pickup apparatus includes a display unit to display a video image being photographed on a screen, a rendering unit to render information on a focus of an image pickup lens on the screen, a first obtaining unit to obtain a current focus position, a second obtaining unit to obtain a moving direction of the current focus position, a registration unit to register a focus position, a first highlighting unit to, in a case that a first condition is satisfied, render first information and perform a first highlighted display of the screen, and a second highlighting unit to, in a case that a second condition is satisfied, render second information and perform a second highlighted display of the screen.

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Background/Summary

BACKGROUND OF THE INVENTION

Field of the Invention

(1) The present invention relates to an image pickup apparatus, a control method for the image pickup apparatus, and a storage medium, and more particularly relates to an image pickup apparatus that assists a manual focus operation, a control method for the image pickup apparatus, and a storage medium.

Description of the Related Art

(2) Conventionally, when producing a video image work, a photographing method has been known

in which photographing is performed while focusing on a subject by a manual operation.
(3) When performing this photographing method, a camera may be provided with a function that assists a manual focus operation so as to ensure that a subject desired by a user is in focus. For example, as this function, there is a technique in which a focus position where the subject desired by the user is in focus during test photographing is registered in the camera, and the camera notifies the user when the current focus position becomes the registered focus position during actual photographing.
(4) In Japanese Laid-Open Patent Publication (kokai) No. 2004-287180, furthermore, when a difference between the focus position registered during the test photographing and the focus position during the actual photographing becomes less than or equal to a certain threshold value, the camera notifies the user in advance (the camera performs (gives) an advance notification to the user).
(5) However, in Japanese Laid-Open Patent Publication (kokai) No. 2004-287180, when performing the actual photographing, a memory plate, on which a location (mark) of the focus position registered during the test photographing is marked, is displayed on a viewfinder or the like, and the above-mentioned advance notification is performed by switching the mark on the memory plate from a lit display to a blinking display. Therefore, the user cannot confirm whether or not the advance notification has been given unless he or she looks at the memory plate during the actual photographing. That is, in Japanese Laid-Open Patent Publication (kokai) No. 2004-287180, when the user is watching the entire video image displayed on the viewfinder or the like during the actual photographing, there is a possibility that the current focus position will pass through the registered focus position without noticing the above-mentioned advance notification. On the other hand, when the user watches the memory plate during the actual photographing, there is an issue that the entire video image cannot be maintained in a composition intended by the user.

SUMMARY OF THE INVENTION

(6) The present invention provides an image pickup apparatus capable of, when a manual focus operation is performed during photographing, performing photographing with a subject desired by a user in focus while maintaining an entire video image in a composition intended by the user, a control method for the image pickup apparatus, and a storage medium.
(7) Accordingly, the present invention provides an image pickup apparatus that assists a manual focus operation during photographing of a video image by using an image pickup lens with a focus mechanism, the image pickup apparatus comprising a display unit configured to display the video image being photographed on a screen, a rendering unit configured to render information on a focus of the image pickup lens on the screen, a first obtaining unit configured to obtain a current focus position of the image pickup lens during the photographing, a second obtaining unit configured to obtain a moving direction of the current focus position, a registration unit configured to register a focus position of the image pickup lens, a first highlighting unit configured to, in a case that a first condition that a difference between the current focus position and the registered focus position is less than or equal to a first threshold value is satisfied, render first information as the information on the focus of the image pickup lens and perform a first highlighted display of the screen, and a second highlighting unit configured to, in a case that a second condition that the difference between the current focus position and the registered focus position is less than or equal to a second threshold value smaller than the first threshold value is satisfied, render second information as the information on the focus of the image pickup lens and perform a second highlighted display of the screen. The first highlighting unit performs the first highlighted display of the screen based on the moving direction of the current focus position obtained by the second obtaining unit and the focus position registered by the registration unit.
(8) According to the present invention, it is possible for the user to perform the photographing with the subject desired by the user in focus without taking his or her eyes off the entire video image displayed during the photographing.

(9) Further features of the present invention will become apparent from the following description of exemplary embodiments with reference to the attached drawings.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

(1) FIG. **1** is a block diagram that shows a hardware configuration of a video camera as an image pickup apparatus according to an embodiment of the present invention.

(2) FIG. **2**A is a flowchart that shows an example of a focus position guide processing executed in the video camera.

(3) FIG. **2**B is a flowchart that shows details of a registered focus position rendering processing performed in a step S**2108** of FIG. **2**A.

(4) FIG. **2**C is a flowchart that shows details of a highlighted display rendering processing performed in a step S**2111** of FIG. **2**A.

(5) FIGS. **3**A, **3**B, **3**C, **3**D, **3**E, and **3**F are diagrams that show screen examples of the video camera.

DESCRIPTION OF THE EMBODIMENTS

(6) The present invention will now be described in detail below with reference to the accompanying drawings showing embodiments thereof.

(7) Hereinafter, a preferred embodiment of the present invention will be described with reference to the drawings. In the present embodiment, an example, in which an image pickup apparatus according to the present invention is a video camera **100**, will be described.

(8) FIG. **1** is a block diagram that shows a hardware configuration of the video camera **100**.

(9) The video camera **100** includes a lens **101**, a CMOS **102**, a camera signal processing unit **103**, a recording medium **104**, a power source **105**, an operation unit **106**, a lens communication unit **107**, an input interface (an input I/F) **108**, a read only memory (a ROM) **109**, a random access memory (a RAM) **110**, and a compressor/decompressor (a CODEC) **111**. Furthermore, the video camera **100** includes an on-screen display rendering unit (an OSD rendering unit) **112**, an output I/F **116**, a liquid crystal display panel (an LCD panel) **113**, an electronic view finder (an EVF) **114**, an external output terminal **115**, a central processing unit (a CPU) **117**, and a communication unit **118**. Respective components are controlled by programs running on the CPU **117**, and perform data input/output between them via a data bus **119**.

(10) The lens **101** (an image pickup lens) is an optical system having a focus mechanism, an aperture mechanism, etc., and forms an optical image of a subject. The CMOS **102** is a complementary metal-oxide-semiconductor (CMOS) solid-state image pickup device, includes an A/D converter (not shown), converts the optical image inputted from the lens **101** into analog electrical signals, and then converts them into digital signals. It should be noted that the image pickup device of the video camera **100** is not limited to the CMOS **102**, and may be another image pickup device such as a charge coupled device (CCD) solid-state image pickup device. The digital signals outputted from the CMOS **102** are subjected to signal processing such as resizing processing such as predetermined pixel interpolation and reduction, color conversion, and various correction processing by the camera signal processing unit **103**. Further, the digital signals subjected to the signal processing by the camera signal processing unit **103** are compressed and encoded at a predetermined bit rate and in a predetermined format by the CODEC **111**, which will be described below, to become video image compression encoded data (hereinafter, simply referred to as “a video image”). The CODEC **111** also performs decoding of this video image. The recording medium **104** records the video image outputted from the CODEC **111** and metadata accompanying the video image.

(11) The power source **105** is an AC power source or a battery, and supplies necessary power to the

respective components of the video camera **100**. The operation unit **106** includes a switch that performs ON/OFF control of the power source **105** of the video camera **100**. In addition, the operation unit **106** includes a menu display button and a cross key, or includes a pointing device such as a touch panel. Operation information accepted by the operation unit **106** is inputted into the CPU **117** via the input I/F **108** and the data bus **119**. The lens communication unit **107** communicates with the lens **101** regarding attachment information of the lens **101** to the video camera **100** and information such as a focus position and an angle of view. The ROM **109** stores a program for controlling the video camera **100**, and the CPU **117** controls the respective components based on this program. The RAM **110** is a memory that functions as a work area for the CPU **117**, and stores information on a focus position guide function, which will be described below, and focus positions registered in advance in test photographing. The CODEC **111** reproduces the video image and audio that are recorded in the RAM **110** and the recording medium **104**. The reproduced video image is displayed on at least one output destination (display unit) of the LCD panel **113**, the EVF **114**, and a monitor (not shown) connected to the external output terminal **115**. The OSD rendering unit **112** (a rendering unit) renders an on-screen display (an OSD) such as character strings and icons that represent the status and settings of the video camera **100**, information on the focus of the lens **101** such as various kinds of frames and markers, and menus for various kinds of settings to a video random access memory (a VRAM) on the RAM **110**. Resource data such as characters and icons that constitute the OSD is stored in the ROM **109**, and when the CPU **117** generates the OSD by using the resource data, the OSD rendering unit **112** renders the OSD to the VRAM.

(12) The output I/F **116** generates display signals based on the video image generated by the processing of the CMOS **102** and the camera signal processing unit **103** and display data such as the OSD generated by the CPU **117**. In order to display the display signals on the LCD panel **113**, the EVF **114**, and the external output terminal **115**, the output I/F **116** outputs the display signals to the LCD panel **113**, the EVF **114**, and the external output terminal **115**. The external output terminal **115** is a terminal that satisfies serial digital interface (SDI) standard or high-definition multimedia interface (HDMI) standard (registered trademark) and outputs the video image generated by the processing of the CMOS **102** and the camera signal processing unit **103** to an external device. The output I/F **116** includes a mixer circuit (not shown) and outputs the video image and the OSD in a superimposed manner. Furthermore, it is possible to output signals resized according to each output. It is also possible to display the OSD with the same content in each output, or it is also possible to display different contents in each output by using a method described below. The CPU **117** executes the program loaded from the ROM **109** to the RAM **110**. The communication unit **118** transmits and receives video image signals, audio signals, and other various kinds of information to and from external devices connected via wireless or wired cables.

(13) FIG. **2**A is a flowchart that shows an example of a focus position guide processing executed in the video camera **100**. The focus position guide processing is realized by the CPU **117** operating based on a program stored in the ROM **109** or the recording medium **104**, or a program obtained via the communication unit **118**, and controlling the respective components of the video camera **100**. In addition, the focus position guide processing starts during actual photographing in which the video image being photographed is displayed on the at least one output destination in the video camera **100**. Hereinafter, the focus position guide processing shown in the flowchart of FIG. **2**A will be described by using screen examples of the video camera **100** shown in FIGS. **3**A, **3**B, **3**C, **3**D, **3**E, and **3**F.

(14) First, in a step S**2101**, the CPU **117** determines whether or not a lens compatible with the focus position guide function (hereinafter, simply referred to as “a compatible lens”) has been attached based on information obtained from the lens communication unit **107**. In the case that the compatible lens has been attached (YES in the step S**2101**), the focus position guide processing proceeds to a step S**2102**. On the other hand, in the case that the compatible lens has not been attached (NO in the step S**2101**), the focus position guide processing proceeds to a step S**2112**. It

should be noted that the focus position guide function is a function that guides a user to the focus position in order to assist a manual focus operation during photographing of the video image in the actual photographing.

(15) In the step S**2102**, the CPU **117** determines whether or not the focus position guide function is turned on (the focus position guide function is ON) based on the information on the focus position guide function stored in the RAM **110**. In the case that the focus position guide function is turned on (YES in the step S**2102**), the focus position guide processing proceeds to a step S**2103**. On the other hand, in the case that the focus position guide function is not turned on (NO in the step S**2102**), the focus position guide processing proceeds to the step S**2112**.

(16) In the step S**2103**, the CPU **117** renders a meter **301** for the focus position guide by using the OSD rendering unit **112**.

(17) In a step S**2104**, the CPU **117** (a first obtaining unit) obtains information on the current focus position by the manual focus operation from the lens communication unit **107**. In a step S**2105**, the CPU **117** renders the current focus position by using the OSD rendering unit **112** based on the information on the current focus position obtained in the step S**2104**. Specifically, the current focus position is rendered as a region for issuing an in-focus notification (an in-focus notification region **302** shown in FIG. **3**A) with a width corresponding to a second threshold value in a far direction and a near direction of the current focus position. In addition, at this time, a region for issuing an advance notification (an advance notification region **303** shown in FIG. **3**A) is also rendered with a width corresponding to a first threshold value (>the second threshold value) in the far direction and the near direction of the current focus position.

(18) Thereafter, the CPU **117** outputs the OSD rendered in the steps S**2103** and S**2104** to the at least one output destination via the output I/F **116**, and displays the OSD rendered in the steps S**2103** and S**2104**.

(19) FIG. **3**A is a diagram that shows a screen **300***a* displayed on the video camera **100** when a highlighted display (highlighting), which will be described below, is not performed.

(20) In FIG. **3**A, on the screen **300***a*, in addition to the above-described in-focus notification region **302** and the above-described advance notification region **303**, the meter **301** and a marker **304** are displayed so as to be superimposed on the video image during the actual photographing (are superimposed and displayed on the video image during the actual photographing).

(21) The meter **301** is a meter for displaying the current focus position where the actual photographing is being performed. The marker **304** indicates a focus position when focusing on a subject desired by the user by means of the test photographing, and is registered as the focus position used in the focus position guide function by the CPU **117** (a registration unit) in response to a user operation in the test photographing. Information on the marker **304** is held in the RAM **110** as a part of focus registration information, which will be described below. In addition, in the case that there is a plurality of focus positions registered by means of the test photographing, the markers **304** corresponding to the respective focus positions are displayed in different colors, respectively, so as to be superimposed on the video image on the screen **300***a*.

(22) In a step S**2106**, the CPU **117** determines whether or not the registered focus position has been set in advance in the test photographing. In the case that the registered focus position has been set in advance in the test photographing (YES in the step S**2106**), the focus position guide processing proceeds to a step S**2107**. On the other hand, in the case that the registered focus position has not been set in advance in the test photographing (NO in the step S**2106**), the focus position guide processing proceeds to the step S**2112**.

(23) In the step S**2107**, the CPU **117** obtains the number of the registered focus positions. In a step S**2108**, the CPU **117** performs a registered focus position rendering processing, which will be described below with reference to FIG. **2**B. In a step S**2109**, the CPU **117** obtains the information on the current focus position again from the lens communication unit **107**. In a step S**2110**, the CPU **117** renders the OSD indicating the current focus position (specifically, the in-focus

notification region **302** and the advance notification region **303**) by using the OSD rendering unit **112** based on the information on the current focus position obtained in the step S**2109**. Thereafter, the CPU **117** outputs the OSD rendered to the at least one output destination via the output I/F **116**, and displays the OSD rendered. As a result, for example, in the case that the in-focus notification region **302** does not match any one of the plurality of the registered focus positions, the screen shown in FIG. **3**A is displayed on the at least one output destination.

(24) In a step S**2111**, the CPU **117** performs a highlighted display rendering processing (a highlight rendering processing), which will be described below with reference to FIG. **2**C. In the step S**2112**, the CPU **117** determines whether or not the focus position guide function is turned off (the focus position guide function is OFF) based on the information on the focus position guide function stored in the RAM **110**. In the case that the focus position guide function is turned off (YES in the step S**2112**), the focus position guide processing proceeds to a step S**2113**. On the other hand, in the case that the focus position guide function is not turned off (NO in the step S**2112**), the focus position guide processing returns to the step S**2101**. In the step S**2113**, the CPU **117** ends displaying the focus position guide (ends the focus position guide display) and ends the focus position guide processing.

(25) FIG. **2**B is a flowchart that shows details of the registered focus position rendering processing performed in the step S**2108** of FIG. **2**A.

(26) First, in a step S**2201**, the CPU **117** prepares a variable I and defines I=1. In a step S**2202**, the CPU **117** obtains the I-th focus registration information. Here, the focus registration information includes color information of the registered focus position, sensitivity information of the registered focus position, and position information of the registered focus position.

(27) In a step S**2203**, the CPU **117** renders the marker **304** (see FIG. **3**A) indicating the I-th registered focus position by using the OSD rendering unit **112**. This rendering is executed based on the color information of the registered focus position and the position information of the registered focus position, which are included in the focus registration information obtained in the step S**2202**. In a step S**2204**, the CPU **117** compares the number of the registered focus positions obtained in the step S**2107** with the variable I, and determines whether or not the number of the registered focus positions and the variable I match (the number of the registered focus positions is equal to the variable I). In the case that the number of the registered focus positions and the variable I do not match (NO in the step S**2204**), the registered focus position rendering processing proceeds to a step S**2205**. On the other hand, in the case that the number of the registered focus positions and the variable I match, the CPU **117** ends the registered focus position rendering processing. In the step S**2205**, the CPU **117** adds 1 to the variable I, and returns the registered focus position rendering processing to the step S**2202**.

(28) FIG. **2**C is a flowchart that shows details of the highlighted display rendering processing performed in the step S**2111** of FIG. **2**A.

(29) First, in a step S**2301**, the CPU **117** prepares a variable I and defines I=1. In a step S**2302**, the CPU **117** sets the I-th rendering flag to 0. In a step S**2303**, the CPU **117** determines whether or not I-1 matches the number of the registered focus positions obtained in the step S**2107** (I-1 is equal to the number of the registered focus positions). In the case that I-1 matches the number of the registered focus positions (YES in the step S**2303**), the highlighted display rendering processing proceeds to a step S**2307**. On the other hand, in the case that I-1 does not match the number of the registered focus positions (NO in the step S**2303**), the highlighted display rendering processing proceeds to a step S**2304**.

(30) In the step S**2304**, the CPU **117** determines whether or not a difference between the I-th registered focus position and the current focus position is less than or equal to the second threshold value. In the present embodiment, the second threshold value is determined based on sensitivity information of the I-th registered focus position obtained in the step S**2202** of FIG. **2**B. In the case that the difference between the I-th registered focus position and the current focus position is less

than or equal to the second threshold value (a second condition is satisfied) (YES in the step S**2304**), the highlighted display rendering processing proceeds to a step S**2305**. On the other hand, in the case that the difference between the I-th registered focus position and the current focus position is greater than the second threshold value (the second condition is not satisfied) (NO in the step S**2304**), the highlighted display rendering processing proceeds to a step S**2306**. It should be noted that the second threshold value may be determined based on predetermined information other than the sensitivity information. For example, the second threshold value may be determined based on a rotatable angle of the lens **101**, a focus movable distance, a depth of field, other user settings, etc.

(31) In the step S**2305**, the CPU **117** sets the I-th rendering flag (sets the I-th rendering flag to 1). In the step S**2306**, the CPU **117** adds 1 to the variable I, and returns the highlighted display rendering processing to the step S**2303**. As a result, the rendering flags whose number is one more than the number of the registered focus positions are set. It should be noted that the rendering flags are set in order from the focus position registered at the position with the shallowest depth of focus.

(32) In the step S**2307**, the CPU **117** determines whether or not there is a rendering flag that is set (there is a rendering flag whose value is 1). In the case that there is a rendering flag that is set (YES in the step S**2307**), the highlighted display rendering processing proceeds to a step S**2308**. On the other hand, in the case that all the rendering flags are not set (all the rendering flags whose values are 0) (NO in the step S**2307**), the highlighted display rendering processing proceeds to a step S**2312**.

(33) In the step S**2308**, the CPU **117** determines whether or not a plurality of rendering flags are set (values of the plurality of rendering flags are 1). In the case that the plurality of rendering flags are set (YES in the step S**2308**), the highlighted display rendering processing proceeds to a step S**2309**. On the other hand, in the case that only one rendering flag is set (NO in the step S**2308**), the highlighted display rendering processing proceeds to a step S**2310**.

(34) In the step S**2309**, the CPU **117** sets only the rendering flag of the registered focus position closest to the current focus position to 1, and sets the other rendering flags (the rendering flags other than the rendering flag of the registered focus position closest to the current focus position) to 0. In the step S**2310**, the CPU **117** causes the OSD rendering unit **112** to render the OSD of a frame **306** (see FIG. **3**C) with the same emphasis color as the marker **304** indicating the registered focus position where the value of the rendering flag is 1 (second information). That is, the CPU **117** (a second highlighting unit) performs a highlighted display that surrounds the edge of a screen **300***c* (see FIG. **3**C) with the frame **306** (a second highlighted display). It should be noted that the CPU **117** obtains information on the color of the marker **304** from the color information obtained in the step S**2202** of FIG. **2**B. Thereafter, the CPU **117** outputs the OSD rendered to the at least one output destination via the output I/F **116**, and displays the OSD rendered. At this time, difference information from the registered focus position may be displayed. In this way, in the case that the in-focus notification region **302** matches the registered focus position, in the video camera **100**, the highlighted display of the screen **300***c* (see FIG. **3**C) is performed. It should be noted that the highlighted display (the highlighting method) may be performed by using not only a frame but also a numerical value, a rectangle, or the like.

(35) In a step S**2311**, the CPU **117** sets the variable I to 1. In the step S**2312**, the CPU **117** determines whether or not I-1 matches the number of the registered focus positions (I-1 is equal to the number of the registered focus positions). In the case that I-1 does not match the number of the registered focus positions (NO in the step S**2312**), the highlighted display rendering processing proceeds to a step S**2313**. On the other hand, in the case that I-1 matches the number of the registered focus positions (YES in the step S**2312**), the highlighted display rendering processing proceeds to a step S**2317**. In the step S**2313**, the CPU **117** (a second obtaining unit) obtains a moving direction of the current focus position (a focus moving direction) from the lens communication unit **107**, and determines whether or not the I-th registered focus position is closer

to the moving direction side than the current focus position obtained in the step S**2104**. In the case that the I-th registered focus position is closer to the moving direction side than the current focus position (YES in the step S**2313**), the highlighted display rendering processing proceeds to a step S**2314**. On the other hand, in the case that I-th registered focus position is not closer to the moving direction side than the current focus position (NO in the step S**2313**), the highlighted display rendering processing proceeds to a step S**2316**. By performing this determination, as shown in FIG. **3**D, the frame **306** to be described below is not displayed when the current focus position passes through the registered focus position.

(36) In the step S**2314**, the CPU **117** determines whether or not the difference between the I-th registered focus position and the current focus position is less than or equal to the first threshold value. In the present embodiment, the first threshold value is determined based on the sensitivity information of the I-th registered focus position obtained in the step S**2202** of FIG. **2**B. In the case that the difference between the I-th registered focus position and the current focus position is less than or equal to the first threshold value (a first condition is satisfied) (YES in the step S**2314**), the highlighted display rendering processing proceeds to a step S**2315**. On the other hand, in the case that the difference between the I-th registered focus position and the current focus position is greater than the first threshold value (the first condition is not satisfied) (NO in the step S**2314**), the highlighted display rendering processing proceeds to a step S**2316**. It should be noted that the first threshold value may be determined based on predetermined information other than the sensitivity information. For example, the first threshold value may be determined based on the rotatable angle of the lens **101**, the focus movable distance, the depth of field, other user settings, etc.

(37) In the step S**2315**, the CPU **117** sets the I-th rendering flag (sets the I-th rendering flag to 1). In the step S**2316**, the CPU **117** adds 1 to the variable I, and returns the highlighted display rendering processing to the step S**2312**.

(38) In the step S**2317**, the CPU **117** determines whether or not there is a rendering flag that is set (there is a rendering flag whose value is 1). In the case that there is a rendering flag that is set (YES in the step S**2317**), the highlighted display rendering processing proceeds to a step S**2318**. On the other hand, in the case that all the rendering flags are not set (all the rendering flags whose values are 0) (NO in the step S**2317**), the CPU **117** ends the highlighted display rendering processing.

(39) In the step S**2318**, the CPU **117** determines whether or not a plurality of rendering flags are set (values of the plurality of rendering flags are 1). In the case that the plurality of rendering flags are set (YES in the step S**2318**), the highlighted display rendering processing proceeds to a step S**2319**. On the other hand, in the case that only one rendering flag is set (NO in the step S**2318**), the highlighted display rendering processing proceeds to a step S**2320**.

(40) In the step S**2319**, the CPU **117** sets only the rendering flag of the registered focus position closest to the current focus position to 1, and sets the other rendering flags (the rendering flags other than the rendering flag of the registered focus position closest to the current focus position) to 0. In the step S**2320**, the CPU **117** causes the OSD rendering unit **112** to render the OSD of a frame **305** (see FIG. **3**B) with an emphasis color related to the color of the marker **304** indicating the registered focus position where the value of the rendering flag is 1 (first information). Here, in this case, the emphasis color related to the color of the marker **304** is a color obtained by lightening the color of the marker **304**. That is, the CPU **117** (a first highlighting unit) performs an advance highlighted display that surrounds the edge of a screen **300***b* (see FIG. **3**B) with the frame **305** (a first highlighted display). It should be noted that the CPU **117** obtains the information on the color of the marker **304** from the color information obtained in the step S**2202** of FIG. **2**B. Thereafter, the CPU **117** outputs the OSD rendered to the at least one output destination via the output I/F **116**, and displays the OSD rendered. FIG. **3**B is a diagram that shows the screen **300***b* that is pre-highlighted on the video camera **100** (the screen **300***b* where the advance highlighted display is performed on the video camera **100**) when the advance notification region **303** matches the registered focus position. It should be noted that, in the present embodiment, although a color related to the

registered focus position is used for the advance highlighted display, any color may be used as long as it is an advance display indicating that the current focus position is approaching the registered focus position. In addition, the advance highlighted display may be performed by using not only a frame but also a numerical value, a rectangle, or the like. In addition, the advance highlighted display may be performed in a different method capable of distinguishing between that the current focus position is approaching the registered focus position and that the current focus position has passed through the registered focus position based on the determination performed in the step S**2104** (for example, in a method of changing the color of the frame **305**).

(41) According to the video camera **100** according to the present embodiment, in the case that the focus position guide function is ON during the actual photographing, when the current focus position approaches the registered focus position, as shown in the screen **300***b* in FIG. **3**B, the advance highlighted display that surrounds the edge of the screen with the frame **305** is performed. In addition, when the current focus position matches the registered focus position (when the current focus position is in focus), as shown in the screen **300***c* in FIG. **3**C, the highlighted display that surrounds the edge of the screen with the frame **306** is performed. Furthermore, by using different colors that are related to each other as the color of the frame **305** and the color of the frame **306**, the user is notified that the notification contents are different. As a result, when the user performs the manual focus operation during the actual photographing, the user is able to confirm whether or not the subject desired by the user is in focus without taking his or her eyes off the entire video image on the screen of the EVF **114** or the like and watching a single point on the screen (the in-focus notification region **302** or the like). Therefore, when the manual focus operation is performed during the actual photographing, it is possible to perform photographing with the subject desired by the user in focus while maintaining the entire video image in a composition intended by the user.

(42) It should be noted that since the second threshold value is a value smaller than the first threshold value as described above, in the case that the difference between the I-th registered focus position and the current focus position is less than or equal to the second threshold value, the difference between the I-th registered focus position and the current focus position is also less than or equal to the first threshold value. In this case, in the highlighted display rendering processing, by determining in the step S**2304** whether or not the difference between the I-th registered focus position and the current focus position is less than or equal to the second threshold value before determining in the step S**2314** whether or not the difference between the I-th registered focus position and the current focus position is less than or equal to the first threshold value, priority is given to the highlighted display shown in FIG. **3**C over the advance highlighted display shown in FIG. **3**B. As a result, it is possible to more reliably perform the photographing with the subject desired by the user in focus.

(43) Furthermore, as shown in FIG. **3**E, in the case that a plurality of adjacent registered focus positions are located close to each other, when the current focus position moves to the position shown in FIG. **3**F, there may be a case where a plurality of registered focus positions exist within the advance notification region **303**. In such a case, only the rendering flag of the registered focus position closest to the current focus position is set, and the frame **305** with a color related to the color of the marker **304** indicating the registered focus position is displayed. As a result, the user is able to intuitively recognize which registered focus position the current focus position is closest to while viewing the entire screen of the EVF **114** or the like.

(44) Although the present invention has been described above in detail based on its preferred embodiments, the present invention is not limited to these specific embodiments, and the present invention also includes various forms without departing from the gist of the invention. Some of the embodiments described above may be combined as appropriate.

(45) In addition, the present invention also includes a case where a software program that implements the functions of the above-described embodiments is supplied directly from a recording medium or using wired/wireless communication to a system or an apparatus having a computer

capable of executing the program, and the program is executed.
(46) Therefore, in order to realize the functional processing of the present invention on a computer, program codes itself that are supplied and installed in the computer also realizes the present invention. In other words, the present invention also includes a computer program itself for realizing the functional processing of the present invention.
(47) In this case, the form of the program does not matter, such as object codes, a program executed by an interpreter, or script data supplied to an operating system (OS), as long as it has the functions of the program.
(48) The recording medium for supplying the program may be, for example, a hard disk, a magnetic recording medium such as a magnetic tape, an optical/magnetic optical storage medium, or a nonvolatile semiconductor memory.
(49) Further, as a method of supplying the program, a method may be considered in which a computer program forming the present invention is stored in a server on a network, and a connected client computer downloads the computer program from the server on the network.
OTHER EMBODIMENTS
(50) Embodiment(s) of the present invention can also be realized by a computer of a system or apparatus that reads out and executes computer executable instructions (e.g., one or more programs) recorded on a storage medium (which may also be referred to more fully as a ‘non-transitory computer-readable storage medium’) to perform the functions of one or more of the above-described embodiment(s) and/or that includes one or more circuits (e.g., ASIC) for performing the functions of one or more of the above-described embodiment(s), and by a method performed by the computer of the system or apparatus by, for example, reading out and executing the computer executable instructions from the storage medium to perform the functions of one or more of the above-described embodiment(s) and/or controlling the one or more circuits to perform the functions of one or more of the above-described embodiment(s). The computer may comprise one or more processors (e.g., central processing unit (CPU), micro processing unit (MPU)) and may include a network of separate computers or separate processors to read out and execute the computer executable instructions. The computer executable instructions may be provided to the computer, for example, from a network or the storage medium. The storage medium may include, for example, one or more of a hard disk, a random-access memory (RAM), a read only memory (ROM), a storage of distributed computing systems, an optical disk (such as a compact disc (CD), digital versatile disc (DVD), or Blu-ray Disc (BD)™), a flash memory device, a memory card, and the like.
(51) While the present invention has been described with reference to exemplary embodiments, it is to be understood that the invention is not limited to the disclosed exemplary embodiments. The scope of the following claims is to be accorded the broadest interpretation so as to encompass all such modifications and equivalent structures and functions.
(52) This application claims the benefit of Japanese Patent Application No. 2022-193493, filed on Dec. 2, 2022, which is hereby incorporated by reference herein in its entirety.

Claims

1. An image pickup apparatus that assists a manual focus operation during photographing of a video image by using an image pickup lens with a focus mechanism, the image pickup apparatus comprising: a display unit configured to display the video image being photographed on a screen; a rendering unit configured to render information on a focus of the image pickup lens on the screen; a first obtaining unit configured to obtain a current focus position of the image pickup lens during the photographing; a second obtaining unit configured to obtain a moving direction of the current focus position; a registration unit configured to register a focus position of the image pickup lens; a first highlighting unit configured to, in a case that a first condition that a difference between the

current focus position and the registered focus position is less than or equal to a first threshold value is satisfied, render first information as the information on the focus of the image pickup lens and perform a first highlighted display of the screen; and a second highlighting unit configured to, in a case that a second condition that the difference between the current focus position and the registered focus position is less than or equal to a second threshold value smaller than the first threshold value is satisfied, render second information as the information on the focus of the image pickup lens and perform a second highlighted display of the screen, and wherein the first highlighting unit performs the first highlighted display of the screen based on the moving direction of the current focus position obtained by the second obtaining unit and the focus position registered by the registration unit.

2. The image pickup apparatus according to claim 1, wherein the first highlighting unit, in a case of determining that the current focus position has passed through the registered focus position based on the moving direction of the current focus position obtained by the second obtaining unit and the focus position registered by the registration unit, does not perform the first highlighted display.

3. The image pickup apparatus according to claim 1, wherein the first highlighting unit, in a case of determining that the current focus position is approaching the registered focus position and in a case of determining that the current focus position has passed through the registered focus position based on the moving direction of the current focus position obtained by the second obtaining unit and the focus position registered by the registration unit, makes a display method of the first highlighted display different.

4. The image pickup apparatus according to claim 1, wherein the first information and the second information are information including at least one of a numerical value and a rectangle.

5. The image pickup apparatus according to claim 1, wherein an emphasis color for performing the first highlighted display is a color related to an emphasis color for performing the second highlighted display.

6. The image pickup apparatus according to claim 1, wherein the first threshold value is determined based on at least one of a rotatable angle of the image pickup lens, a focus movable distance, a depth of field, and a user setting.

7. The image pickup apparatus according to claim 1, wherein the second threshold value is determined based on at least one of a rotatable angle of the image pickup lens, a focus movable distance, a depth of field, and a user setting.

8. The image pickup apparatus according to claim 1, wherein, in a case that both the first condition and the second condition are satisfied, the second highlighted display is given priority.

9. The image pickup apparatus according to claim 1, wherein the information on the focus of the image pickup lens includes information indicating the registered focus position.

10. The image pickup apparatus according to claim 1, wherein, in a case that there are a plurality of the registered focus positions, the plurality of the registered focus positions are superimposed and displayed on the video image in different colors, respectively.

11. The image pickup apparatus according to claim 10, wherein an emphasis color of the first highlighted display is the same color as a color in which the registered focus position, to which the current focus position is determined to be approaching among the plurality of the registered focus positions based on the moving direction of the current focus position obtained by the second obtaining unit and the focus position registered by the registration unit, is superimposed and displayed on the video image.

12. The image pickup apparatus according to claim 10, wherein an emphasis color of the second highlighted display is a color related to a color in which the registered focus position, to which the current focus position is determined to be approaching among the plurality of the registered focus positions based on the moving direction of the current focus position obtained by the second obtaining unit and the focus position registered by the registration unit, is superimposed and displayed on the video image.

13. The image pickup apparatus according to claim 10, wherein, in a case that the registered focus position closest to the current focus position among the plurality of the registered focus positions and the current focus position satisfy the first condition, an emphasis color of the first highlighted display is the same color as a color in which the registered focus position closest to the current focus position is superimposed and displayed on the video image.
14. The image pickup apparatus according to claim 10, wherein, in a case that the registered focus position closest to the current focus position among the plurality of the registered focus positions and the current focus position satisfy the second condition, an emphasis color of the second highlighted display is a color related to a color in which the registered focus position closest to the current focus position is superimposed and displayed on the video image.
15. A control method for an image pickup apparatus that assists a manual focus operation during photographing of a video image by using an image pickup lens with a focus mechanism, the control method comprising: a display step of displaying the video image being photographed on a screen; a rendering step of rendering information on a focus of the image pickup lens on the screen; a first obtaining step of obtaining a current focus position of the image pickup lens during the photographing; a second obtaining step of obtaining a moving direction of the current focus position; a registration step of registering a focus position of the image pickup lens; a first highlighting step of, in a case that a first condition that a difference between the current focus position and the registered focus position is less than or equal to a first threshold value is satisfied, rendering first information as the information on the focus of the image pickup lens and performing a first highlighted display of the screen; and a second highlighting step of, in a case that a second condition that the difference between the current focus position and the registered focus position is less than or equal to a second threshold value smaller than the first threshold value is satisfied, rendering second information as the information on the focus of the image pickup lens and performing a second highlighted display of the screen, and wherein in the first highlighting step, the first highlighted display of the screen is performed based on the moving direction of the current focus position obtained in the second obtaining step and the focus position registered in the registration step.
16. A non-transitory computer-readable storage medium storing a program for causing a computer to execute a control method for an image pickup apparatus that assists a manual focus operation during photographing of a video image by using an image pickup lens with a focus mechanism, the control method comprising: a display step of displaying the video image being photographed on a screen; a rendering step of rendering information on a focus of the image pickup lens on the screen; a first obtaining step of obtaining a current focus position of the image pickup lens during the photographing; a second obtaining step of obtaining a moving direction of the current focus position; a registration step of registering a focus position of the image pickup lens; a first highlighting step of, in a case that a first condition that a difference between the current focus position and the registered focus position is less than or equal to a first threshold value is satisfied, rendering first information as the information on the focus of the image pickup lens and performing a first highlighted display of the screen; and a second highlighting step of, in a case that a second condition that the difference between the current focus position and the registered focus position is less than or equal to a second threshold value smaller than the first threshold value is satisfied, rendering second information as the information on the focus of the image pickup lens and performing a second highlighted display of the screen, and wherein in the first highlighting step, the first highlighted display of the screen is performed based on the moving direction of the current focus position obtained in the second obtaining step and the focus position registered in the registration step.