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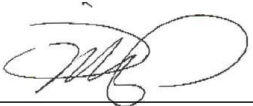
I served as Chief Examiner of the certified court interpreter test for the State of California and as a contract translator and interpreter for various federal agencies through the U.S. Department of State for more than a decade. I served as an instructor at the University of California at Berkeley and the Middlebury Institute of International Studies at Monterey (MIIS) Graduate Program in Translation.

I have more than 30 years of experience reviewing thousands of technical, legal, and business documents from Japanese to English submitted to, among others, Japanese judicial authorities, U.S. federal courts, the U.S. International Trade Commission (ITC), and the USPTO Patent Trial and Appeal Board (PTAB).

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I certify under penalty of perjury that the foregoing is true and correct.

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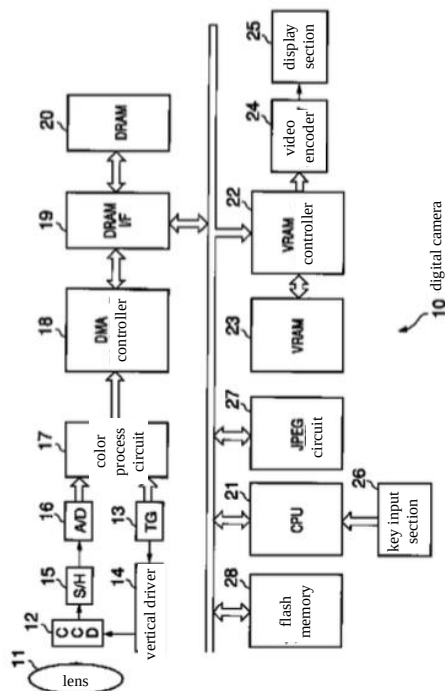
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(54) (Title of the Invention) IMAGE EDITING DEVICE, IMAGE EDITING METHOD, AND STORAGE MEDIUM

(57) [ABSTRACT]

[PROBLEM] To set, to captured moving image data, a preview image that is the most suited to represent that moving image data.

[SOLUTION] Provided are a flash memory 28 that can store mixed moving image data and still image data and a CPU 21 that selects any still image data from moving image data stored in the memory 28 and sets the selected still image data as the preview image data for the moving image data.



[SCOPE OF PATENT CLAIMS]

[CLAIM 1] An image editing device equipped with a storage means capable of storing mixed moving image data and still image data,

a selection means for selecting any still image data from moving image data stored in the storage means, and
a setting means for setting the still image data selected with the selection means as preview image data of the moving image data.

[CLAIM 2] The image editing device described in claim 1, wherein the selection means selects from time-continuous still image data composing the moving image data.

[CLAIM 3] The image editing device described in claim 1, wherein the selection means selects still image data of the storage means separately from the moving image data.

[CLAIM 4] An image editing method having a selection step for selecting any still image data from moving image data stored on a storage unit capable of storing mixed moving image data and still image data and
a setting step for setting the still image data selected in the selection step as preview image data of the moving image data.

[CLAIM 5] A storage medium capable of being read by a computer for storing a control program that includes commands for a computer to execute a selection step for selecting any still image data from moving image data stored on a storage unit capable of storing mixed moving image data and still image data and
a setting step for setting the still image data selected in the selection step as preview image data of the moving image data.

[DETAILED DESCRIPTION OF THE INVENTION]

[0001]

[TECHNICAL FIELD OF THE INVENTION] The present invention relates to a capture device capable of capturing moving images, an image editing method for editing a moving image file captured by the device, and a storage medium for storing the method as a control program that can be read by a computer.

[0002]

[CONVENTIONAL ART] Recently, digital cameras that convert captured images into digital data and store the result on a memory card or other storage media rather than silver-halide film have come into general, widespread use. In addition to the image data obtained by capturing, this type of digital camera creates and stores a preview image, also called a thumbnail image or the like, in which the pixels that make up the image are greatly thinned out for menu display.

[0003] Many models are capable of capturing not only still images but also moving images, and for the moving image data that is obtained, a preview image is created by automatically selecting, in particular, the first still image

from among the plurality of time-continuous still image data items that compose the moving image data.

[0004]

[PROBLEM TO BE SOLVED BY THE INVENTION]

However, in moving image data, the image located at the beginning is not necessarily the most suitable image to represent the moving images, and the most suitable image is often in the middle of the moving images.

[0005] The present invention was invented taking into consideration the situation described above, and it is an object of the present invention to provide an image editing device, an image editing method, and a storage medium for setting, to captured moving image data, the preview image most suited for representing that moving image data.

[0006]

[MEANS TO SOLVE THE PROBLEM] The invention described in claim 1 is equipped with a storage means capable of storing mixed moving image data and still image data, a selection means for selecting any still image data from moving image data stored in the storage means, and a setting means for setting the still image data selected with the selection means as preview image data of the moving image data.

[0007] With such a configuration, it is possible for the user to set, to moving image data, any preview image thought to be most suited for representing that moving image.

[0008] In the invention described in claim 2, the selection means in the invention described in claim 1 selects from time-continuous still image data composing the moving image data.

[0009] With such a configuration, in addition to the effect of the invention described in claim 1, it is possible to select any item from the plurality of still image data composing the moving image data thought to best represent that moving image data, so a better suited item can be selected as the preview image data.

[0010] In the invention described in claim 3, the selection means in the invention described in claim 1 selects still image data of the storage means separately from the moving image data.

[0011] With such a configuration, in addition to the effect of the invention described in claim 1, by separately taking, for example, a still image of a title image of the moving image data separate therefrom and selecting the resulting still image data as the preview image data, a better suited item can be selected as the preview image data.

[0012] The invention described in claim 4 has a selection step for selecting any still image data from moving image data stored on a storage unit capable of storing mixed moving image data and still image data and a setting step for setting the still image data selected in the selection step as preview image data of the moving image data.

[0013] By using such a method, it is possible for the user to set, to the moving image data, any preview image

thought to be most suited for representing that moving image data.

[0014] The invention described in claim 5 stores a control program that includes commands for a computer to execute a selection step for selecting any still image data from moving image data stored on a storage unit capable of storing mixed moving image data and still image data and a setting step for setting the still image data selected in the selection step as preview image data of the moving image data.

[0015] By providing such storage content, it is possible for the user to set, to the moving image data, any preview image thought to be most suited for representing that moving image data.

[0016]

[CONFIGURATIONS FOR REDUCING THE INVENTION TO PRACTICE] A configuration in which the present invention is applied to a digital still camera is described below with reference to the drawings.

[0017] FIG. 1 shows a circuit configuration of the configuration of the invention in which 10 is the digital camera. This digital camera 10 can switch between record mode and playback mode, in the record mode, a timing generator (TG) 13 and a vertical driver 14 drive a CCD 12 arranged behind a lens 11 to scan and output one screen of a photoelectric conversion output at fixed intervals.

[0018] For the photoelectric conversion output, after the gain is adjusted appropriately for each RGB color component by an AGC amplifier, not illustrated, in a state of analog value signals, a sample is held by a sample hold circuit (S/H) 15, converted to digital data by an A/D converter (A/D) 16, and color process processing including interpolation processing and γ correction processing is performed in a color process circuit 17 to output a digital value luminance signal Y and color difference signals Cb and Cr to a direct memory access (DMA) controller 18.

[0019] The DMA controller 18 writes the luminance signal Y and the color difference signals Cb and Cr output by the color process circuit 17 to a buffer inside the DMA controller 18 using the same synchronous signal, memory write enable, and clock output of the color process circuit 17 and carries out DMA transfer to a DRAM 20 through a DRAM interface (I/F) 19.

[0020] After the DMA transfer of the luminance and color difference signals to the DRAM 20 is complete, a CPU 21 reads these luminance and color difference signals from the DRAM 20 through the DRAM interface 19 and writes the signals to a VRAM 23 through a VRAM controller 22.

[0021] A digital video encoder (hereinafter abbreviated as "video encoder") 24 periodically reads the luminance and color difference signals from the VRAM 23 through the VRAM controller 22 and generates a video signal on the basis of that data to output to a display section 25.

[0022] Composed of a color liquid crystal display panel, e.g., with a backlight, and a drive circuit therefor, the display section 25 is disposed on the rear side of the camera and functions as an electronic view finder (EVF) in recording mode, carries out display on the basis of the video signal from the video encoder 24, and displays an image on the basis of image information currently being captured from the VRAM controller 22.

[0023] When a shutter key composing a key input section 26 is operated at the timing when the user wants to record and save in a state where an image is thus currently displayed in real time on the display section 25, a trigger signal is generated. After the DMA transfer of the luminance and color difference signals of one screen captured at that time by the CCD 12 in response to the trigger signal to the DRAM 20 is complete, the path from the CCD 12 to the DRAM 20 is immediately stopped and the camera transitions to a state of record and save.

[0024] In this state of record and save, the CPU 21 reads the luminance and color difference signals of one frame written to the DRAM 20 through the DRAM interface 19 in units of eight vertical pixels $\times$ eight horizontal pixels for each of the Y, Cb, and Cr components, which units are called basic blocks, and writes the basic blocks to a JPEG circuit 27, reads the coded data compressed by the JPEG circuit 27 using adaptive discrete cosine transform (ADCT), Huffman encoding, which is an entropy encoding method, or the like from the JPEG circuit 27, and writes to a flash memory 28, which is a nonvolatile memory that can be detachably installed as a storage medium in the digital camera 10.

[0025] Then, upon completion of the compression processing of the luminance and color difference signals of one frame and the writing of all the compressed data to the flash memory 28, the CPU 21 restarts the path from the CCD 12 to the DRAM 20.

[0026] At this time, the CPU 21 also creates image data in which the number of pixels composing the original image data is significantly reduced, and stores the result as a preview image in the flash memory 28 in association with the original image data.

[0027] In addition to the shutter key, the key input section 26 consists of a record/play mode switching key to switch between record (REC) mode and playback (PLAY) mode, a single/continuous shooting switching key to switch between still image shooting and moving image shooting in record mode, a cursor key and an "Enter" key for image selection, and the like, and a signal accompanying key operation is sent directly to the CPU 21.

[0028] In particular, during moving image imaging, it is possible to store moving image data comprising time-continuous still image data for a maximum of, for example, 15 shots/second $\times$ 30 seconds in the flash memory 28 by repeatedly operating the shutter key by pressing.

[0029] At the end of such moving image capturing, the CPU 21 automatically selects and reads the still image data located at the beginning of the moving images, creates image data with a significantly reduced number of component pixels, and stores the result as a preview image in the flash memory 28 associated with the original moving image data.

[0030] In playback mode, the CPU 21 stops the path from the CCD 12 to the DRAM 20, and in response to an operation of an image selection key or the like of the key input section 26, the CPU 21 reads the encoded data of one specific frame from the flash memory 28, writes same to the JPEG circuit 27, and carries out decompression processing and storage of one frame of YUV data in the VRAM 23 through the VRAM controller 22 in basic block units of 8 pixels × 8 pixels obtained by expansion processing in the JPEG circuit 27. The video encoder 24 then generates a video signal on the basis of the one frame of YUV data that is expanded and stored in the VRAM 23, and the video signal is displayed on the display section 25.

[0031] The operation of the present configuration is described next.

[0032] Here, it is assumed that still image data and moving image data are stored mixed in the flash memory 28 in advance, and that the moving image data has a preview image created from the still image data located at the beginning of the moving image data that is automatically appended and set at the time of recording.

[0033] FIG. 2 mainly shows the processing during playback mode executed by the CPU 21, in which a predetermined number of image data items, e.g., nine, is selected from among the recent image data stored in the flash memory 28 regardless of whether the data items are still or moving images on the basis of, for example, the date and time data attached to each image data item (step S01), the corresponding preview images are read out and deployed, the screen is divided on the display section 25 and the preview images are displayed in a list as a menu screen along with symbols or the like representing the respective still and moving images (step S02).

[0034] At this time, the CPU 21 repeatedly determines whether or not there is an instruction to specify and select one of the displayed images (step S03) or whether or not there is an instruction to change the range of displayed image data items (step S04) through a key operation of the key input section 26, waiting for these instructions.

[0035] If, in step S04 above, it is determined that an instruction to change the range of image data items to be displayed has been given, the range of preview images to be read from the flash memory 28 is moved in response to the direction of the instruction (step S05), and the menu screen is then displayed with that range.

[0036] If it is determined in step S03 above that there is an instruction to specify and select one of the displayed images, next, it is determined whether or not the selected image data item is moving image data (step S06).

[0037] If it is determined that the preview image is not moving image data but is still image data, the original still image data item corresponding to the preview image is read from the flash memory 38 and expanded by the JPEG circuit 27, and while the resulting still image data is displayed on the display section 25 (step S07), the processing of canceling the display and waiting for a key operation to select another image (step S08) is repeatedly executed, and when a key operation is determined to have been made, the processing returns again to the processing starting at the menu screen display of step S01.

[0038] If it is determined in step S06 that the selected image data is moving image data, it is determined whether or not a specified key operation to change the preview image in particular is performed within a certain period of time (step S09).

[0039] If no key operation is made to change the preview image, the original moving image data corresponding to the preview image is read from the flash memory 28 and sequentially expanded by the JPEG circuit 27, the resulting moving image data is displayed on the display section 25 in a sequence (step S10), and when the display is complete, the processing returns to the menu screen display of step S01.

[0040] If it is determined that the specified key operation for changing the preview image was performed in step S09, the image positioned at the start of the plurality of still image data items composing the moving image data is first selected (step S11).

[0041] Then the selected still image data item is read from the flash memory 28 and expanded by the JPEG circuit 27, the resulting still image data is displayed on the display section 25 (step S12) while repeatedly determining whether or not a key operation is made to move forward or move backward from the selected still image data item (step S13) and whether or not a key operation is performed to newly specify the still image data item being displayed at that time as the preview image as representative of the moving image data (step S14), and the processing waits for these key operations.

[0042] When it is determined that a key operation to move forward/backward from the displayed still image data item has been performed in step S13, a new still image data item corresponding to the operation is selected (step S15), and the processing returns to the processing starting at step S12 again.

[0043] FIG. 3 shows an example of moving image data comprising a plurality of time-continuous still image data items stored in the flash memory 28, which in this case is a total of 15 still image data items from (1) to (15).

[0044] When this moving image data is captured, a preview image is automatically created from the still image data (1) located at the start through the operation described above. However, as can be seen in FIG. 3, the still image data item (1) at the start is not suitable as representative of

the moving image data, and if, for example, the still image data item (4), indicated similarly to the still image data (1) by a thick frame line, out of all of the data items is considered more suitable, then the key operation to advance the still image data items is performed in succession to select and display all of these 15 still image data items (1) to (15) and then the new still image data item (4) is selected and displayed by pressing the key to go back through a large portion of the still image data items.

[0045] When the user selects any still image data item to be displayed and performs the key operation for specifying the preview image, this is determined in step S13, a new preview image data item is created from the selected still image data item, and the content of the flash memory 28 is rewritten to set the new preview image for this moving image data item (step S16), and then the processing returns again to the processing starting at the menu screen display of step S01.

[0046] In this way, the user can set any still image data item thought to be most suitable for the moving image data instead of, for example, the still image data item located at the start of the moving image data being always set as the preview image for the moving image data, which is extremely useful when searching for moving image data.

[0047] In addition, in the configuration described above, any still image data item thought to be the most representative of the moving image data can be selected from among the plurality of still image data items composing the moving image data, , so it is possible to select a still image data item suited as the preview image data item with a simple operation.

[0048] Although not explained in the configuration above, instead of selecting a preview image of the moving image data from among the plurality of still image data items that compose the moving image data, the still image data obtained by taking a still image of, for example, a piece of paper or an image on which the title of the moving data is written can be selected separately from the moving image data as the preview image for the moving image data, greatly expanding the selection range and making it possible to select an item that is an even more suitable preview image.

[0049] Although the above configuration was described such that a digital camera is used to change the preview image setting in playback mode, it is also possible to connect the digital camera to a personal computer or connect a digital camera storage medium directly to a personal computer using an adapter or the like and execute image editing software installed on the personal computer in advance from another storage medium to similarly change the preview image.

[0050] In addition, the invention may be reduced to practice in a variety of variations within the scope that does not depart from the gist of the invention.

[0051]

[EFFECT OF THE INVENTION] According to the invention described in claim 1, it is possible for the user to set, to moving image data, any preview thought to be most suited to represent the moving image data.

[0052] According to the invention described in claim 2, in addition to the effect of the invention described in claim 1, any item thought to be most representative of moving image data can be selected from a plurality of still image data images composing the moving image data, so it is possible to select a suitable item as the preview image data.

[0053] According to the invention described in claim 3, in addition to the effect of the invention described in claim 1 above, if a still image is separately taken separately from the video data of, for example, the title of the video data and the resulting still image data is selected as the preview image data, more suitable image data can be selected as the preview image data.

[0054] According to the invention described in claim 4, it is possible for the user to set, to the moving data, any preview image that is thought to be best suited to represent the moving image data.

[0055] According to the invention described in claim 5, it is possible for the user to set, to the moving data, any preview image that is thought to be best suited to represent the moving image data.

[BRIEF DESCRIPTION OF THE DRAWINGS]

[FIG. 1] A block drawing showing a circuit configuration of the digital camera according to the configuration of the present invention.

[FIG. 2] A flowchart showing the processing details for changing, in particular, the preview image during playback mode according to the same configuration.

[FIG. 3] A drawing showing an example of a selection state of a preview image for moving image data according to the same configuration.

[DESCRIPTION OF THE REFERENTIAL NUMBERS]

- 10 ... digital camera
- 11 ... lens
- 12 ... CCD
- 13 ... timing generator (TG)
- 14 ... vertical driver
- 15 ... sample hold circuit (SH)
- 16 ... A/D converter (A/D)
- 17 ... color process circuit
- 18 ... DMA controller
- 19 ... DRAM interface (I/F)
- 20 ... DRAM
- 21 ... CPU
- 22 ... VRAM controller

23 ... VRAM

24 ... digital video encoder

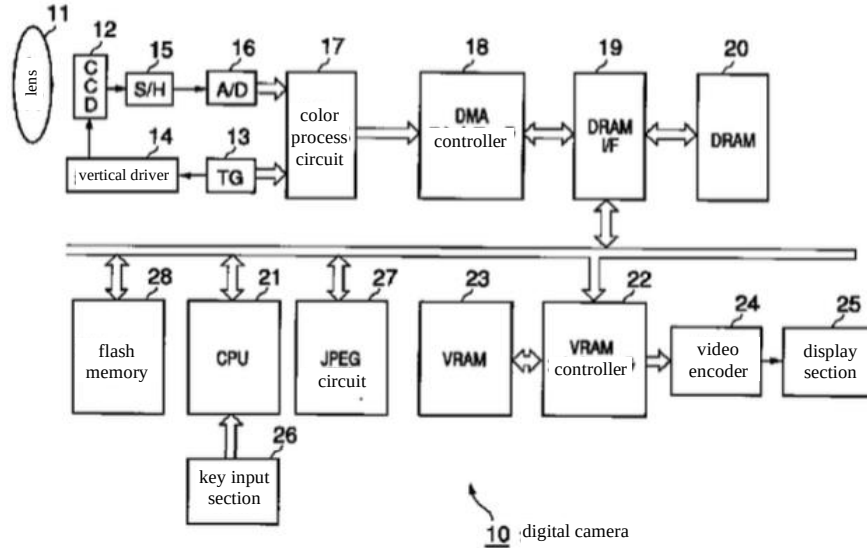
25 ... display section

26 ... key input section

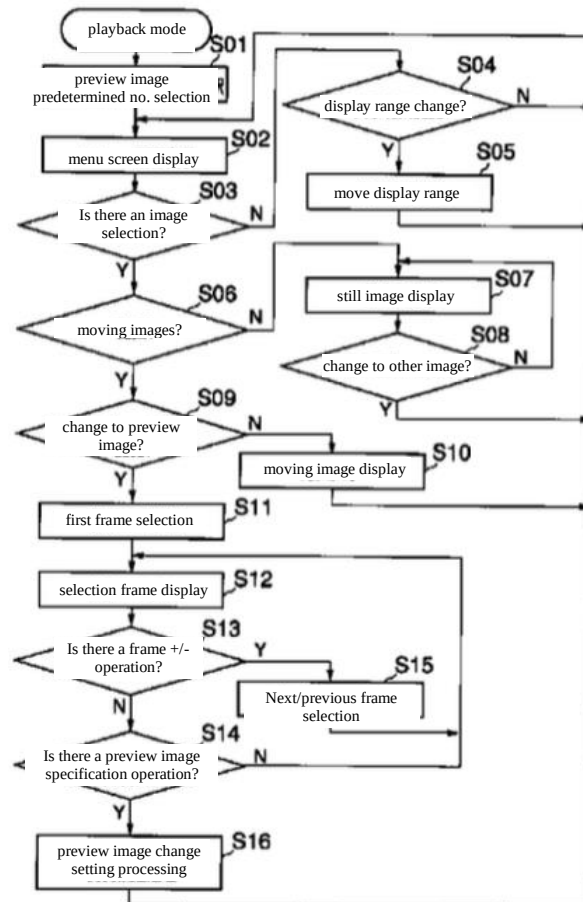
27 ... JPEG circuit

28 ... flash memory

[FIG. 1]



[FIG. 2]



[FIG. 3]

