159159

G00002

DESCRIPTION

DISPLAY APPARATUS FOR ELECTRONIC STILL CAMERA

Technical Field

The present invention relates to a display apparatus for an electronic still camera that records still images.

Background Art

An electronic still camera is normally provided with a liquid crystal display apparatus for the purpose of displaying an input image or recorded image and the number of pixels that can be displayed by this liquid crystal display apparatus is much smaller than the number of pixels of the image to be recorded.

For example, if a solid image capturing element, which is an image input apparatus of the electronic still camera has approximately 1.3 million pixels, the number of pixels of an image to be recorded is generally 1280 pixels in the horizontal direction and 1024 pixels in the vertical direction, while if the number of pixels that can be displayed by the liquid crystal display apparatus is 80,000 pixels, there are 320 pixels in the horizontal direction and 240 pixels in the vertical direction.

Moreover, at the time of displaying an input image or recorded image, the electronic still camera must subject an input image to thinning processing before displaying it in

order to display the entire image and the thinning rate applied to the above example is 1/4 in the horizontal direction and 1/4.27 in the vertical direction.

Here, in addition to the electronic still camera, an ophthalmologic camera unit is another example of the apparatus that displays an input image after thinning it because the number of pixels of the solid image capturing element for inputting an image is different from the number of pixels displayed on an LC (Liquid Crystal).

This is the apparatus used by an ophthalmologist to capture an image of a patient's eye as an input image and display it on a liquid crystal display apparatus. When the doctor examines the affected area, this apparatus has functions such as showing an enlarged view of part of the image, moving the enlarged area using a shift switch at hand and changing the display area.

FIG. 8 is a block diagram of a conventional electronic still camera.

Reference numeral 9 denotes an optical system that forms an image of the subject on the surface of a solid image capturing element; 10, a solid image capturing element (CCD) with a color separation filter that converts the formed image of the subject (optical image) to an image signal (electric signal); 11, an A/D converter that converts an analog signal obtained from the solid image capturing element 10 to a digital signal; 12, an input image processing section that performs input processing such as correction of the image signal

acquired from the A/D converter 11 and conversion to an image signal with brightness and color difference or RGB; 13, an image control memory (RAM) used for temporary storage of the input image and zooming of the image; 14, a control switch group that transmits instructions from outside; 15, an interface section (I/F) that transmits a signal from the control switch group 14 to a CPU 16 that performs various kinds of control of the electronic still camera interior. Reference numeral 17 denotes a display image control section that performs thinning of an input image or recorded image; 18, a display image control memory (RAM) that stores the thinned image; 19, an LCD (Liquid Crystal Display) section that displays the image of the display image control RAM 18; 20, an image compression section that compresses an input image or decompresses a recorded image; 21, an internal bus that transfers an image signal or other control data between blocks; 22, an interface section (I/F) that performs a data transfer between an image recording section 23 that stores an image signal and the internal bus 21 above.

At the time of recording an input image, the image of the subject is formed on the solid image capturing element 10 through the optical system 9, processed by the A/D converter 11 and the input signal processing section 12, converted to an RGB signal or brightness and color difference signal and temporarily stored in the RAM 13 through the internal bus 21.

The image data recorded in the RAM 13 is sent to the display image control section 17 again through the internal

bus 21, subjected to thinning processing, transferred to the RAM 18 and displayed on the LCD section 19.

The image data stored in the RAM 13 is passed through the internal bus 21, subjected to image compression calculation with its amount of data reduced by the image compression section 20, sent again through the internal bus 21 to the interface section 22, with image attachment information added, and recorded in the recording medium by the image recording section 23.

This series of operations is implemented by the CPU 16 exercising whole control in response to instructions sent from the switch group 14. As shown in the flow chart in FIG. 9, the flow of operations and instructions of this CPU, which is not included in the above explanation of operation, starts with focusing of the optical system in step S1, continues until a shutter switch operation of the switch group 14 is detected in step S5 and data is recorded in a recording medium in step S8.

The flow of operations and instructions of the CPU when reproducing and checking the recorded image is expressed in the flow in FIG. 10. In step S1, image data recorded in the recording medium is read from the image recording section 23, the image data is sent to the image compression section 20 through the interface section 22 and internal bus 21, then in step S2 the compressed image data is subjected to decompression calculation and temporarily stored in the RAM 13 again through the internal bus 21. The image data stored

in the RAM 13 is sent to the display image control section 17 again through the internal bus 21 in step S3, subjected to thinning processing in step S4, transferred to the RAM 18 and displayed on the LCD section 19 in step S5.

Through this reproduction check operation, the image data already recorded can be checked and in step S6 it is possible to decide whether this recorded data should be erased or not. If an instruction that it should not be saved is detected, the image data is deleted in step S7 and the process goes back to step S1.

In this way, all images displayed by the electronic still camera are subjected to thinning processing to display their entire images. If, for example, the image is thinned to 1/4 both vertically and horizontally, this thinning processing generally uses a method of assigning one pixel by finding an average of 16 pixels, 4 pixels in the vertical direction and 4 pixels in the horizontal direction.

FIG. 11 shows a conventional ophthalmologic camera unit.

Reference numeral 24 denotes an optical system that forms an image of the subject on the surface of the solid image capturing element; 25, a solid image capturing element with a color separation filter that converts the formed image of the subject (optical image) to an image signal (electrical signal); 26, an LCD section that displays an image; 27, a display image generation section that controls an input image or display image or controls each block according to instructions from external switches; 28, a switch that

switches between display images; and 29, a switch that changes the display area of the switched image.

In FIG. 11, an image of a patient's eye is the subject and that image is formed on the solid image capturing element 25 via the optical system 24 and captured in the RAM inside the display image generation section 27. The captured image is subjected to thinning processing inside the display image generation section 27 and its full image is displayed on the LCD section 26.

Here, if an instruction is transmitted from the switch 28, part of the image data stored inside the display image generation section 27 is processed and its enlarged view is displayed on the LCD section 26. Furthermore, if an instruction is transmitted from the switch 29, the part to be handled of the image data stored inside the display image generation section 27 is changed and processed and the display area of the enlarged image is moved.

At the time of displaying a full image, this ophthalmologic camera unit also performs thinning processing as in case of the above electronic still camera and in case of showing an enlarged view, displays the image without thinning processing for one-to-one correspondence between pixels or performs processing such as increasing pixels through interpolation processing.

However, the conventional electronic still camera pays little attention to a means for checking whether the image is focused or not and thinning processing is inserted assuming

that displaying a full image is a precondition for the LCD. This results in a problem of making it impossible to check from the image on the LCD whether the image is focused or not due to deterioration of the high frequency component by thinning processing.

Furthermore, with the conventional ophthalmologic camera unit, it is possible to check whether the image on the LCD is focused or not through an enlarged view and all that is needed is to add a recording apparatus. However, when used as an electronic still camera, it has problems such as: displaying an enlarged screen for a long time during recording can make the entire picture of the image to be recorded uncontrollable or always switching between screens using the changeover switch can make the recording operation complicated or it is impossible to see the enlarged screen for a focus check and the reduced screen to see a full image at the same time.

Disclosure of Invention

In order to solve the problems above, the display apparatus for an electronic still camera of the present invention is characterized by its configuration that allows a process of changing an image to be displayed for a certain period of time during recording, a process of switching and recording the display screen using a two-stage switch or a process of displaying two kinds of image by dividing the screen during reproduction. That is, the present invention provides

a display apparatus for an electronic still camera that displays an input image acquired from the optical system on the display section having fewer pixels than this input image, detects a recording instruction and records the input image in a recording medium, and the claims of the present invention have the following features.

The electronic still camera display apparatus described in claim 1 is characterized in that the control means that controls an image signal supplied to the display section is configured in such a way that part of an input image is displayed on the display section during a specific period which is at least part of the period after a recording instruction is detected until a predetermined time elapses, and the input image is displayed in its entirety on the display section after the end of the specific period or after the predetermined time elapses, and since an enlarged view of part of the image to be recorded is shown for a certain period of time after a recording instruction is started, it is possible to check the focus of the recorded image.

The electronic still camera display apparatus described in claim 2 is characterized in that the control means that controls an image signal supplied to the display section is configured in such a way that a first command is detected before detecting a recording instruction as a second command, part of the above described input image is displayed on the display section and the input image is displayed in its entirety on the display section by detecting the recording

instruction, and since an enlarged view of part of the image to be recorded is shown for a certain period of time after a focus adjustment instruction is started until a recording instruction is started, it is possible to check the focus of the recorded images and freely set the time for checking the focus.

The electronic still camera display apparatus described in claim 3 is characterized in that the control means that controls an image signal supplied to the display section when reproducing the image is configured in such a way that a reproduced image is displayed in its entirety on the display section until it is detected that a display change instruction is input and when it is detected that a display change instruction is input, part of the reproduced image is displayed on the display section, and since an enlarged view of part of the recorded image is shown by the display change instruction, it is possible to check the focus of the recorded image.

The electronic still camera display apparatus described in claim 4 is characterized in that the control means that controls an image signal supplied to the display section when reproducing the image is configured in such a way that a reproduced image is displayed in its entirety on the display section until it is detected that a display change instruction is input and when it is detected that a display change instruction is input, the display screen is divided into two areas displaying an input image or an entire recorded image

in one area and part of the input image or the recorded image in the other area, and since part of the input image and the whole or part of the recorded image are shown enlarged by a display change instruction, it is possible to check the focus and a full image of the recorded image.

The electronic still camera display apparatus described in claim 5 is characterized in that one of the screens divided by the display change instruction in claim 4 is a windowed child screen and the control means is configured in such a way that the position of the child screen and images displayed inside and outside the child screen are controlled by a child screen shift instruction, and since the input image and the whole or part of the recorded image are shown enlarged within the above child screen by a display change instruction, it is possible to check the focus and the full image of the recorded image and freely set the focus check position.

The electronic still camera display apparatus described in claim 6 is characterized in that in claim 5, a means for measuring the strength of a force with which the switch for issuing a child screen shift instruction is pressed or the length of time during which the above switch is pressed is provided and the child screen shift speed is changed according to the strength of the above force or the length of time for pressing the switch to control the position of the child screen and images displayed inside and outside the child screen.

As described above, the present invention carries out a process of changing an image shown for a certain period of

time during recording, a process of switching between display screens using a two-stage switch and recording the screens or a process of dividing the screen and displaying two kinds of images, thereby making it possible to implement an excellent electronic still camera display apparatus capable of checking whether the recorded image is focused or not, seeing a full image while checking the focus of the recorded image, and checking the focus of the recorded image without complicated operations.

Brief Description of the Drawings

FIG. 1 is an outlined block diagram of an electronic still camera of the present invention;

FIG. 2 is a control flow chart of an electronic still camera of Embodiment 1 of the present invention;

FIG. 3 shows a first explanatory drawing and a second explanatory drawing of an image displayed on an LCD section of the present invention;

FIG. 4 is a control flow chart of an electronic still camera of Embodiment 2 of the present invention;

FIG. 5 is a control flow chart of electronic still cameras of Embodiment 3 and Embodiment 4 of the present invention;

FIG. 6 is a control flow chart of an electronic still camera of Embodiment 5 of the present invention;

FIG. 7 is a control flow chart of an electronic still camera of Embodiment 6 of the present invention;

FIG. 8 is a detailed block diagram of an electronic still camera;

FIG. 9 is a control flow chart of a conventional electronic still camera during recording;

FIG. 10 is a control flow chart of the conventional electronic still camera during reproduction; and

FIG. 11 is a block diagram of a conventional ophthalmologic camera unit.

Embodiments

With reference now to FIG. 1 to FIG. 7, embodiments of the present invention will be explained below.

(Embodiment 1)

FIG. 1 shows an electronic still camera of (Embodiment 1), which is configured by an optical system 1 including a lens and a focus control mechanism, a solid image capturing element 2, an LCD section 3, an image control section 4, an image memory 5, a shutter switch 6, a zooming switch 7 and a shift switch 8.

Here, detailed blocks of the electronic still camera of (Embodiment 1) configured with a microcomputer as the main part are similar to those in FIG. 8 explained as the conventional example above, but the program, etc. to control the CPU 16 is changed as follows and it is different from the electronic still camera in the conventional example.

FIG. 2 illustrates a control flow of (Embodiment 1).

In FIG. 1, when an instruction is received from the shutter switch 6, an image of the subject is passed through the optical system 1 and formed on the surface of the solid image capturing element 2 and the image formed of the subject (optical image) is processed by the image processing section 4 and then written to the image memory 5. The image data written in the image memory 5 is processed by the image processing section 4 again, displayed on the LCD section 3, and the image data written in the image memory is subjected to compression processing and recorded in another recording medium. This series of operations constitutes a recording operation by a normal electronic still camera.

In this (Embodiment 1), the above described control flow is configured so that the LCD operation at this time is switched in two stages. More specifically, the first stage is implemented in a mode in which an enlarged view of part of the image is shown and the second stage is implemented in a normal mode in which a full image is displayed.

The first mode is executed for a period after the shutter switch 6 is pressed until a certain time elapses and this lapse of time is measured by a timer provided separately.

The operation of the electronic still camera during image recording will be explained below with reference to FIG. 8, FIG. 2 and FIG. 3.

When the power to the electronic still camera is turned on and a recording mode is entered, a full image of the image input through the lens is normally displayed on the LCD section

19. At this time, the shutter switch 14 is not pressed yet and control is performed in such a way that the focus is adjusted when the optical system 9 is operated by an instruction of the CPU 16 in step S1 shown in FIG. 2.

This focus adjustment can also be performed after it is detected that the shutter switch 6 is pressed in step S5, but in that case, the input image can only be seen on an unfocused screen until the shutter switch 6 is pressed.

Next, the image data stored in the solid image capturing element 10 through the optical system 9 is converted to a digital signal by the A/D converter 11 in step S2, subjected to image correction by the input processing section 12 and transferred to the display image control section 17 through the internal bus 21.

The image data transferred at this time is proportional to the number of pixels contained in the solid image capturing element 10. For example, if the solid image capturing element 10 has 1280×960 pixels, 1280×960 RGB image data pieces, each consisting of 8 bits, are transferred. In contrast, if the LCD section 19 has 320×240 pixels, it is necessary to thin the image data to 1/4 both vertically and horizontally, and so the display image control section 17 performs thinning processing by performing sampling at intervals of 4 pixels or using the average of 4×4 pixels as 1 pixel, etc. converting the image data to 320×240 pixels and writing the image data to the RAM 18 in step S3. Then, the written image data is

repeatedly transferred to the LCD section 19 and displayed on the LCD in step S4.

At this time, the image displayed on the LCD section 19 is a full image of the image input through the lens. This series of operations is repeated until the shutter switch 6 is pressed.

The pressing of the shutter switch 6 is detected in step S5 and if a recording instruction is issued, the image data stored in the solid image capturing element 10 at that time is transferred from the internal bus 21 to the RAM 13 through the same path as that described in step S6. Furthermore, the CPU 16 starts to measure a lapse of time using a means for counting clocks, etc. according to the recording instruction.

Then, according to an instruction from the CPU 16, part of the image data stored in the RAM 13 is transferred to the display image control section 17 through the internal bus 21 in step S7 and converted to a display image and transferred to the RAM 18 in step S8.

Then, the written image data is repeatedly transferred to the LCD section 19 and displayed on the LCD in step S9.

At this time, as shown in FIG. 3(b), suppose the image area that is captured by the solid image capturing element is area A and the partial image area transferred to the RAM 18 in step S3 is area B. If, for example, the image captured by the solid image capturing element is 1280×960 pixels, LCD is 320×240 pixels, the image captured by the display image control section 17 is 640×480 pixels, then a process of

thinning to 1/2 both vertically and horizontally is carried out in step S3 and area B is displayed on the entire screen of the LCD section 19.

Therefore, the LCD section 19 shows a full image of the recorded image until the shutter switch 6 is pressed and if the shutter switch 6 is pressed, part of the image is shown enlarged in step S9.

This enlarged view continues unless it is decided that a predetermined time has elapsed through the above timer in step S10.

In step S10, if it is decided that the enlarged display time has ended through the above timer in step S10, the image data stored in the RAM 13 is transferred again to the display image control section 17 through the internal bus 21 in step S11. At this time, the image data transferred is all data recorded. In step S12, the display image control section 17 carries out thinning processing on the image data, which is thinned to 1/4 both vertically and horizontally in the aforementioned example and transfers the image data to the RAM 18.

In step S13, the written image data is repeatedly transferred to the LCD section 19 and displayed on the LCD. At this time, the image displayed on the LCD is a full image of the image input through the lens.

Furthermore, in step S14, the image data recorded in the RAM 13 is transferred to the image compression section 20 by an instruction of the CPU 16, subjected to image compression

calculation processing and its amount of data is reduced. Finally, the data subjected to compression calculation with its amount reduced is transferred to the image recording section 23 through the internal bus 21 and the interface 22, and recorded on a recording medium provided for the image recording section 23 in step S15. This completes the operation after the shutter switch 6 is pressed and a recording instruction is issued until the data is recorded on the recording medium and the electronic still camera is put in a standby state waiting for a new recording instruction and the process returns to the operating environment in the first step S1.

Here, the routine in steps S7 to S13 and the routine in steps S14 and S15 shown in FIG. 2 can be switched round or the routine in steps S14 and S15 can also be implemented included in the routine in steps S7 to S13.

Through the above operation, part of the image captured through the lens is automatically displayed on the LCD section 19 enlarged more for a predetermined period of time after the recording instruction is detected than the period until the aforementioned recording instruction is detected, and so the user can check whether the image is focused or not by checking the image displayed on the LCD section 19 within the period of the enlarged display.

Here, the reason that it is desirable to check whether the image is focused or not when the entire image is displayed is that the size of the image captured by the solid image

capturing element is different from that of the image that can be displayed on the LCD, and so the display image control section 17 must perform thinning processing and the thinning processing has an effect of a low pass filter reducing the resolution that the image originally has.

This embodiment describes the case where the size of the image to be displayed enlarged is 640×480 and the size of the LCD pixels is 320×240. However, a more reliable focus check would be possible if the size of the image to be displayed enlarged is controlled to be equal to the size of the image that can be displayed on the LCD.

This embodiment also describes the case where part of the image is displayed for a predetermined time after the shutter is operated and the entire image is displayed after the predetermined time elapses, but there can be another embodiment in which part of the image is displayed for a specific period of time within a predetermined time after the shutter is operated and the entire image is displayed after the specific period of time elapses and still other embodiment in which part of the image is displayed for a specific period of time within a predetermined time after the shutter is operated and the entire image is displayed after the predetermined time elapses.

(Embodiment 2)

The hardware configuration is the same as that of (Embodiment 1) and can be expressed in FIG. 1 and FIG. 8 and

it is different from (Embodiment 1) in the control flow. FIG. 4 shows the control flow of (Embodiment 2).

In this (Embodiment 2), a shutter switch operation that issues a recording instruction and LCD operation are performed in two stages. The first stage consists of a first mode in which an enlarged view of part of an image is displayed by gently touching or pressing the shutter switch and the second stage consists of a second mode in which a full normal image is displayed by holding down the shutter switch. Then, the focus is adjusted the moment the first mode is executed and the image is recorded the moment the second mode is executed.

More specifically, the electronic still camera is controlled using the following procedure:

When a recording mode is entered when power to the electronic still camera is turned on, a full image of the image input to the LCD section 19 through a lens is usually displayed. That is, until it is detected in step S4 shown in FIG. 4 that the shutter switch 6 is gently pressed, steps S1 to S3 are repeatedly executed in such a way that the image data stored in the solid image capturing element 10 through the optical system 9 by an instruction of the CPU 16 is converted to a digital signal by the A/D converter 11, then subjected to image correction by input image processing section 12 and the image data is transferred to the display image control section 17 through the internal bus 21.

The image data transferred at this time is proportional to the number of pixels of the solid image capturing element 10 and if the solid image capturing element has 1280×960 pixels, for example, 1280×960 RGB image data pieces, each consisting of 8 bits, are transferred. In contrast, if the LCD section 19 has 320×240 pixels, a process of thinning the image data to 1/4 both vertically and horizontally is required, and therefore the thinning process is performed in the display image control section 17 and the image data is converted to 320×240 pixels and written to the RAM 18. Then, the written image data is repeatedly transferred to the LCD section 19 and displayed on the LCD.

The image displayed at this time is a full image of the image input through the lens.

In step S4 when it is detected that the shutter switch 6 is touched or gently pressed, a first focus adjustment instruction is issued, and in step S5 the optical system 9 is operated to adjust the focus. Then in step S6, the image data stored in the solid image capturing element 10 is transferred from the internal bus 21 to the RAM 13 through the same path as that described above. In step S7, part of the image data stored in RAM 13 is transferred to the display image control section 17 through the internal bus 21 according to an instruction from the CPU 16 and converted to a display image and then transferred to the RAM 18 in step S8.

Then, the written image data is repeatedly transferred to the LCD section 19 and displayed on the LCD in step S9.

At this time, as shown in FIG. 3(b), as in the case of (Embodiment 1), if the image area captured by the solid image capturing element is area A, part of the image area transferred to the display image control section 17 is area B, the image captured by the solid image capturing element is, for example, 1280×960 pixels, LCD is 320×240 pixels, the image captured by the display image control section is 640×480 pixels, then the display image control section 17 performs thinning to 1/2 both vertically and horizontally and area B is displayed on the overall LCD screen.

Then, as the operation in the second stage, if in step S10 it is detected that the shutter switch 6 is held down, a second recording instruction is issued and the image data recorded in the RAM 13 in step S11 is transferred to the display image control section 17 through the internal bus 21 again. The image data transferred at this time is all the data recorded.

Then in step S12, in this example, the display image control section 17 performs a thinning processing for thinning the image data to 1/4 both vertically and horizontally and the image data is transferred to the RAM 18.

In step S13, the image data written to the RAM 18 is repeatedly transferred to the LCD section 19 and displayed on the LCD. The image displayed on the LCD at this time is a full image of the image input through the lens.

Furthermore, in step S14, the image data stored in the RAM 13 is transferred to the image compression section 20 by

an instruction of the CPU 16, subjected to image compression calculation processing and the amount of data is reduced.

In step S15, the data subjected to compression calculation and reduced is transferred to the image recording section 23 through the internal bus 21 and interface 22, recorded in a recording medium provided for the image recording section 23 and the process returns to the operating environment in the first step S1.

Here, the routine in steps S11 to S13 and the routine in steps S14 and S15 shown in FIG. 4 can be switched round or the routine in steps S14 and S15 can also be implemented included in the routine in steps S11 to S13.

Through the above operation, within the period after the focus adjustment instruction is issued in the first stage until the recording instruction in the second stage is issued, an enlarged view of part of the image captured through the lens is displayed in the LCD section 19 and the user can check whether the image is focused or not during that enlarged view display period.

Moreover, unlike (Embodiment 1), in this (Embodiment 2), the user himself/herself can freely set the time for checking whether the image is focused or not by operating the shutter switch 6, improving the ease of use.

This embodiment describes the case where the size of the image to be displayed enlarged is 640×480 and the size of the LCD pixels is 320×240. However, a more reliable focus check would be possible if the size of the image to be displayed

enlarged is controlled to be equal to the size of the image that can be displayed on the LCD.

(Embodiment 3)

The hardware configuration is the same as that of (Embodiment 1) and can be expressed in FIG. 1 and FIG. 8 and it is different from (Embodiment 1) in the control flow. FIG. 5 shows the control flow of (Embodiment 3).

In this (Embodiment 3), when power to the electronic still camera is turned on and a reproduction mode is entered, normally nothing is displayed on the LCD section 19 or one piece of the image data already stored is displayed. The purpose for reproducing a recorded image is, for example, to check whether the recorded image is adequately captured or not, or to decide whether to save or delete the recorded image. In this (Embodiment 3), assuming that the user of the electronic still camera has just selected an image on which he or she wants to make some decision, the subsequent operations will be explained below.

When a recorded image to be reproduced in reproduction mode is selected, the image data is called up from a recording medium provided for the image recording section 23 by an instruction of the CPU 16 in step S1 shown in FIG. 5 and transferred to the image compression section 20 through the interface 22 and the internal bus 21. Since the image data sent is data that has been subjected to image compression processing, the image compression section 20 carries out expansion processing, converts data back to data in a

reproducible format and transfers the enlarged data to the RAM 13 through the internal bus 21 in step S2.

The image data stored in the RAM 13 is transferred to the display image control section 17 through the internal bus 21 in step S3. The image data transferred at this time is adjusted to the size of the recorded image and if the recorded image has, for example, 1280×960 pixels, 1280×960 RGB image data pieces, each consisting of 8 bits, are transferred. In contrast, if the LCD section 19 has 320×240 pixels, a process of thinning the image data to 1/4 both vertically and horizontally is required similarly to the case of recording mode, and therefore the display image control section 17 performs the thinning processing to convert the data to 320×240 pixels and writes the data to the RAM 18 in step S4.

Then, in step S5, the image data written to the RAM 18 is repeatedly transferred to the LCD section 19 and displayed on the LCD. The image displayed at this time is a full image of the recorded image and the selected image is being reproduced.

Here, when the user of the electronic still camera tries to expand the image, it is detected in step S6 that the zooming switch 7 is operated and an image expansion instruction is transmitted to the CPU 16 through the interface 15. Then, in step S7, by an instruction from the CPU 16, part of the image data stored in the RAM 13 is transferred to the display image control section 17 through the internal bus 21,

converted to a display image in step S8 and then transferred to the RAM 18.

In step S9, the image data written to the RAM 18 is repeatedly transferred to the LCD section 19 and displayed on the LCD. At this time, as shown in FIG. 3(b), if the image area in which data is recorded is area A, part of the image area transferred to the display image control section 17 is area B, the image recorded is, for example, 1280×960 pixels, the LCD has 320×240 pixels, the image captured by the display image control section has 640×480 pixels, then the display image control section 17 performs a thinning processing of 1/2 both vertically and horizontally and area B is displayed on the entire LCD screen. Through the aforementioned series of operations after the display change instruction is issued until the enlarged image is displayed, it is possible to check the focus of the recorded image.

Then, a decision is made as to whether the record should be saved or deleted about the image currently being reproduced whose focus has been checked, and if it is decided in step S10 that the record should be saved, nothing is specially done and if it is decided that the record should be deleted, an instruction of the CPU 16 is sent to the image recording section 23 and the recorded image data is deleted in step S11.

When the above operation is completed, the process returns to the initial image reproduction mode again.

This embodiment describes the case where the size of the image to be displayed enlarged is 640×480 and the size of the

LCD pixels is 320×240. However, a more reliable focus check would be possible if the size of the image to be displayed enlarged is controlled to be equal to the size of the image that can be displayed on the LCD.

Moreover, in this embodiment, image expansion processing is immediately followed by recorded data save/decision processing, but the image expansion processing can also be followed by a zooming switch cancellation process. In that case, an image expansion processing cancellation decision flow and the routines in steps S3 and S4 in FIG. 5 are inserted after the image expansion processing.

Moreover, in FIG. 5, after all operations are completed, the process returns to the operation of transferring the image data of the image recording section 23 to the compression section, but returning to the operation of selecting a new image is a more natural reproduction mode.

(Embodiment 4)

This (Embodiment 4) only differs from the above (Embodiment 3) in the area in which the data transferred from the display image control section 17 is written to the RAM 18 in step S8 in FIG. 5, and it is the same as (Embodiment 3) in other aspects.

Here, as in the case of (Embodiment 3), assuming that the user of the electronic still camera has just selected an image on which he or she wants to make some decision, the subsequent operations will be explained below. Steps S1 to S9 are as follows:

When a recorded image to be reproduced in reproduction mode is selected, the image data called up from a recording medium provided for the image recording section 23 is transferred to the image compression section 20 through the interface 22 and the internal bus 21 by an instruction of the CPU 16. The image compression section 20 carries out expansion processing, converts data back to data in a reproducible format and writes the enlarged data to the RAM 13 through the internal bus 21. Then, the image data stored in the RAM 13 is sent to the display image control section 17 through the internal bus 21. The image data transferred at this time is adjusted to the size of the recorded image, subjected to a thinning processing by the display image control section 17 and written to the RAM 18. The written image data is repeatedly transferred to the LCD section 19 and displayed on the LCD. The image displayed on the LCD at this time is a full image of the recorded image and the selected image is being reproduced. Here, when the user of the electronic still camera tries to expand the image, an image expansion instruction is transmitted from the zooming switch 7 through the interface 15 to the CPU 16. Then, by an instruction from the CPU 16, part of the image data stored in the RAM 13 is transferred to the display image control section 17 through the internal bus 21, converted to an image for display and transferred to the RAM 18. Then, the written image data is repeatedly transferred to the LCD section 19 and displayed on the LCD.

In this (Embodiment 4), in step S8, suppose the image area in which the data transferred from the display image control section 17 is written to the RAM 18 in step 8 is area A as shown in FIG. 3(a), part of the image area transferred from the RAM 13 to the display image control section 17 is area C and the area in which the data transferred from the display image control section 17 is written to the RAM 18 is area B shown in FIG. 3(b). For example, if the recorded image has 1280×960 pixels, LCD has 320×240 pixels, part of the image transferred from the RAM 13 to the display image control section 17 has 160×120 pixels and the image transferred from the display image control section 17 and written to the RAM 18 has 160×120 pixels, then since the size of the image transferred from the RAM 13 to the display image control section 17 is equal to the size of the image transferred from the display image control section 17 on the LCD screen and written to the RAM 18, the display image control section 17 does not require any thinning processing. Furthermore, since some area of the image data already written in the initial stage is overwritten with new data, a full image of the recorded image is displayed in area A excluding area B in FIG. 3(a) of the screen displayed on the LCD and an enlarged view of the image of area C is displayed in area B. That is, as shown in FIG. 3(b), a windowed area B that displays an enlarged screen exists in area A showing the entire LCD screen and a full image is displayed in area A and an enlarged image is displayed in area B.

From this, it is possible to check the focus of the recorded screen by seeing area B, which is the enlarged screen and it is possible to check an outline of a full image of the recorded image by seeing area A, which is the full screen, enabling both images to be checked simultaneously.

Then, about the image currently being reproduced whose focus has been checked, a decision is made as to whether the record should be saved or deleted, and if it is decided that the record should be saved, nothing is specially done and if it is decided that the record should be deleted, an instruction of the CPU 16 is sent to the image recording section 23 and the recorded image data is deleted.

When the above operation is completed, the process returns to the initial image reproduction mode again.

This embodiment describes the case where the size of the image to be displayed enlarged is 160×120 and area B, which is the LCD area, is 160×120, but if the size of the image to be displayed enlarged is different from the size of the image that can be displayed on the LCD, it is possible to check the focus.

Moreover, in this embodiment, the image expansion processing is immediately followed by the recorded data save/decision processing, but the image expansion processing can also be followed by a zooming switch cancellation process. In that case, an image expansion processing cancellation decision flow and the routines in steps S3 and S4 in FIG. 5 are inserted after the image expansion processing.

Moreover, in FIG. 5, after all operations are completed, the process returns to the operation of transferring the image data of the image recording section to the compression section, but returning to the operation of selecting a new image is a more natural reproduction mode.

Moreover, the shape of area B and the shape of area C of the image displayed in area B in FIG. 3(a) and FIG. 3(b) need not be set to a shape of the same ratio as that of the LCD screen and not only the vertical-to-horizontal ratio of the rectangle but also any shape other than a rectangle can be freely set. When a screen is partitioned in this embodiment, a windowed child screen is displayed, but the screen can also be divided into two portions vertically or horizontally.

Furthermore, in this embodiment, a screen is partitioned in an image reproduction mode to show a full image and enlarged image, but executing this display method by LCD display in an image recording mode makes it possible to check the focus of the recorded image by seeing the area, which is an enlarged screen and check a full image of the recorded image by seeing the area which is a full screen, thus providing an effect of allowing both images to be checked simultaneously at the time of recording the image.

(Embodiment 5)

This (Embodiment 5) differs from (Embodiment 3) and (Embodiment 4) above in the area in which the data transferred from the display image control section 17 is written to the

RAM 18 after an instruction to enlarge the image from the zooming switch 7 is detected.

Here, in (Embodiment 5), as in the case of (Embodiment 3), assuming that the user of the electronic still camera has just selected an image on which he or she wants to make some decision, the subsequent operations will be explained below. FIG. 6 shows a flow of (Embodiment 5) and steps S1 to S6 are the same as steps S1 to S6 of (Embodiment 3) shown in FIG. 5.

When a recorded image to be reproduced in reproduction mode is selected, the image data called up from a recording medium provided for the image recording section 23 is transferred to the image compression section 20 through the interface 22 and the internal bus 21 by an instruction of the CPU 16. The image compression section 20 carries out expansion processing, converts data back to data in a reproducible format and writes the enlarged data to the RAM 13 through the internal bus 21. Then, the image data stored in the RAM 13 is sent to the display image control section 17 through the internal bus 21. The image data transferred at this time is adjusted to the size of the recorded image, subjected to a thinning processing by the display image control section 17 and written to the RAM 18. The written image data is repeatedly transferred to the LCD section 19 and displayed on the LCD. The image displayed on the LCD at this time is a full image of the recorded image and the selected image is being reproduced.

Here, when the user of the electronic still camera tries to expand the image, an image expansion instruction is transmitted from the zooming switch 7 through the interface 15 to the CPU 16. Then, part of the image data stored in the RAM 13 is transferred to the display image control section 17 through the internal bus 21, converted to an image for display and transferred to the RAM 18.

Then, the written image data is repeatedly transferred to the LCD section 19 and displayed on the LCD. The above series of operations is the same as those of (Embodiment 3) and (Embodiment 4). As in the case of (Embodiment 4), this embodiment differs in the area in which the data transferred from the display image control section is written to the RAM 18 and by overwriting part of the area of the image data already written in the initial stage with new data, as shown in FIG. 3(b), a windowed area B that displays an enlarged screen exists in area A that displays the entire LCD screen and a full image is displayed in area A and an enlarged image is displayed in area B. From this, it is possible to check the focus of the recorded screen by seeing area B, which is the enlarged screen and it is possible to check an outline of a full image of the recorded image by seeing area A, which is the full screen, enabling both images to be checked simultaneously.

Furthermore, when area B in FIG. 3(b), which becomes a windowed child screen that displays an enlarged image is opened within the above LCD screen, if the shift switch 8 to shift the child screen is pressed toward one of directions

right/left and up/down, this is detected in step S8 and the CPU 16 detects the position at which the child screen is opened in step S9.

In steps S10 and S11, the image data written in the RAM 13 is transferred to the display image control section 17. The data transferred at this time can be all the recorded data of the entire screen and the entire display image can be reconstructed. However, the data to be transferred can be the blank area produced in the direction opposite to the shifting direction by shifting the child screen using the shift switch 8, that is, the data for reconstructing the area where the child screen existed before the shift but there is no longer the child screen after the shift, and the data in the image area to be displayed enlarged in the newly shifted child screen area, and overwriting it with an image created based on that data can reduce the amount of processing. The display image control section 17 carries out thinning processing by which the area outside the child screen can display a full image, carries out thinning processing by which the area inside the child screen can display an enlarged image or does nothing and overwrites the RAM 18 with the data after displaying the image as it is.

In step S12, the image data of the RAM 18 is repeatedly transferred to the LCD section 19 and displayed on the LCD.

Since the shift of the child screen may not be completed in one step for the processing after the switch 8 of shifting

this child screen is pressed until the LCD image is displayed, the above series of processing is repeatedly conducted.

Thus, shifting the child screen to check the focus of the recorded image allows the focus at any desired position to be checked.

Then, when the child screen is no longer shifted and a decision is made as to whether the record should be saved or deleted about the image currently being reproduced whose focus has been checked, and if it is decided in step S13 that the record should be saved, nothing is specially done and if it is decided that the record should be deleted, an instruction of the CPU 16 is sent to the image recording section 23 and the recorded image data is deleted in step S14.

Here, a decision on whether the child screen is no longer shifted is made by measuring time using the timer of the CPU 16 and changing the operating mode according to a lapse of time after the shift switch 8 is no longer pressed or changing the operating mode using the switch to issue a delete instruction without performing any special processing.

When the above operation is completed, the process returns to the initial stage of the image reproduction mode again.

(Embodiment 6)

FIG. 7 shows a routine to be inserted in place of the routines in steps S8 to S12 in FIG. 6.

In this embodiment, as in the case of the operation flow of (Embodiment 5) shown in FIG. 6, the subsequent operations

will be explained below assuming that the user of the electronic still camera has just selected an image on which he or she wants to make some decision and displayed a child screen from the state in which the entire recorded image is displayed on the LCD using the zooming switch.

When area B in FIG. 3(b) which becomes a windowed child screen that displays an enlarged image is opened within the above LCD screen, if it is detected in step S8 that the shift switch 8 to shift the child screen is pressed toward one of directions right/left and up/down, in steps S9a, S9b and S9c, the CPU 16 starts a timer and detects the position at which the child screen is opened to measure the time during which the user holds down the switch 8 and calculate the distance the child screen is shifted from the time detected by the timer. Here, the calculated distance the child screen is shifted is set to be greater when the time during which the switch 8 is pressed is longer than a predetermined time compared to the case where it is shorter than the predetermined time.

In steps S10 and S11, the image data written in the RAM 13 is transferred to the display image control section 17. The data transferred at this time can be the data for reconstructing the blank area produced in the direction opposite to the shifting direction by shifting the child screen using the shift switch 8 as in the case of (Embodiment 5), and the data in the image area to be displayed enlarged in the child screen area newly shifted, and the image created based on that data is overwritten. The display image control

section 17 carries out thinning processing by which the area outside the child screen can display the entire image and carries out thinning processing by which the area inside the child screen can display an enlarged image or displays the image as it is without doing anything and then overwrites the RAM 18 with the data. The image data of the RAM 18 is repeatedly transferred to the LCD section 19 and displayed on the LCD. Since the shift of the child screen may not be completed in one step, the above series of processing is repeatedly conducted after the switch of shifting this child screen is pressed until the LCD image is displayed. By shifting the child screen to check the focus of the recorded image, it is possible to check the focus at any position and it has an effect of rapidly shifting the child screen to the position at which the focus is to be checked.

Here, the speed of shifting the child screen is changed in two stages according to the time during which the shift switch 8 is pressed, but the speed can also be changed in more stages. By using a two-stage switch as the shift switch or a pressure sensor, etc., it is also possible to perform control in response to the strength of the pressing force, not the time during which the switch is held down so that the child screen is shifted farther when the shift switch is pressed stronger.

Furthermore, the child screen is no longer shifted, and regarding the operation flow after a decision on whether to save or delete the record about the image currently being

reproduced whose focus has been checked, either saving or deleting is performed as in the case of (Embodiment 5) and the process returns to the initial stage of the image reproduction mode again.

The control flow in the above embodiment is not only used independently but can also be used combined. That is, the same effect can also be obtained even if the present invention is configured so that the child screen is displayed or shifted during image recording or the reproduction mode is automatically entered immediately after recording, followed by a focus checking mode.

CLAIMS

1. An electronic still camera display apparatus which displays an input image obtained from an optical system (1, 9) on a display section (3, 19) with fewer pixels than this input image, detects a recording instruction and records said input image in a recording medium (23),

characterized in that control means for controlling an image signal supplied to said display section (3, 19) is configured so that part of said input image is displayed on said display section (3, 19) during a specific period which is at least part of the period after said recording instruction is detected until a lapse of a predetermined time is detected, and the input image is displayed in its entirety on said display section (3, 19) after the end of said specific period or after the predetermined time elapses.

2. An electronic still camera display apparatus which displays an input image obtained from an optical system (1, 9) on a display section (3, 19) with fewer pixels than this input image, detects a recording instruction and records said input image in a recording medium (23),

characterized in that control means for controlling an image signal supplied to said display section (3, 19) is configured so that part of said input image is displayed on said display section (3, 19) after detecting a first command before detecting said recording instruction as a second

command, and the input image is displayed in its entirety on said display section (3, 19) after detecting said recording instruction.

3. An electronic still camera display apparatus which displays an input image obtained from an optical system (1, 9) on a display section (3, 19) with fewer pixels than this input image, detects a recording instruction and records said input image in a recording medium (23),

characterized in that control means for controlling an image signal supplied to said display section (3, 19) at the time of carrying out reproduction is configured so that a reproduced image is displayed in its entirety on said display section (3, 19) until it is detected that a display change instruction is input, and part of the reproduced image is displayed on said display section (3, 19) after detecting that a display change instruction is input.

4. An electronic still camera display apparatus which displays an input image obtained from an optical system (1, 9) on a display section (3, 19) with fewer pixels than this input image, detects a recording instruction and records said input image in a recording medium (23),

characterized in that control means for controlling an image signal supplied to said display section (3, 19) at the time of carrying out reproduction is configured so that a reproduced image is displayed in its entirety on said display

section (3, 19) until it is detected that a display change instruction is input and after detecting that a display change instruction is input, a display screen is divided into two areas, with one area showing the input image or the recorded image in its entirety and the other area showing part of the input screen or the recorded image.

5. The electronic still camera display apparatus according to claim 4, characterized in that one of the screens divided by the display change instruction is a windowed child screen and the control means is configured to control the position of the child screen and the image displayed inside or outside the child screen according to a child screen shift instruction.

6. The electronic still camera display apparatus according to claim 5, characterized in that the apparatus further comprises measuring means for measuring the strength of a force of pressing a switch (8) issuing a child screen shift instruction or the length of time during which said switch is pressed, and that the control means is configured to control the position of the child screen and the image displayed inside or outside the child screen by changing the speed of shifting the child screen according to the strength of said force or the length of time during which said switch is pressed.