

Date of Filing: August 10, 2004
Japanese Patent Application No.: 2004-233872

[Name of Document] Application for Patent
[Reference No.] 0404338
[Date of Filing] August 10, 2004
[Addressee] Commissioner of Japan Patent Office
5 [Int' l Class] H04N 5/232
 G03B 17/00

[Inventor]
 [Address] c/o Ricoh Company, Ltd.,
 3-6, Nakamagome 1-chome, Ota-ku,
10 Tokyo
 [Name] Kazumitsu Watanabe
[Applicant]
 [Id No.] 000006747
 [Name] Ricoh Company, Ltd.
15 [Representative] Masamitsu Sakurai
[Agent]
 [Id. No.] 100085660
 [Name] Hitoshi Suzuki
 [Phone No.] 03-3380-7533
20 [Application Fee]
 [Prepayment No.] 060613
 [Amount of Payment] 16,000 Yen
[List of Attached Documents] ..
 [Name of Document] Scope of Claims 1
25 [Name of Document] Specification 1
 [Name of Document] Drawing 1
 [Name of Document] Abstract 1
 [General Power of Attorney No.] 0201246
[Name of Document] Scope of Claims
30 [Claim 1]

An image recording apparatus for executing image processing on
read image data and recording the image data, characterized by
comprising an image generation means for obtaining the image data,

an image processing means for executing image processing based on processing information transmitted together with the image data from the image generation means, and a recording means for recording the image data subjected to the image processing by the image processing means on a recording medium.

[Claim 2]

An image recording apparatus for executing image processing on read image data and recording the image data characterized by comprising an image generation means for obtaining the image data, an image processing means for executing image processing based on processing information transmitted together with the image data from the image generation means, and a printing control means for controlling to print and output the image data subjected to the image processing by the image processing means.

[Claim 3]

The image recording apparatus according to claim 1 or 2, characterized by comprising a selection means for selecting the processing information.

[Claim 4]

The image recording apparatus according to claim 1 or 2, characterized in that the processing information is information of distortion aberration at a time of generating the image, and the image processing means executes distortion aberration correction processing based on the information of distortion aberration.

[Claim 5]

The image recording apparatus according to claim 1 or 2, characterized in that the processing information is information of peripheral light intensity at the time of generating the image, and the image processing means executes peripheral light intensity correction processing based on the information of peripheral light intensity.

[Claim 6]

The image recording apparatus according to claim 1 or 2, characterized in that the processing information is information of a lens type, focal length, and a zoom position at the time of generating the image, and the image processing means executes distortion aberration correction processing based on the information of the lens type, the focal length, and the zoom position at the time of generating the image.

[Claim 7]

The image recording apparatus according to claim 1 or 2, characterized in that the processing information is information of a lens type, focal length, and a zoom position at the time of generating the image, and the image processing means executes peripheral light intensity correction processing based on the information of the lens type, the focal length, and the zoom position at the time of generating the image.

[Claim 8]

The image recording apparatus according to claim 1 or 2, characterized in that the processing information is information of a type of correction processing and a correction value for the generated image, and the image processing means executes correction processing based on the information of the type of the correction processing and the correction value for the generated image.

[Name of Document] Specification

[Title of the Invention] Image Recording Apparatus

[Technical Field]

[0001]

The present invention relates to an image recording apparatus for executing image processing on read image data and recording the image data, and more specifically, to an image recording apparatus capable of automatically and simply executing image processing such as distortion aberration correction or peripheral light intensity correction.

[Background Art]

[0002]

Conventionally, in an image recording apparatus for executing image processing on read image data and recording the data, various image processing is executed on the image data to record the data.

5 Examples of such image processing are distortion aberration correction, peripheral light intensity correction, and so forth. As distortion aberration correction processing method, a table look-up method where a lens distortion aberration rate is predetermined according to each focal length and zoom position is
10 generally known (see, for instance, Patent document 1).

Further, as peripheral light intensity correction processing method, correction processing which uses the cosine fourth law known as an extinction coefficient is generally known (see, for instance, Patent document 2).

15 Moreover, a following technique is proposed as another conventional image processing system, wherein an image is transmitted from an image recording apparatus to an image processing apparatus, where image processing such as distortion aberration correction or peripheral light intensity correction is executed
20 based on additional data. Then the image subjected to the image processing is transmitted from the image processing apparatus to the image recording apparatus, where the image is recorded.

According to the patent document 1, a plurality sets of corresponding photographed points are detected from a plurality
25 of images including common patterns, which are photographed at a single spot by means of an image pickup apparatus such as a digital camera, and angles formed by the correspondent photographed points and an optical axis of an image pickup system of the image pickup apparatus are calculated. Then a parameter for correcting
30 distortion of the image is estimated based on the information of the calculated angles.

According to the patent document 2, an image recording apparatus is proposed to include a diaphragm control means for controlling

a diaphragm stop in a photographic lens system, a compensating filter located in the photographic lens system, and capable of variably controlling density applied to a neighborhood of a center of an image circle, and a filter control means for controlling the compensating filter in conjunction with the diaphragm control means in order to compensate reduction of peripheral light intensity caused by degradation of aperture efficiency at a neighborhood of open diaphragm.

[Patent document 1] Japanese Patent Laid-Open No. H9-294225

10 [Patent document 2] Japanese Patent No. 3461061

[Disclosure of the Invention]

[Problems to be Solved]

[0003]

However, the above conventional methods have a disadvantage in which processing data needs to be transmitted between apparatuses and consequently the processing becomes complicated. That is, in the conventional processing for transmitting image data from an image recording apparatus to an image processing apparatus, a user manually selects an image file and processing software for the image processing apparatus, so that the methods take time.

20 [Means for Solving the Problems]

[0004]

To achieve the above object, the present invention according to claim 1 refers to an image recording apparatus for executing image processing on read image data and recording the image data, characterized by including an image generation means for obtaining the image data, an image processing means for executing image processing based on processing information transmitted together with the image data from the image generation means, and a recording means for recording the image data subjected to the image processing by the image processing means on a recording medium.

The present invention according to claim 2 refers to an image recording apparatus for executing image processing on read image

data, and recording the image data, characterized by including an image generation means for obtaining the image data, an image processing means for executing image processing based on processing information transmitted together with the image data from the image generation means, and a printing control means for controlling to print and output the image data subjected to the image processing by the image processing means.

The present invention according to claim 3 refers to the image recording apparatus according to claim 1 or 2, characterized by including a selection means for selecting the processing information.

The present invention according to claim 4 refers to the image recording apparatus according to claim 1 or 2, characterized in that the processing information is information of distortion aberration at a time of generating the image, and the image processing means executes distortion aberration correction processing based on the information of distortion aberration.

The present invention according to claim 5 refers to the image recording apparatus according to claim 1 or 2, characterized in that the processing information is information of peripheral light intensity at the time of generating the image, and the image processing means executes peripheral light intensity correction processing based on the information of peripheral light intensity.

The present invention according to claim 6 refers to the image recording apparatus according to claim 1 or 2, characterized in that the processing information is information of a lens type, focal length, and a zoom position at the time of generating the image, and the image processing means executes distortion aberration correction processing based on the information of the lens type, the focal length, and the zoom position at the time of generating the image.

The present invention according to claim 7 refers to the image recording apparatus according to claim 1 or 2, characterized in

that the processing information is information of a lens type, focal length, and a zoom position at the time of generating the image, and the image processing means executes peripheral light intensity correction processing based on the information of the lens type, the focal length, and the zoom position at the time of generating the image.

The present invention according to claim 8 refers to the image recording apparatus according to claim 1 or 2, characterized in that the processing information is information of a type of correction processing and a correction value for the generated image, and the image processing means executes correction processing based on the information of the type of the correction processing and the correction value for the generated image.

[Effects of the Invention]

[0005]

According to the present invention, in an image processing means image processing is executed based on processing information transmitted together with image data from an image generation means, and then the image data subjected to the image processing is recorded on a recording medium. Therefore, image processing such as distortion aberration correction, peripheral light intensity correction, etc. may be automatically and simply executed.

[Best Mode for Carrying out the Invention]

[0006]

Embodiments of the present invention are described in detail below by referring to the accompanying drawings.

Fig. 1 shows a schematic block diagram of a first embodiment of an image recording apparatus according to the present invention.

As shown in Fig. 1, a digital camera as the image recording apparatus is provided with a lens 1, a mechanical structure 2 having an auto focus mechanism, a CCD (Charge Coupled Device) 3, a CDS (Correlated Double Sampling) circuit 4, an A/D converter 5, a digital signal processing circuit 6, a CPU 7, a ROM 8, a RAM 9,

a memory card 10, a memory card I/F 10a, an LCD 11, an image compression/extraction circuit 12, a driver 13, an SG 14, an operating portion 15, an image display control circuit 16, an image display memory 17, a transmission I/F 18, an internal memory 19, and so forth.

A lens unit includes the lens 1, the mechanical structure 2 having an auto focus (AF) mechanism, a diaphragm and a filter portion, and so forth. A mechanical shutter of the mechanical structure 2 shields light during reading out charge stored on a CCD-type image pickup device.

The CCD 3 is a circuit for converting an image input through the lens unit to electrical signals (analogue image data), and the CDS circuit 4 is a circuit for reducing noise for the CCD-type image pickup device. Further, the A/D converter 5 converts the analogue image data input from the CCD 3 through the CDS circuit 4, to digital image data. That is, output signals from the CCD 3 pass through the CDS circuit 4, and are converted by the A/D converter 5 to digital signals at optimum sampling frequency (e.g. an integral multiple of sub-carrier frequency of an NTSC signal).

In addition, the digital signal processing circuit 6 sorts out the image data input from the A/D converter 5 into color difference data and brightness data, and executes various processing, correction and data processing for image compression/extraction. An image compression/extraction circuit 12 performs, for example, orthogonal transformation/inverse orthogonal transformation which is one process of compression/extraction in conformity with the JPEG, Huffman coding/decoding which is another process of compression/extraction in conformity with the JPEG, and so forth.

The ROM 8 stores a program, data necessary for executing a program, etc., and the RAM 9 temporarily stores data to be processed by the CPU 7. Compressed image data is stored in the memory card 10 and the internal memory 19, as image data files.

The image display control circuit 16 displays a monitor image

or a reproduced image on the LCD 11, and a set state of the digital still camera, for example, a set mode display, an error display and so forth.

The operating portion 15 has buttons for selecting a function, instructing photographing, and performing other various settings from outside. In one example, a shutter release button generally used at a time of photographing, a zoom key, a mode dial, a strobe button, a macro button, a menu key for displaying guidance on a screen and carrying out a function by operation, up/down/left/right cursor keys, an enter key, a cancel key, a select key, a power button for turning on/off the digital camera, and so forth are employed. Each button may perform other functions according to each operation mode such as a photographing mode, a reproducing mode, a transmission mode, and so forth.

Based on a control program stored in the ROM 8, the CPU 7 controls operations of each part of the digital still camera according to external instructions from an operating portion 15, etc. by way of a photographing program in the control program, and executes processing on image data by way of an image processing program in the control program. For example, the CPU 7 executes recording operation control of image data for the memory card 10, reproducing operation control of an image data file recorded in the memory card 10, connection processing on image data, correction processing on image data, and so forth. That is, the CPU 7 functions as an image generation means (photographing means), a reproduction control means, a communication means, an image processing means, and so forth.

The image display memory 17 stores a plurality of planes, and image display control is carried out in a form of a composite display superposing each plane. While superposing each plane a display position, display magnification, brightness, a transparent attribute, etc. are controlled on a plane to plane basis.

[0007]

A data structure subjected to processing by the image recording apparatus of Fig. 1 is explained below.

Fig. 2 is a diagram showing an example of a data structure subjected to processing by the image recording apparatus of Fig. 1, and Fig. 3 is an explanatory diagram showing a process for a more specific data structure.

As shown in Fig.2, various data (data 1 to data N) are added to image data as processing information. As such processing information, for example, information relating to lens characteristic (i.e. information relating to distortion aberration in terms of distortion aberration correction), information of peripheral light intensity as information relating to peripheral light intensity correction, and so forth are stored.

In addition, as shown in Fig. 3, if information of a lens type, focal length at a time of photographing, and a zoom position are added to the data 1, data 2 and data 3 respectively, and if tables including distortion aberration correction values and peripheral light intensity correction values in accordance with focal length and zoom position are prepared in advance for each lens type, then by way of image correction processing program 21, the CPU 7 determines a table according to a lens type, and determines correction values according to focal length and a zoom position, and then corrected image data 22 is obtained in compliance with the correction values. That is, image processing may be selected by way of selecting various data (data 1 to data N) according to need.

Thus, data results from generated image data on which distortion aberration correction processing is executed according to distortion aberration information, data results from generated image data on which peripheral light intensity correction processing is executed according to peripheral light intensity information, and so forth may be recorded.

Further, data results from generated image data on which

distortion aberration correction processing is executed according to a lens type, focal length and a zoom position, data results from generated image data on which peripheral light intensity correction processing is executed according to a lens type, focal length and a zoom position, and so forth may be recorded.

[0008]

A relation between a photographing operation and an image processing operation is described below by referring to the Fig. 4.

According to the first embodiment of the present invention, if the shutter release button is pushed and the photographing program is initiated, then image data is generated and the image data is transferred together with processing information to the image processing program, and after completion of predetermined correction processing in conformity with the processing information, the image data subjected to the correction is transferred to the photographing program and is recorded on the memory card 10.

Further, in the image recording apparatus of the embodiment, the CPU 7 constitutes an image generation means by controlling each part of the apparatus according to the photographing program, and the CPU 7 also constitutes an image processing means by controlling each part of the apparatus according to the image processing program.

Fig. 4 is a flowchart showing a relation between a photographing operation and an image processing operation of the image recording apparatus of Fig. 1. In the embodiment, the CPU 7 is configured to execute the image processing program and the photographing program.

If the operation of both the image processing program and the photographing program is started, whether or not photographing is started is judged (Step 101 and Step 201), and then whether or not processing to be executed exists is judged (Step 102 and Step 202). In the photographing program, if it is determined that processing

to be executed exists ('YES' in the Step 202), then the processing information and the image data are transferred to the image processing program side (Step 203).

In the image processing program, the processing information and the image data transferred to the image processing program side are received (Step 103), then image processing is executed on the image data in accordance with the processing information (Step 104), and the image data subjected to the image processing is transferred to the photographing program side (Step 105).

10 In the photographing program, after transferring the processing information and the image data to the image processing program side in the Step 203, whether or not processing is idling is judged (Step 204). In the case it is determined that processing to be executed exists ('YES' in the Step 204), then the image data subjected to the image processing and transferred to the photographing program side is received (Step 205), and the image data subjected to the processing is recorded on a file, i.e. the memory card 60 (Step 206).

Thus, image processing such as distortion aberration correction or peripheral light intensity correction may be executed automatically and simply according to processing information added to image data.

[0009]

A second embodiment of the image recording apparatus according to the present invention is described below.

Fig. 5 is a schematic block diagram showing the second embodiment of an image recording apparatus according to the present invention.

As shown in Fig. 5, an MFP (Multifunction Printer) as the image recording apparatus is provided with a CPU 30 for executing processing by way of a program, a ROM 31 for storing a program and font data, a RAM 32 for temporarily storing print data and video data converted to a print pattern, a host I/F 33 for connecting a host machine such as a PC, a panel control portion 35 and an

operation panel 34 for performing an interface function of changing control operations, a printer I/F 37 and a printer portion 36 for performing a printing operation, a scanner I/F 39 and a scanner portion 38 for performing a scanning operation, and so forth. Further, a facsimile controller, a memory card interface, a USB port for directly connecting a digital camera, and so forth may be employed.

A data structure subjected to processing by the image recording apparatus of Fig. 5 is explained below.

Fig. 6 is an explanatory diagram showing a process for a data structure subjected to the processing by the image recording apparatus of Fig. 5.

As shown in Fig. 6, processing information is added to image data. In such a case, for example, the processing information includes a processing type of distortion aberration correction, a correction value concerning distortion aberration, a processing type of peripheral light intensity correction, and a correction value concerning peripheral light intensity. Therefore, the CPU 30 executes distortion aberration correction processing and peripheral light intensity correction processing by way of the image correction processing program 21, and then corrected image data 23 is obtained through the correction processing. That is, image processing may be selected by way of selecting various data according to need. Thus, the data subjected to correction processing based on a correction value and a processing type of correction for the generated image may be recorded.

In this connection, the processing information described in the first embodiment may be applied to the second embodiment. Reversely, the processing information described in the second embodiment may be applied to the first embodiment.

[0010]

A relation between a printing control operation and an image processing operation is described below by referring to the Fig.

7.

According to the second embodiment of the present invention, if a printing start button is pushed and a printing control program is initiated, then image data is generated and the image data is transferred together with processing information to an image processing program. After completion of predetermined correction processing in conformity with the processing information, the image data subjected to the correction processing is transferred to the printing control program, and then a printing operation is performed.

The CPU 30 constitutes a printing control means by controlling each part of the apparatus according to the printing control program, and the CPU 30 also constitutes an image processing means by controlling each part of the apparatus according to the image processing program.

Fig. 7 is a flowchart showing a relation between a printing control operation and an image processing operation of the image recording apparatus of Fig. 5. The image processing program and the printing control program are configured for the CPU 30 to execute.

If the operation of both the image processing program and the printing control program is started, whether or not scanning operation is started is judged (Step 301 and Step 401), and then whether or not processing to be executed exists is judged (Step 302 and Step 402). In the printing control program, if it is determined that processing to be executed exists ('YES' in the Step 402), then the processing information and the image data are transferred to the image processing program side (Step 403).

In the image processing program, the processing information and the image data transferred to the image processing program side are received (Step 303), then image processing is executed on the image data in accordance with the processing information (Step 304), and the image data subjected to the image processing is transferred

to the printing control program side (Step 305).

In the printing control program, after transferring the processing information and the image data to the image processing program side in the Step 403, whether or not processing is idling is judged (Step 404). In the case it is determined that processing to be executed exists ('YES' in the Step 404), then the image data subjected to the processing and transferred to the printing control program side is received (Step 405), and the image data subjected to the processing is transferred to the printer portion 36, and is printed (Step 406).

Thus, as is the case with the first embodiment of the present invention, image processing such as distortion aberration correction or peripheral light intensity correction may be automatically and simply executed according to processing information added to image data.

Although a digital camera and an MFP are cited and explained as an example of image recording apparatus in the above embodiments, the digital camera and the MFP are only an example, and the present invention may be applied to an image forming apparatus such as a copier, a printer, a facsimile, and so forth.

[Brief Description of the Drawings]

[0011]

[Fig. 1] A schematic block diagram showing a first embodiment of an image recording apparatus according to the present invention.

[Fig. 2] A diagram showing an example of a data structure subjected to processing by the image recording apparatus of Fig. 1.

[Fig. 3] An explanatory diagram showing a process for a more specific data structure subjected to processing by the image recording apparatus of Fig. 1.

[Fig. 4] A flowchart showing a relation between a photographing operation and an image processing operation of the

image recording apparatus of Fig. 1.

[Fig. 5] A schematic block diagram showing a second embodiment of an image recording apparatus according to the present invention.

5 [Fig. 6] An explanatory diagram showing a process for a data structure subjected to processing by the image recording apparatus of Fig. 5.

[Fig. 7] A flowchart showing a relation between a printing control operation and an image processing operation of the image recording apparatus of Fig. 5.

10 [Reference Numerals]

[0012]

Lens 1, Mechanical structure 2, CCD 3, CDS circuit 4, A/D converter 5, Digital signal processing circuit 6, CPU 7, ROM 8, RAM 9, Memory card 10, LCD 11, Image compression/extraction circuit 12, Driver 13, SG 14, Operating portion 15, Image display control circuit 16, Image display memory 17, Internal memory 19, Correction value table 20, Image correction processing program 21, Corrected image data 22, Corrected image data 23, CPU 30, ROM 31, RAM 32, 20 Operation panel 34, Panel control portion 35, Printer portion 36, Scanner portion 38.

[Name of Document] Abstract of the Disclosure

[Abstract]

[Objectives of the Invention] To provide an image recording apparatus capable of automatically and simply executing image processing such as distortion aberration correction or peripheral light intensity correction.

[Means for Achieving the Objectives] An image recording apparatus for executing image processing on read image data and recording the image data subjected to the image processing, including an image generation means for obtaining the image data, an image processing means for executing processing on the image data based on processing information, and a recording means for recording the image data

on a recording medium. Further the image recording apparatus is configured to transmit the image data and the processing information from the image generation means to the image processing means, then execute image processing on the image data based on the processing
5 information in the image processing means, transmit the image data subjected to the image processing from the image processing means to the image generation means, and record the image data subjected to the image processing in the image generation means, on the recording medium.

10 [Selected Drawing] Fig. 4

1. مؤلفی

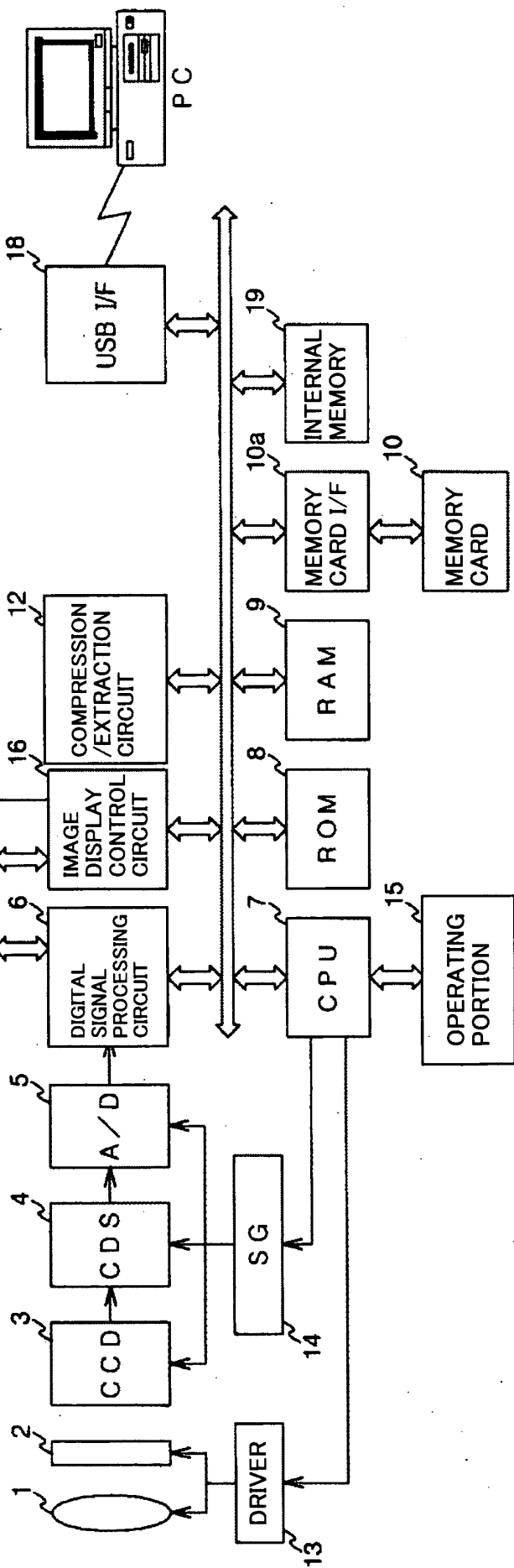


Fig. 2

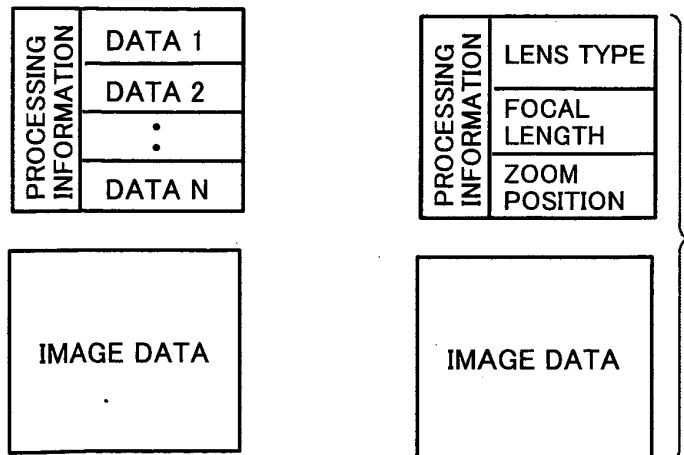


Fig. 3

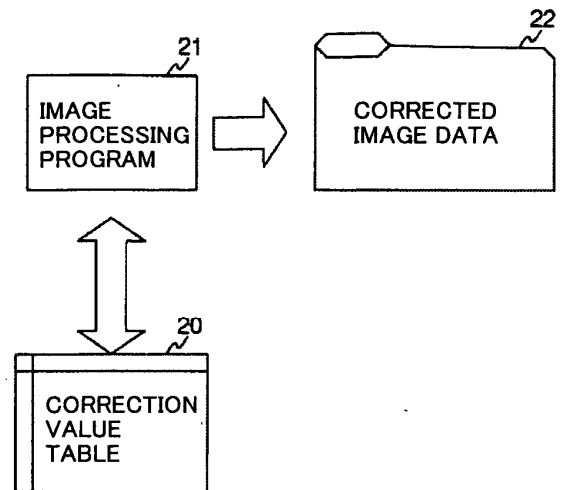


Fig. 4

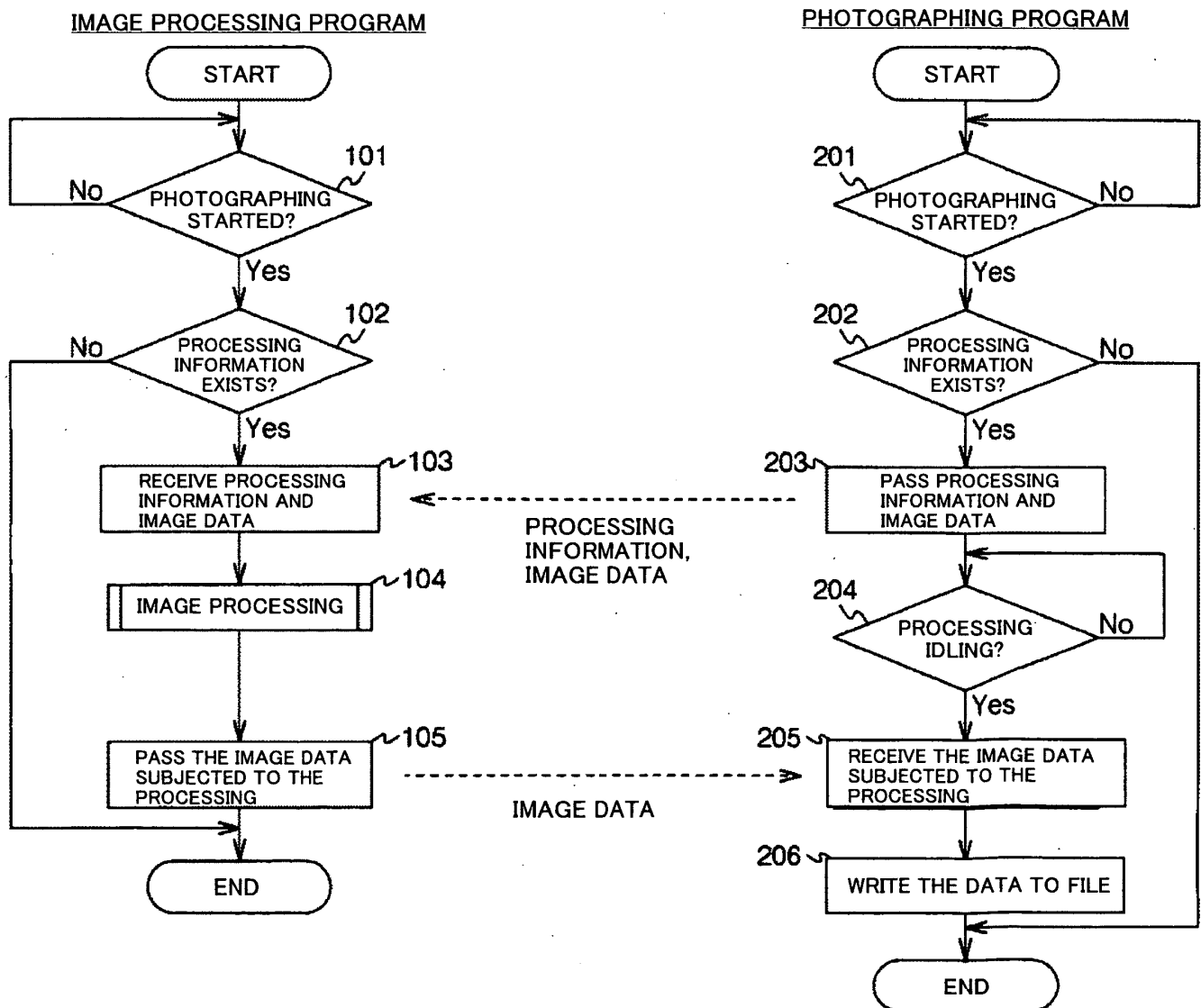


Fig. 5

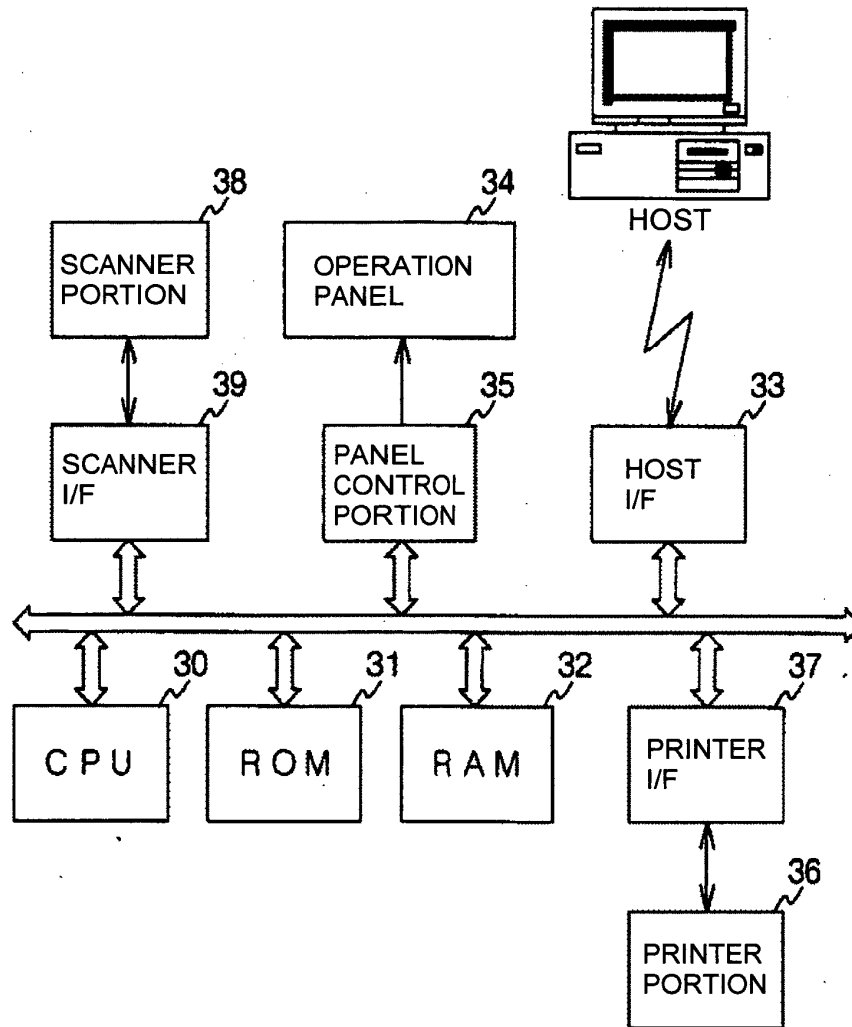


Fig. 6

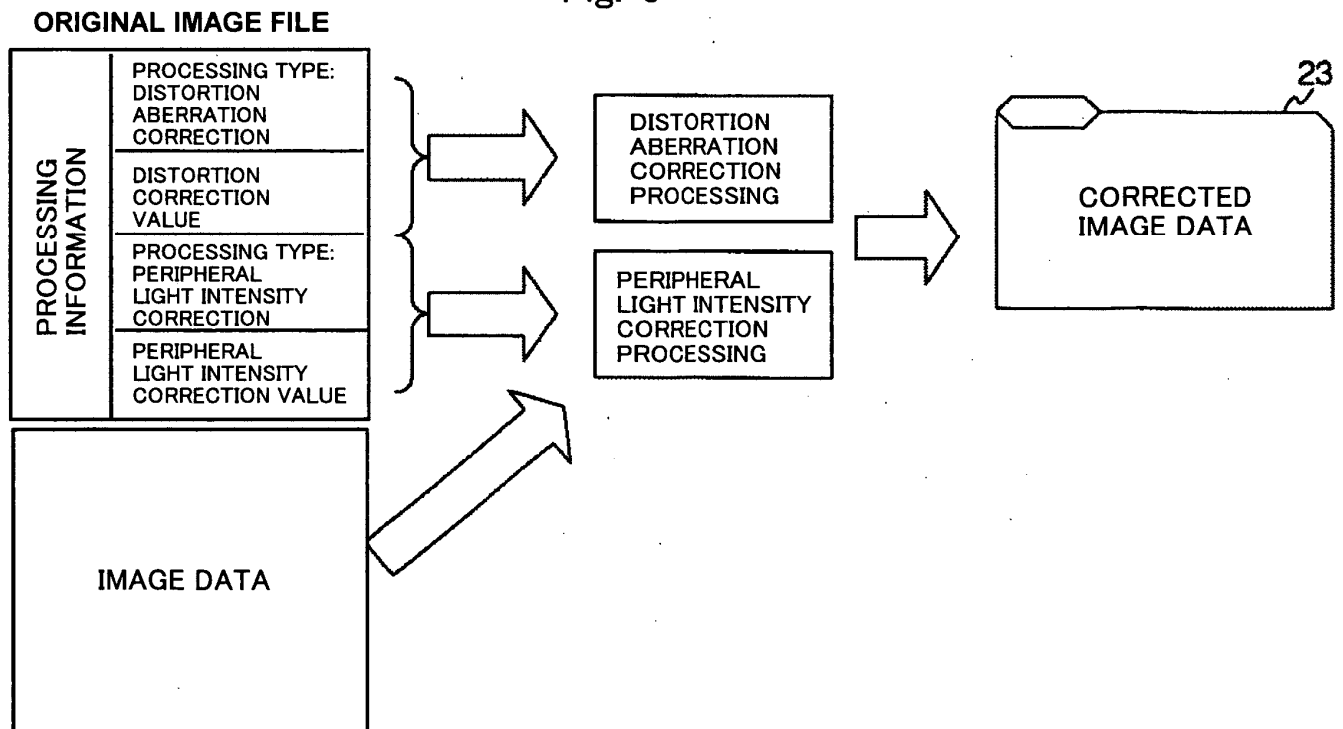


Fig. 7

