



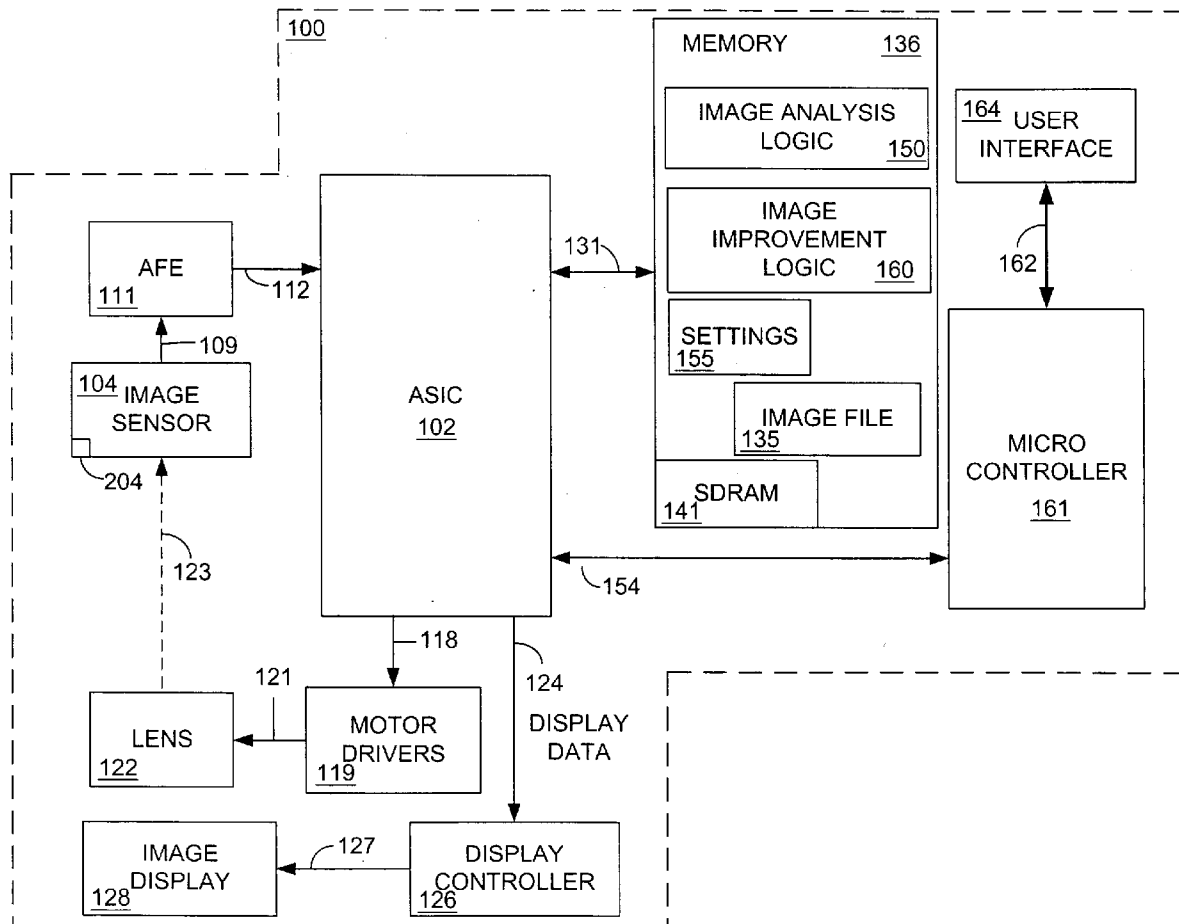
US 20040252217A1

(19) **United States**(12) **Patent Application Publication**
Battles et al.(10) **Pub. No.: US 2004/0252217 A1**(43) **Pub. Date: Dec. 16, 2004**(54) **SYSTEM AND METHOD FOR ANALYZING A
DIGITAL IMAGE****Publication Classification**(51) **Int. Cl.⁷ H04N 5/222**(52) **U.S. Cl. 348/333.01**(76) **Inventors: Amy E. Battles, Windsor, CO (US);
Dan L. Dalton, Greeley, CO (US);
Shelley I. Moore, Ft. Collins, CO (US);
Andrew C. Goris, Loveland, CO (US)**(57) **ABSTRACT**

Correspondence Address:

**HEWLETT PACKARD COMPANY
P O BOX 272400, 3404 E. HARMONY ROAD
INTELLECTUAL PROPERTY
ADMINISTRATION
FORT COLLINS, CO 80527-2400 (US)**

A system and method for analyzing a captured image is disclosed. In one embodiment, a system for analyzing a digital image comprises an image sensor including a plurality of image capture elements, each of the image capture elements configured to capture image data. The image data is captured according to at least one setting. The system also includes a memory for storing the image data and logic for dynamically analyzing the image data to determine at least one characteristic of the image data, and a display for communicating a description of the characteristic.

(21) **Appl. No.: 10/461,600**(22) **Filed: Jun. 12, 2003**

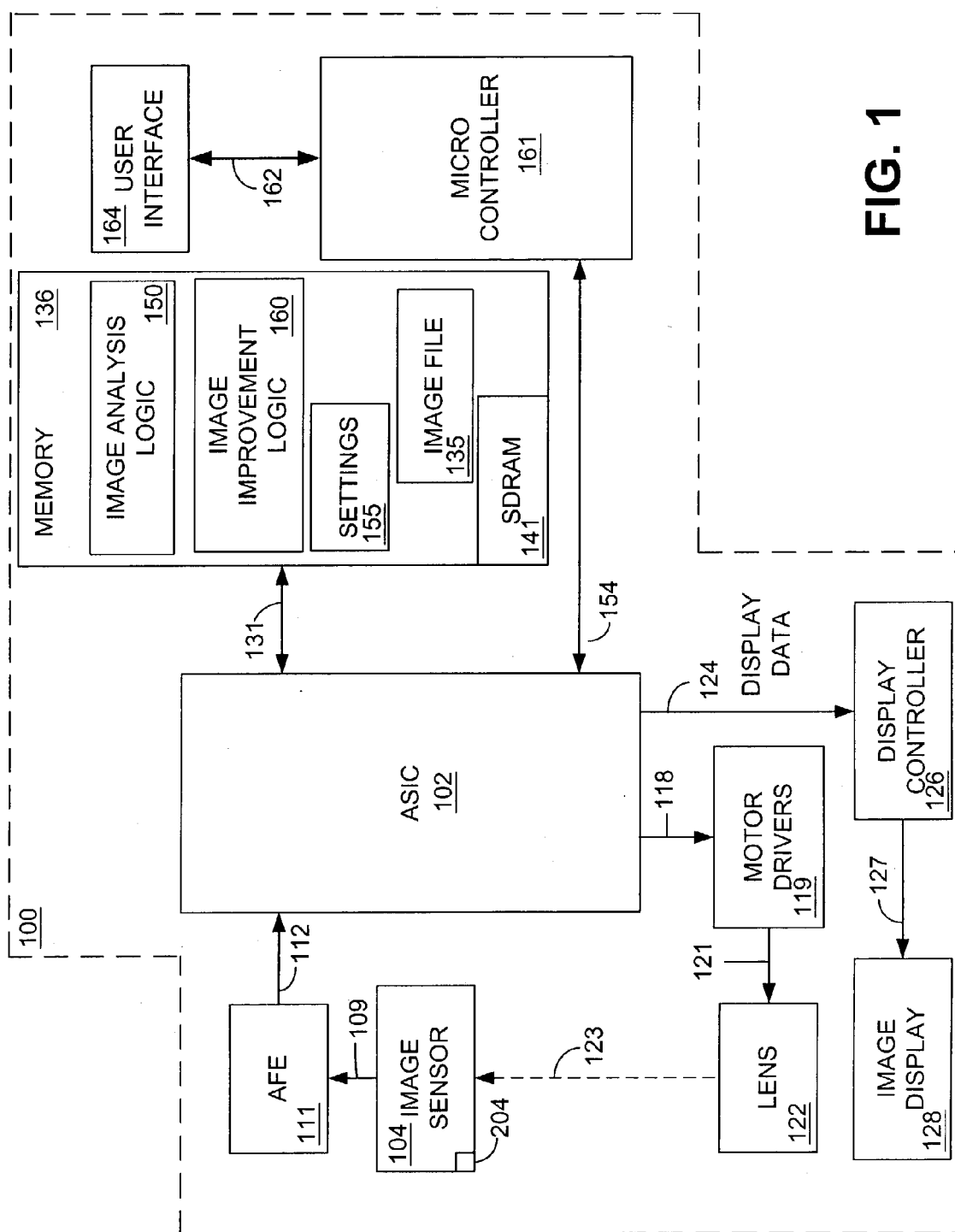


FIG. 1

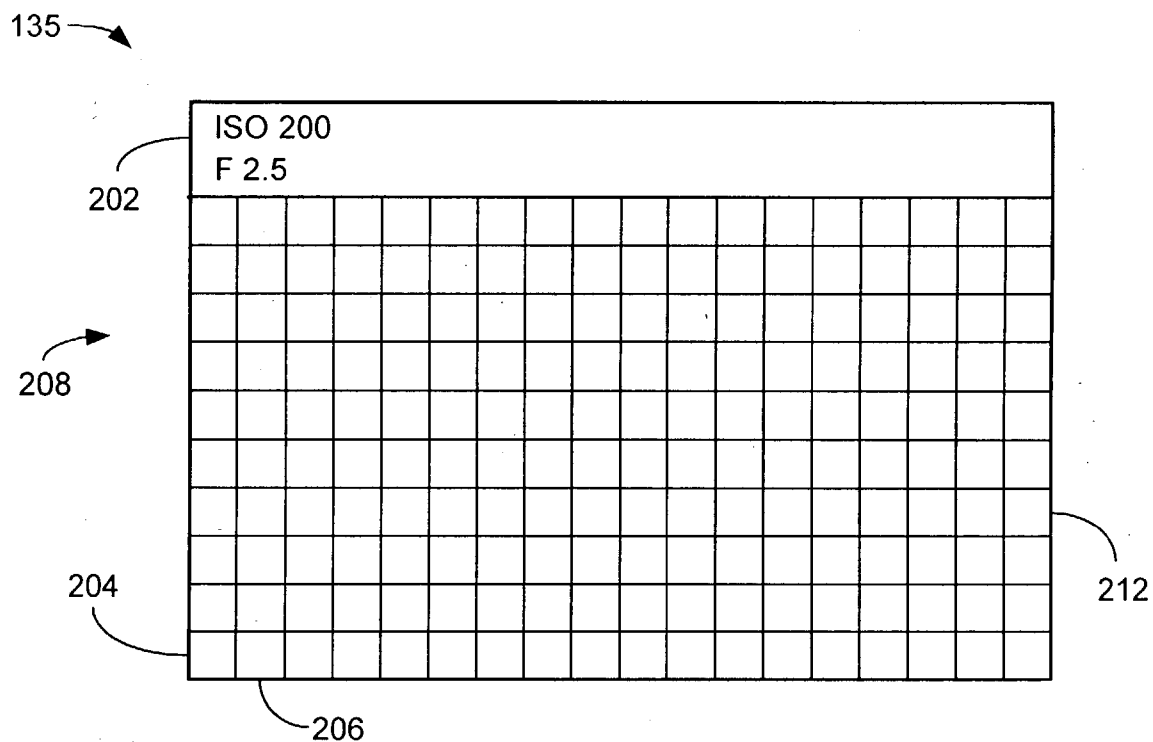


FIG. 2

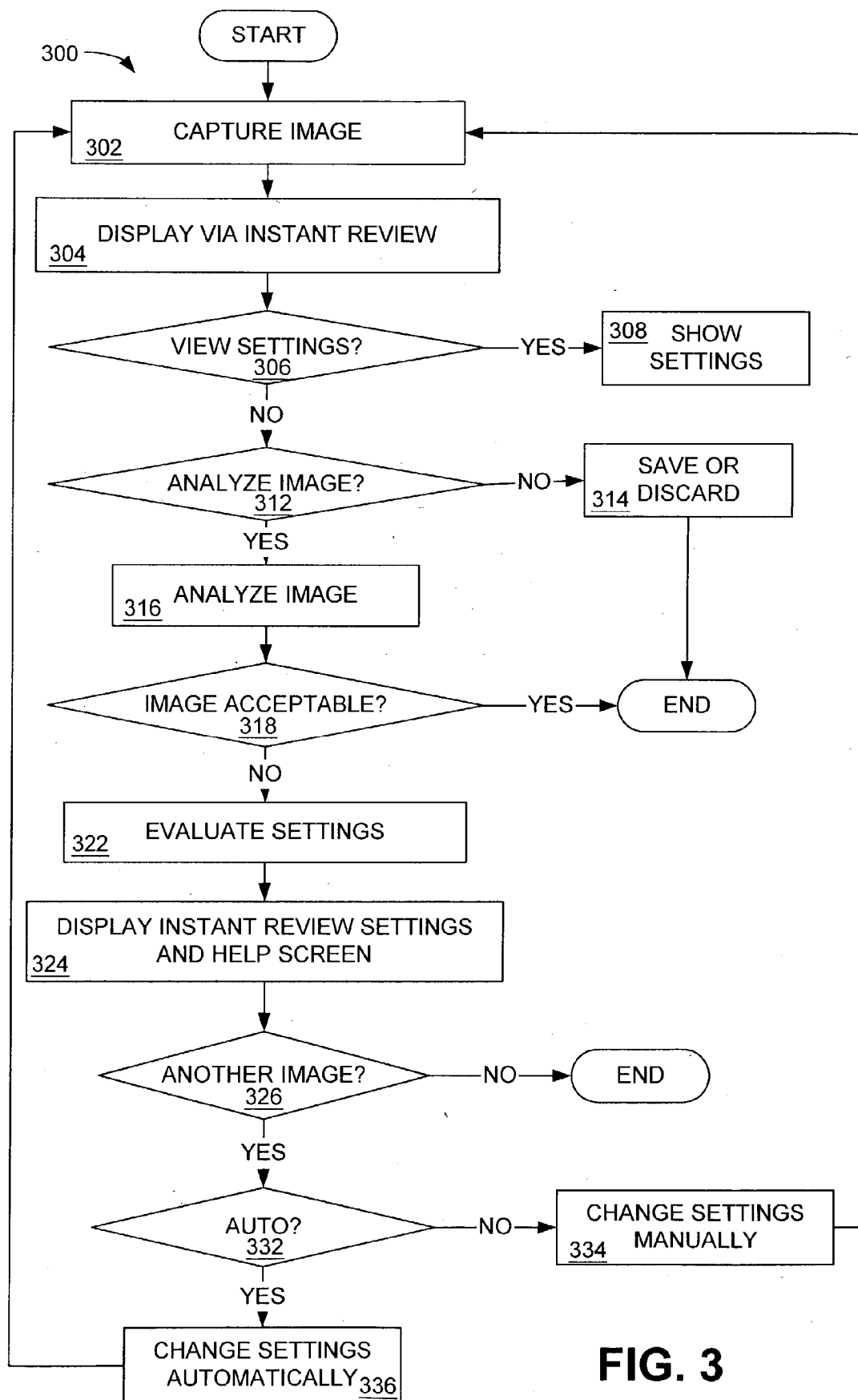


FIG. 3

400 →

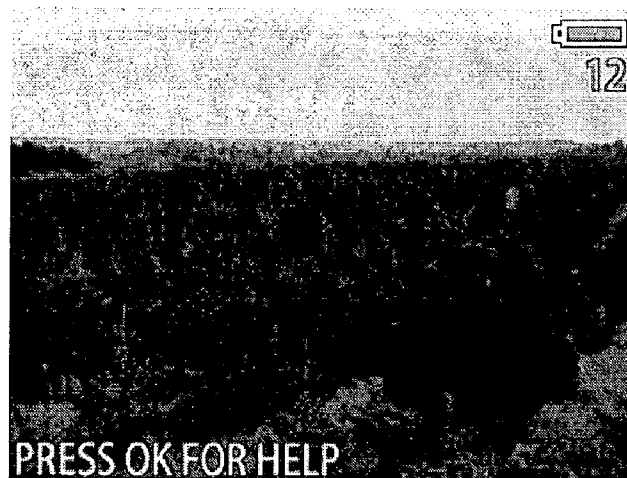
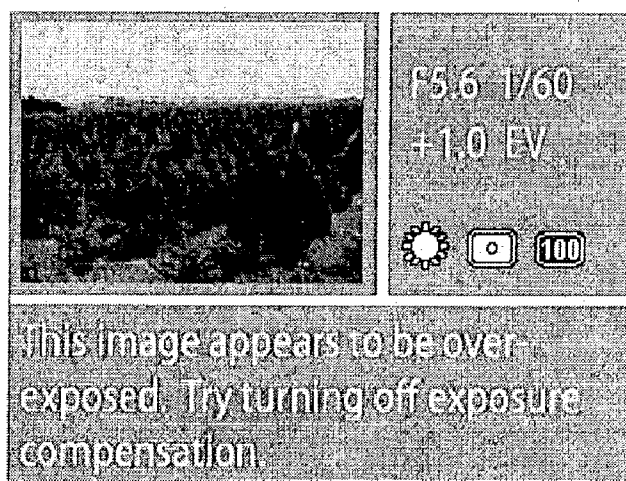


FIG. 4A

410 →

402 →



← 404

← 406

410 →

FIG. 4B

SYSTEM AND METHOD FOR ANALYZING A DIGITAL IMAGE

TECHNICAL FIELD

[0001] The present invention relates generally to digital photography, and, more particularly, to a system and method for analyzing a digital image.

BACKGROUND OF THE INVENTION

[0002] With the proliferation of low cost microprocessors, memory and image capture electronics, digital cameras are gaining popularity and are becoming more and more widely available to a larger number of consumers. One of the advantages that a digital camera enjoys over a conventional film camera is that when a digital camera captures an image, the image is stored electronically in a memory element associated with the camera and is available for immediate viewing. For example, it is common to capture an image using a digital camera and then immediately display the captured image to the user on a display screen associated with the digital camera. This ability to immediately view the image is commonly referred to as "instant review." The ability to immediately review the captured image allows the user to immediately decide if the image is satisfactory, worth keeping and perhaps printing.

[0003] Unfortunately, many characteristics for determining whether the image is satisfactory may not be readily visually noticeable on the small display associated with many digital cameras. For example, while the image may appear to be in focus when viewed on the camera display, the image may appear out of focus when printed. Unfortunately, printing the image is a time consuming and costly way to determine whether the image is satisfactory.

[0004] Therefore, it would be desirable to determine the quality of various characteristics associated with the captured image prior to printing the image. Further, if the image is deemed unacceptable, it would be desirable to provide instructions to the user for improving a subsequent image.

SUMMARY OF THE INVENTION

[0005] A system and method for analyzing a digital image is disclosed. In one embodiment, a system for analyzing a digital image comprises an image sensor including a plurality of image capture elements, each of the image capture elements configured to capture image data. The image data is captured according to at least one setting. The system also includes a memory for storing the image data, logic for analyzing the image data to determine at least one characteristic of the image data, and a display for communicating a description of the characteristic.

[0006] Related methods of operation and computer readable media are also provided. Other systems, methods, features, and advantages of the invention will be or become apparent to one with skill in the art upon examination of the following figures and detailed description. It is intended that all such additional systems, methods, features, and advantages be included within this description, be within the scope of the invention, and be protected by the accompanying claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] Embodiments of the present invention, as defined in the claims, can be better understood with reference to the

following drawings. The components within the drawings are not necessarily to scale relative to each other, emphasis instead being placed upon clearly illustrating the principles of the present invention.

[0008] FIG. 1 is a block diagram illustrating a digital camera constructed in accordance with an embodiment of the invention.

[0009] FIG. 2 is a graphical illustration of an image file.

[0010] FIG. 3 is a flow chart describing the operation of an embodiment of the image analysis and improvement logic of FIG. 1.

[0011] FIGS. 4A and 4B are graphical illustrations showing an instant review screen and a help screen in accordance with an embodiment of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0012] The invention described below is applicable to any digital camera that provides an "instant review" function. The system and method for analyzing a captured image can be implemented in hardware, software, firmware, or a combination thereof. In the preferred embodiment(s), the system and method for analyzing a captured image is implemented using a combination of hardware, software or firmware that is stored in a memory and that is executed by a suitable instruction execution system. The hardware portion of the system and method for analyzing a captured image can be implemented with any or a combination of the following technologies, which are all well known in the art: a discrete logic circuit(s) having logic gates for implementing logic functions upon data signals, an application specific integrated circuit (ASIC) having appropriate combinational logic gates, a programmable gate array(s) (PGA), a field programmable gate array (FPGA), etc. The software portion of the system and method for analyzing a captured image can be stored in one or more memory elements and executed by a suitable general purpose or application specific processor.

[0013] The software for analyzing a captured image, which comprises an ordered listing of executable instructions for implementing logical functions, can be embodied in any computer-readable medium for use by or in connection with an instruction execution system, apparatus, or device, such as a computer-based system, processor-containing system, or other system that can fetch the instructions from the instruction execution system, apparatus, or device and execute the instructions. In the context of this document, a "computer-readable medium" can be any means, which contain, store, communicate, propagate, or transport the program for use by or in connection with the instruction execution system, apparatus, or device.

[0014] FIG. 1 is a block diagram illustrating a digital camera 100 constructed in accordance with an embodiment of the invention. In the implementation to be described below, the digital camera 100 includes an application specific integrated circuit (ASIC) 102 that executes the image analysis logic 150 of the invention. As will be described below, the image analysis logic 150 can be software that is stored in memory and executed by the ASIC 102. In an alternative embodiment, the image analysis logic 150 may be implemented in firmware, which can be stored and

executed in the ASIC 102. Further, while illustrated using a single ASIC 102, the digital camera 100 may include additional processors, digital signal processors (DSPs) and ASICs.

[0015] The ASIC 102 may also include other elements, which are omitted for simplicity. The ASIC 102 controls the function of various aspects of the digital camera 100.

[0016] The camera 100 includes an image sensor 104. The image sensor 104 may comprise a charge coupled device (CCD) array or an array of complementary metal oxide semiconductor (CMOS) sensors. Regardless of whether the image sensor 104 comprises an array of individual CCD elements or CMOS sensors, each of the elements in the array comprises a pixel (picture element) of the image sensor 104. An exemplary pixel is indicated using reference numeral 204. The pixels in the image sensor 104 are typically arranged in a two-dimensional array. For example, an image array may comprise 2272 pixels in length and 1712 pixels in height.

[0017] The image sensor 104 captures an image of a subject by converting incident light into an analog signal, and sends this representation of the image via connection 109 to an analog front end (AFE) processor 111. The analog front end processor 111 typically includes an analog-to-digital converter for converting the analog signal received from the image sensor 104 into a digital signal. The analog front end processor provides this digital signal as image data via connection 112 to the ASIC 102 for image processing.

[0018] The ASIC 102 couples via connection 118 to one or more motor drivers 119. The motor drivers 119 control the operation of various parameters of the lens 122 via connection 121. For example, lens controls, such as zoom, focus, aperture and shutter operations can be controlled by the motor drivers 119. The connection 123 between the lens 122 and the image sensor 104 is shown as a dotted line to illustrate the operation of the lens 122 focusing on a subject and communicating light to the image sensor 104, which captures the image provided by the lens 122.

[0019] The ASIC 102 also sends display data via connection 124 to a display controller 126. The display controller may be, for example, a national television system committee (NTSC)/phase alternate line (PAL) encoder, although, depending on the application, other standards for presenting display data may be used. The display controller 126 converts the display data from the ASIC 102 into a signal that can be forwarded via connection 127 to image display 128. The image display 128, which can be, for example a liquid crystal display (LCD) or other display, displays the captured image to the user of a digital camera 100, and is typically the color display located on the digital camera 100. Depending on the configuration of the digital camera 100, the image shown to a user on the image display 128 may be shown before the image is captured and processed, in what is referred to as "live view" mode, or after the image is captured and processed, in what is referred to as "instant review" mode, or, if the image was previously captured, in what is referred to as "review" or "playback" mode. The playback mode can be invoked via a menu command. The instant review mode is typically used to display the captured image to the user immediately after the image is captured and the playback mode is typically used to display the captured image to the user sometime after the image has been captured and stored in memory.

[0020] The instant review mode allows the user of the camera 100 to immediately view the image on the display 128. Unfortunately, because the image display 128 is typically small, only gross features, or characteristics, of the image can be visually observed. Further, the image display 128 may not accurately reproduce color, tint, brightness, etc., which may further make it difficult for a user to determine the quality of the captured image. The difficulty in visually determining the quality of the captured image leads to the possibility of saving an image that may include deficiencies that, if visually detected, would likely cause the user to discard the image and attempt to capture another image having better quality. To determine whether the image includes deficiencies that may not be apparent to the user when viewing the captured image on the image display 128 in the instant review mode, the image analysis logic 150 dynamically analyzes one or more characteristics of the captured image and presents to the user, via the image display 128 and a user interface, an analysis of the captured image. An exemplary dynamic analysis of the data for each pixel in a captured image is described below in FIG. 2. For example, information associated with each pixel may be analyzed to determine whether a significant number of the pixels forming the image is either black or white. A predominance of white pixels may be indicative of overexposure and a predominance of black pixels may be indicative of underexposure.

[0021] Similar dynamic analyses can be performed to determine whether an image is in focus or to determine the white balance the image is correct. To determine whether an image is in focus, pixels in an image are examined to determine whether sharp transitions exist between pixels. For example, a black pixel adjoining a white pixel may indicate that the image is in focus, while a black pixel separated from a white pixel by a number of gray pixels may indicate that the image is out of focus.

[0022] White balance is a characteristic of the image that generally refers to the color balance in the image to ensure that white portions of the image appear white. An image in which each pixel is a different shade of the same color may indicate an image in which the white balance is improperly adjusted.

[0023] Further, an image improvement logic 160 may be provided to present to the user a recommendation in the form of instructions presented on the image display 128 on ways in which to possibly improve a subsequent image by, for example, adjusting a condition under which the image was captured or adjusting a setting used to capture the image. As will be described below, the image analysis logic 150 analyzes the captured image and, optionally, the camera settings used to capture the image, and determines a value of one or more characteristics of the captured image. For example, to determine whether the exposure of the image is satisfactory, if a predefined number of white pixels in the image is exceeded, then the image analysis logic 150 may indicate that the image is overexposed. Further, if the image analysis logic 150 determines that one or more characteristics of the captured image is not satisfactory to yield a high quality image, the image improvement logic 160 determines whether a condition used to capture the image should be adjusted, or whether a camera setting should be adjusted, to improve a subsequent image. For example, if the image analysis logic 150 determines that the image is underex-

posed, the image improvement logic **160** can determine that a subsequent image may be improved by activating the camera flash for a subsequent image. When the image analysis logic **150** analyzes the data representing the captured image and the settings used to capture the image, the analysis can be used by the image improvement logic **160** to suggest adjustments to the settings to improve a subsequent image. These suggested adjustments to the camera settings can be presented to the user on a help screen via the image display **128**, or, in an alternative configuration, can be automatically changed for a subsequent image.

[0024] The ASIC **102** couples to a microcontroller **161** via connection **154**. The microcontroller **161** can be a specific or a general purpose microprocessor that controls the various operating aspects and parameters of the digital camera **100**. For example, the microcontroller **161** is coupled to a user interface **164** via connection **162**. The user interface **164** may include, for example but not limited to, a keypad, one or more buttons, a mouse or pointing device, a shutter release, and any other buttons or switches that allow the user of the digital camera **100** to input commands. Further, the image analysis logic **150** and the image improvement logic **160** communicate with the user via the user interface **164**, through the image display **128**.

[0025] The ASIC **102** also couples to one or more different memory elements, collectively referred to as memory **136**. The memory **136** may include memory internal to the digital camera **100** and/or memory external to the digital camera **100**. The internal memory may, for example, comprise flash memory and the external memory may comprise, for example, a removable compact flash memory card. The various memory elements may comprise volatile, and/or non-volatile memory, such as, for example but not limited to, synchronous dynamic random access memory (SDRAM) **141**, illustrated as a portion of the memory **136** and flash memory. Furthermore, the memory elements may comprise memory distributed over various elements within the digital camera **100**.

[0026] The ASIC **102** couples to memory **136** via connection **131**. The memory **136** includes the image analysis logic **150**, the image improvement logic **160**, the settings file **155** and the various software and firmware elements and components (not shown) that allow the digital camera **100** to perform its various functions. The memory also stores the image file **135**, which represents a captured image. When the system and method for analyzing an image is implemented in software, the software code (i.e., the image analysis logic **150**) is typically stored in the memory **136** and transferred to the SDRAM **141** to enable the efficient execution of the software in the ASIC **102**. The settings file **155** comprises the various settings used when capturing an image. For example, the exposure time, aperture setting (f-stop), shutter speed, white balance, flash on or off, focus, contrast, saturation, sharpness, ISO speed, exposure compensation, color, resolution and compression, and other camera settings may be stored in the settings file **155**. As will be described below, the settings file **155** may be accessed by the image analysis logic **150** to analyze a captured image by, in one example, determining the camera settings used to capture the image that is under analysis.

[0027] The ASIC **102** executes the image analysis logic **150** so that after an image is captured by the image sensor

104, the image analysis logic **150** analyzes various characteristics of the captured image. These characteristics may include characteristics of the captured image, or alternatively, may include the settings used to capture the image. Further, if the image improvement logic **160** determines that the image could be improved by changing one or more of the conditions under which the image was captured, or by changing one or more camera settings, then the image improvement logic **160** can either suggest these changes via the user interface **164** and the image display **128**, or can automatically change the settings and prepare the camera for a subsequent image.

[0028] FIG. 2 is a graphical illustration of an image file **135**. The image file **135** includes a header portion **202** and a pixel array **208**. The pixel array **208** comprises a plurality of pixels, exemplary ones of which are illustrated using reference numerals **204**, **206** and **212**. Each pixel in the pixel array **208** represents a portion of the captured image represented by the image file **135**. An array size can be, for example, 2272 pixels wide by 1712 pixels high. When processed, the image file **135** can also be represented as a table of values for each pixel and can be stored, for example, in the memory **136** of FIG. 1. For example, each pixel has an associated red (R), green (G) and blue (B) value. The value for each R, G and B component can be, for example, a value between 0 and 255, where the value of each R, G and B component represents the color that the pixel has captured. For example, if pixel **204** has respective R, G and B values of 0, 0 and 0, respectively, (or close to 0,0,0) the pixel **204** represents the color black, or is close to black. Conversely, for the pixel **212**, a respective value of 255 (or close to 255) for each R, G and B component represents the color white, or close to white. R, G and B values between 0 and 255 represent a range of colors between black and white. The data for each pixel in the image file **135** can be analyzed by the image analysis logic **150** to determine characteristics of the image. For example, characteristics including, but not limited to, the exposure, focus or the white balance of the captured image can be analyzed. A predominance of white pixels may be indicative of overexposure and a predominance of black pixels may be indicative of underexposure. To determine whether an image is in focus, pixels in an image are analyzed to determine whether sharp transitions exist between pixels. For example, a black pixel adjoining a white pixel may indicate that the image is in focus, while a black pixel separated from a white pixel by a number of gray pixels may indicate that the image is out of focus. An image in which each pixel is a different shade of the same color may indicate a problem with the white balance of the image. An example of determining the exposure will be described below with respect to FIG. 3.

[0029] FIG. 3 is a flow chart **300** describing the operation of an embodiment of the image analysis logic **150** and the image improvement logic **160** of FIG. 1. Any process descriptions or blocks in the flow chart to follow should be understood as representing modules, segments, or portions of code which include one or more executable instructions for implementing specific logical functions or steps in the process, and alternative implementations are included within the scope of the preferred embodiment. For example, functions may be executed out of order from that shown or discussed, including substantially concurrently or in reverse

order, depending on the functionality involved, as would be understood by those reasonably skilled in the art of the present invention.

[0030] In block 302 the image sensor 104 of FIG. 1 captures an image. The image is stored in the memory 136 as image file 135.

[0031] In block 304, the image is displayed to the user of the digital camera 100 via the image display 128 (FIG. 1) during the "instant review" mode. The instant review mode affords the user the opportunity to view the captured image immediately after capture.

[0032] In block 306, the user determines whether they want to view the settings with which the image was captured. If the user wants to view the settings, the settings are displayed to the user on the image display 128 as indicated in block 308. If the user does not want to view the settings, then, in block 312, it is determined whether the user wants the image analysis logic 150 to analyze the image. If the user does not want the image to be analyzed, then, in block 314 the image can be saved or discarded. Alternatively, the image analysis logic 150 can be invoked automatically without user intervention.

[0033] In block 316, the image analysis logic 150 analyzes the data within the image file 135. The data is analyzed to determine various characteristics of the captured image. The following example will use exposure as the characteristic that is analyzed by the image analysis logic 150. However, other characteristics, such as, for example, focus and white balance, can be analyzed.

[0034] When analyzing exposure, the image analysis logic 150 performs a pixel by pixel analysis to determine whether the image includes a predominance of either black or white pixels. In this example, the data associated with each pixel in the image file 135 is analyzed to determine whether a pixel is a black pixel or a white pixel. Each pixel is analyzed to determine its corresponding R, G and B values. For example, if the R, G and B values for the pixel 204 are all zeros, the pixel is considered a black pixel. Each pixel in the pixel array 208 is analyzed in this manner to determine the number of black or white pixels in the pixel array 208 for this image file. A determination in block 306 that a substantial portion of the pixels in the array 208 are black indicates that the image is likely underexposed. Conversely, a determination that many of pixels in the array 208 are white indicates that the image is likely overexposed. Of course, the image may be of an all white or an all black subject, in which case the user may choose to disregard the analysis.

[0035] In an alternative embodiment, the data in the image file 135 can be analyzed in combination with other data available either in the image file 135 or from the settings file 155 in the camera 100. For example, additional data saved in the header 202 of the image file 135 can be analyzed in conjunction with the information from each pixel in the array 208. This information might include, for example, the ISO setting and the aperture setting (f-stop) used to capture the image. These data items can be used in conjunction with the pixel data described above to develop additional information regarding the characteristic of the analyzed image.

[0036] Furthermore, the image analysis logic 150 can also analyze the camera settings used to capture the image and use those settings when analyzing the data in the image file

135 to develop additional data regarding the image file 135. For example, the image analysis logic 150 can access the settings file 155 in the memory 136 of FIG. 1 to determine, for example, whether the flash was enabled, or to determine the position of the lens when the image was captured. In this manner, the image analysis logic 150 can gather a range of information relating to the captured image to perform an analysis on the captured image file 135 to determine whether the captured image meets certain criteria. To illustrate an example, if the image analysis logic 150 determines that the image is underexposed, i.e., the image file contains many black pixels, the image analysis logic 150 can access the settings file 155 to determine whether the flash was active when the image was captured. If the image analysis logic 150 determines that the flash was turned off, the image analysis logic 150 may communicate with the image improvement logic 160 to recommend that the user activate the flash so that a subsequent image may have less likelihood of being underexposed.

[0037] In block 318, it is determined whether the image data analyzed in block 316 represents an acceptable image. This can be an objective determination based on criteria that the user enters into the camera 100 via a user interface 164 (FIG. 1) or can be preset in the camera 100 at the time of manufacture. Alternatively, the determination of whether the image data represents an acceptable image can be a subjective determination based on user input. If the image is determined to be acceptable, then no further calculation is performed.

[0038] If, however, in block 318 the image analysis logic 150 determines that certain conditions under which the image was captured or settings used to capture the image can be changed to improve the image, then, in block 322, the image improvement logic 160 evaluates the settings used to capture the data in the image file 135 to determine whether a condition or setting can be changed to improve the image. In addition, the image improvement logic 160 can also develop recommendations to present to the user of the camera to improve a subsequent image. For example, if the analysis in block 316 suggests that the image was underexposed, the image improvement logic 160 may develop "advice" to be presented to the user. In this example, as will be described below, the image improvement logic 160 may suggest that the user activate the flash to improve a subsequent image. This suggestion may be provided to the user via the image display 128 in conjunction with the user interface 164.

[0039] In block 324, and instant review settings and help screen (to be described below with regard to FIG. 4B) is displayed to the user. The instant review and help screen may include, for example, a thumbnail size display of the image, a display of the settings used to capture the image, an evaluation of the image and, if the user desires, suggestions on ways to improve the image. The evaluation of the image may include, for example, a notification that characteristics, such as exposure, focus and color balance are satisfactory. Suggestions on ways in which to improve the image may be communicated to the user via the image display 128 and may include, for example, changing a condition under which the image was captured, changing a setting with which the image was captured, or a combination of both changing a condition and a setting.

[0040] In block 326, determines whether they want to capture another image. If the user does not want to capture another image, the process ends. If, however, in block 326, the user wants to capture another image, then, in block 332, it is determined whether the user wants to manually change a condition or setting for the subsequent image or, if the setting is one that can be changed by the digital camera 100, whether the user wants the digital camera 100 to automatically change the setting.

[0041] If, in block 332, the user decides to manually change the setting, then, in block 334, the user changes the setting and the process returns to block 302 where another image is captured and the process repeats. If, however, in block 332, the user wants the digital camera 100 to automatically change the setting, then, in block 336, the setting used to capture the previous image are changed according to the new settings determined in block 324, and the process returns to block 302 to capture a subsequent image.

[0042] FIGS. 4A and 4B are graphical illustrations showing an instant review screen and a help screen provided by the image analysis logic 150 and the image improvement logic 160. In FIG. 4A, the captured image is displayed to the user via the instant review screen 400 immediately after an image is captured. If the user desires additional information regarding the image, then, in this example, the user actuates an appropriate control on the user interface 164 to display the instant review help screen shown in FIG. 4B. The instant review help screen 410 includes a thumbnail image 402 of the captured image from FIG. 4A, the exposure settings 404, and any other settings 406 used when the image in FIG. 4A was captured. The instant review help screen 410 also includes an improvement message portion 410, referred to as an "advice" portion. The advice portion 410 may include, for example, the settings that were evaluated in block 322 of FIG. 3, and/or advice on ways in which to improve the image. In this manner, the digital camera 100 captures an image, analyzes the image, and provides instructions, via the instant review help screen 410, on ways to improve a subsequent image.

[0043] While various embodiments of the invention have been described, it will be apparent to those of ordinary skill in the art that many more embodiments and implementations are possible that are within the scope of this invention. All such modifications and variations are intended to be included herein within the scope of this disclosure and the present invention and protected by the following claims.

What is claimed is:

1. A system for analyzing a digital image, comprising:
 - an image sensor including a plurality of image capture elements, each of the image capture elements configured to capture image data, the image data captured according to at least one setting;
 - a memory for storing the image data;
 - logic for dynamically analyzing the image data to determine at least one characteristic of the image; and
 - a display for communicating a description of the characteristic.
2. The system of claim 1, wherein the at least one characteristic of the image determines whether the image is in focus.

3. The system of claim 1, wherein the at least one characteristic of the image determines exposure of the image.

4. The system of claim 1, wherein the at least one characteristic of the image determines a white balance of the image.

5. The system of claim 1, further comprising logic for revising the at least one setting to alter the at least one characteristic.

6. The system of claim 5, wherein the at least one setting is automatically revised.

7. The system of claim 5, wherein the at least one setting is manually revised by a user of the system.

8. The system of claim 5, wherein the display communicates the at least one revised setting to a user.

9. The system of claim 1, further comprising logic for providing advice on improving a subsequent image, wherein the advice comprises adjusting the at least one setting, and wherein the advice is communicated via the display.

10. The system of claim 1, further comprising logic for providing advice on improving a subsequent image, wherein the advice comprises adjusting a condition under which the image was captured, and wherein the advice is communicated via the display.

11. A method for analyzing a digital image, comprising:

capturing an image;

storing the image as image data;

dynamically analyzing the image data to determine at least one characteristic of the image; and

communicating a description of the characteristic to a user.

12. The method of claim 11, wherein the at least one characteristic of the image determines whether the image is in focus.

13. The method of claim 11, wherein the at least one characteristic of the image determines exposure of the image.

14. The method of claim 11, wherein the at least one characteristic of the image determines a white balance of the image.

15. The method of claim 11, further comprising revising a setting to alter the at least one characteristic.

16. The method of claim 15, further comprising automatically revising the at least one setting.

17. The method of claim 15, further comprising manually revising the at least one setting.

18. The method of claim 15, further comprising displaying the at least one revised setting to a user.

19. The method of claim 11, further comprising providing advice on improving a subsequent image, wherein the advice comprises adjusting the at least one setting, and wherein the advice is communicated via the display.

20. The method of claim 11, further comprising providing advice on improving a subsequent image, wherein the advice comprises adjusting a condition under which the image was captured, and wherein the advice is communicated via the display.

21. A digital camera, comprising:

an image sensor including a plurality of image capture elements, each of the image capture elements configured to capture image data, the image data captured according to at least one setting;

a memory for storing the image data;

logic for dynamically analyzing the image data to determine at least one characteristic of the image;

logic for revising the at least one setting to alter the characteristic; and

a display for communicating the revised setting to a user.

22. The camera of claim 21, further comprising logic for providing advice on improving a subsequent image, wherein the advice comprises adjusting the at least one setting, and wherein the advice is communicated via the display.

23. The camera of claim 21, further comprising logic for providing advice on improving a subsequent image, wherein the advice comprises adjusting a condition under which the image was captured, and wherein the advice is communicated via the display.

24. A computer readable medium having a program for analyzing a digital image, the program including logic for:

capturing an image;

storing the image as image data;

dynamically analyzing the image data to determine at least one characteristic of the image; and

communicating a description of the characteristic to a user.

25. The program of claim 24, further comprising logic for automatically revising a setting to alter the at least one characteristic.

26. The program of claim 24, further comprising logic for manually revising a setting to alter the at least one characteristic.

27. The program of claim 24, further comprising logic for providing advice on improving a subsequent image, wherein the advice comprises adjusting the at least one setting, and wherein the advice is communicated via the display.

28. The program of claim 24, further comprising logic for providing advice on improving a subsequent image, wherein the advice comprises adjusting a condition under which the image was captured, and wherein the advice is communicated via the display.

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