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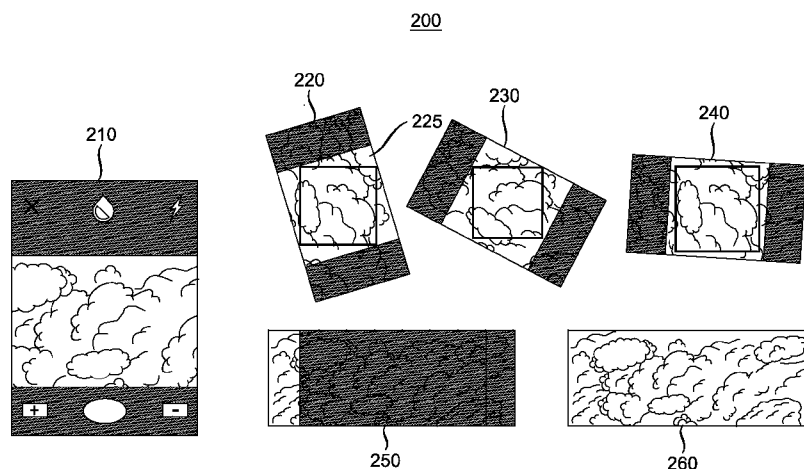


FIG. 2

(57) Abstract: A method and apparatus for dynamically maintaining a horizontal framing of a video. The system permits the user to freely rotate the device while filming, while visualizing the final output in an overlay on the device viewfinder or screen during shooting. The resulting recording is subsequently corrected to maintain a single orientation with a stable horizon. The system and method is operative display an overlay over a captured representation of the captured video wherein the overlay indicates a modified image with respect to said orientation.

PHOTO-VIDEO-CAMERA WITH DYNAMIC ORIENTATION LOCK, CONSTANT
FRAMING AND DEFINED ASPECT RATIO**CROSS REFERENCE TO RELATED APPLICATIONS**

This application claims priority from U.S. Provisional Application No. 62/003281
5 filed May 27, 2014 having attorney docket number PU140089 and U.S. Utility
Application No. 14/475,192 filed September 2, 2014 having attorney docket number
PU140119-US.

BACKGROUND OF THE INVENTION

10 Portable electronic devices are becoming more ubiquitous. These devices, such as
mobile phones, music players, cameras, tablets and the like often contain a combination
of devices, thus rendering carrying multiple objects redundant. For example, current
touch screen mobile phones, such as the Apple iPhone or Samsung Galaxy android phone
contain video and still cameras, global positioning navigation system, internet browser,
15 text and telephone, video and music player, and more. These devices are often enabled
an multiple networks, such as wifi, wired, and cellular, such as 3G, to transmit and
received data.

The quality of secondary features in portable electronics has been constantly
20 improving. For example, early “camera phones” consisted of low resolution sensors with
fixed focus lenses and no flash. Today, many mobile phones include full high definition
video capabilities, editing and filtering tools, as well as high definition displays. With
this improved capabilities, many users are using these devices as their primary

photography devices. Hence, there is a demand for even more improved performance and professional grade embedded photography tools.

For example, many videos on mobile devices are recorded in a manner where the user may inadvertently rotate the mobile device, thereby tilting the video horizon the vertical orientation of the video for the viewer. In an extreme case, a user may start filming with the camera in a vertical orientation and change to a horizontal orientation. This would result in a video which starts out oriented properly, but ends up rotated 90 degrees when being displayed to a viewer. To correct this problem post processing is required, which is an undesirable option for a user wishing to directly share the video via a social network.

Additionally, recording a video with the mobile device in a vertical position often results in a video which is taller than it is wide. This end result is not optimal for consumption on most displays, such as television screens, which are typically wider than they are tall. In many cases users shoot video without specific attention to horizontal orientation, especially when filming a social activity, live event or other subject matter where the user is engaged in the experience that takes their focus off the device they are recording with. Further, most mobile phones are designed to be used in a vertical orientation. Thus, a user may start using the device in its intended orientation, only to realize later that video should be filmed in a horizontal orientation.

Thus, it is desirable to overcome these problems with current video cameras embedded in mobile electronic devices.

SUMMARY OF THE INVENTION

5 A method and apparatus for dynamically maintaining a horizontal framing of a video. The system permits the user to freely rotate the device while filming, while visualizing the final output in an overlay on the device viewfinder or screen during shooting. The resulting recording is subsequently corrected to maintain a single orientation with a stable horizon. The system and method is operative display an overlay
10 over a captured representation of the captured video wherein the overlay indicates a modified image with respect to said orientation.

 In one embodiment, the present invention also involves a method of processing a video stream. The method comprises the steps of initializing a video capture mode,
15 receiving data representing a video stream, displaying a representation of said video stream, receiving a data representing an aspect ratio, receiving a data representing rotational position, interpolating an orientation based on the received data representing rotational position, and overlaying a graphic representative of said aspect ratio and said orientation over said representation of said video stream.

20 In another embodiment, an apparatus is provided. The apparatus comprises an image sensor, an inertial sensor, a processor, and a memory. The image sensor is for capturing image data having a first orientation. The inertial sensor is for determining rotational values. The processor is for determining a second orientation based on said rotational values received from inertial sensor, interpolating an intermediate orientation

based on the first and second orientations, and reorienting said image data from said first orientation to said second orientation through said intermediate orientation. The memory is coupled to the processor and is for storing image data and reorientated image data.

Another embodiment involves a method of saving image data comprising the steps of receiving data representing a first image having a first orientation, receiving data representing a second orientation indicating a device vertical orientation with respect to gravity, reorienting said first image such that said second orientation becomes a vertical orientation of said first image to generate a reoriented image, wherein the framing of the image is maintained, and saving said reoriented image.

Another embodiment involves a method of processing a video stream comprising the steps of initializing a video capture mode, receiving a first data representing a video stream, displaying a representation of said video stream, receiving a second data representing an aspect ratio, receiving a third data representing a rotational position, and overlaying a graphic representative of said aspect ratio and said rotational position over said representation of said video stream wherein the framing of video is maintained.

In another aspect, the present disclosure also involves an apparatus comprising an image sensor for capturing an image data having a first orientation, an inertial sensor for determine a rotational value, a processor for determining a second orientation in response to said rotational value and for reorienting said image data in response to said second orientation while maintaining the framing of the image data to generate a reoriented image having the same framing, and storing said reoriented image.

DETAILED DESCRIPTION OF THE DRAWINGS

These and other aspects, features and advantages of the present disclosure will be described or become apparent from the following detailed description of the preferred
5 embodiments, which is to be read in connection with the accompanying drawings.

In the drawings, wherein like reference numerals denote similar elements throughout the views:

FIG. 1 shows a block diagram of an exemplary embodiment of mobile electronic
10 device;

FIG. 2 shows an exemplary mobile device display having an active display according to the present invention;

FIG. 3 shows an exemplary process for image stabilization and reframing in accordance with the present disclosure;

15 FIG. 4 shows an exemplary mobile device display having a capture initialization 400 according to the present invention; and

FIG. 5 shows an exemplary process for initiating an image or video capture 500 in accordance with the present disclosure.

FIG. 6 shows and exemplary process for tracking rotation during video capture in
20 accordance with the present disclosure;

FIG. 7 shows and exemplary process for tracking rotation during image capture in accordance with the present disclosure; and

FIG. 8 shows an exemplary process for maintaining framing of a shot with rotations during video capture accordance with the present disclosure.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

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The examples set out herein illustrate preferred embodiments of the invention, and such examples are not to be construed as limiting the scope of the invention in any manner.

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Referring to FIG. 1, a block diagram of an exemplary embodiment of mobile electronic device is shown. While the depicted mobile electronic device is a mobile phone 100, the invention may equally be implemented on any number of devices, such as music players, cameras, tablets, global positioning navigation systems etc. A mobile phone typically includes the ability to send and receive phone calls and text messages, interface with the Internet either through the cellular network or a local wireless network, take pictures and videos, play back audio and video content, and run applications such as word processing, programs, or video games. Many mobile phones include GPS and also include a touch screen panel as part of the user interface.

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The mobile phone includes a main processor 150 that is coupled to each of the other major components. The main processor 150 may be a single processor or more than one processor as known by one skilled in the art. The main processor 150, or processors, routes the information between the various components, such as the network interfaces 110, 120, camera 140, inertial sensor 170, touch screen 180, and other

input/output I/O interfaces 190. The main processor 150 also processes audio and video content for play back either directly on the device or on an external device through the audio/video interface. The main processor 150 is operative to control the various sub devices, such as the camera 140, inertial sensor 170 touch screen 180, and the USB
5 interface 130. The main processor 150 is further operative to execute subroutines in the mobile phone used to manipulate data similar to a computer. For example, the main processor may be used to manipulate image files after a photo has been taken by the camera function 140. These manipulations may include cropping, compression, color and brightness adjustment, and the like.

10

The cell network interface 110 is controlled by the main processor 150 and is used to receive and transmit information over a cellular wireless network. This information may be encoded in various formats, such as time division multiple access (TDMA), code division multiple access (CDMA) or Orthogonal frequency-division multiplexing
15 (OFDM). Information is transmitted and received from the device through the cell network interface 110. The interface may consist of multiple antennas encoders, demodulators and the like used to encode and decode information into the appropriate formats for transmission. The cell network interface 110 may be used to facilitate voice or text transmissions, or transmit and receive information from the internet. The
20 information may include video, audio, and/or images.

The wireless network interface 120, or wifi network interface, is used to transmit and receive information over a wifi network. This information can be encoded in various

formats according to different wifi standards, such as 802.11g, 802.11b, 802.11ac and the like. The interface may consist of multiple antennas encoders, demodulators and the like used to encode and decode information into the appropriate formats for transmission and decode information for demodulation. The wifi network interface 120 may be used to
5 facilitate voice or text transmissions, or transmit and receive information from the internet. This information may include video, audio, and/or images.

The universal serial bus (USB) interface 130 is used to transmit and receive information over a wired link, typically to a computer or other USB enabled device. The
10 USB interface 120 can be used to transmit and receive information, connect to the internet, transmit and receive voice and text calls, etc. Additionally, the wired link may be used to connect the USB enabled device to another network using the mobile devices cell network interace 110 or the wifi network interface 120. The USB interface 130 can be used by the main processor 150 to send and receive configuration information to a
15 computer.

A memory 160, or storage device, may be coupled to the main processor 150. The memory 160 may be used for storing specific information related to operation of the mobile device and needed by the main processor 150. The memory 160 may be used for
20 storing audio, video, photos, or other data stored and retrieved by a user.

The inertial sensor 170 may be a gyroscope, accelerometer, axis orientation sensor, light sensor or the like, which is used to determine a horizontal and/or vertical indication of the position of the mobile device.

5 The input output (I/O) interface 190, includes buttons, a speaker/microphone for use with phone calls, audio recording and playback, or voice activation control. The mobile device may include a touch screen 180 coupled to the main processor 150 through a touch screen controller. The touch screen 180 may be either a single touch or multi touch screen using one or more of a capacitive and resistive touch sensor. The
10 smartphone may also include additional user controls such as but not limited to an on/off button, an activation button, volume controls, ringer controls, and a multi-button keypad or keyboard

Turning now to FIG. 2, an exemplary mobile device display having an active
15 display 200 according to the present invention is shown. The exemplary mobile device application is operative for allowing a user to record in any framing and freely rotate their device while shooting, visualizing the final output in an overlay on the device's viewfinder during shooting and ultimately correcting for their orientation in the final output.

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According to the exemplary embodiment, when a user begins shooting the user's current orientation is taken into account and the vector of gravity based on the device's sensors is used to register a horizon. For each possible orientation, such as portrait 210, where the device's screen and related optical sensor is taller than wide, or landscape 250,

where the device's screen and related optical sensor is wider than tall, an optimal target aspect ratio is chosen. An inset rectangle 225 is inscribed within the overall sensor that is best-fit to the maximum boundaries of the sensor given the desired optimal aspect ratio for the given (current) orientation. The boundaries of the sensor are slightly padded in order to provide 'breathing room' for correction. The inset rectangle 225 is transformed to compensate for rotation 220, 230, 240 by essentially rotating in the inverse of the device's own rotation, which is sampled from the device's integrated gyroscope. The transformed inner rectangle 225 is inscribed optimally inside the maximum available bounds of the overall sensor minus the padding. Depending on the device's current most orientation, the dimensions of the transformed inner rectangle 225 are adjusted to interpolate between the two optimal aspect ratios, relative to the amount of rotation.

For example, if the optimal aspect ratio selected for portrait orientation was square (1:1) and the optimal aspect ratio selected for landscape orientation was wide (16:9), the inscribed rectangle would interpolate optimally between 1:1 and 16:9 as it is rotated from one orientation to another. The inscribed rectangle is sampled and then transformed to fit an optimal output dimension. For example, if the optimal output dimension is 4:3 and the sampled rectangle is 1:1, the sampled rectangle would either be aspect filled (fully filling the 1:1 area optically, cropping data as necessary) or aspect fit (fully fitting inside the 1:1 area optically, blacking out any unused area with 'letter boxing' or 'pillar boxing'. In the end the result is a fixed aspect asset where the content framing adjusts based on the dynamically provided aspect ratio during correction. So for example a 16:9 video comprised of 1:1 to 16:9 content would oscillate between being

optically filled 260 (during 16:9 portions) and fit with pillar boxing 250 (during 1:1 portions).

Additional refinements whereby the total aggregate of all movement is considered
5 and weighed into the selection of optimal output aspect ratio are in place. For example, if
a user records a video that is 'mostly landscape' with a minority of portrait content, the
output format will be a landscape aspect ratio (pillar boxing the portrait segments). If a
user records a video that is mostly portrait the opposite applies (the video will be portrait
and fill the output optically, cropping any landscape content that falls outside the bounds
10 of the output rectangle).

Referring now to FIG. 3, an exemplary process for image stabilization and
reframing 300 in accordance with the present disclosure is shown. The system is
initialized in response to the capture mode of the camera being initiated 310. The
15 initialization may be initiated according to a hardware or software button, or in response
to another control signal generated in response to a user action. Once the capture mode
of the device is initiated, the mobile device sensor 320 is chosen in response to user
selections. User selections may be made through a setting on the touch screen device,
through a menu system, or in response to how the button is actuated. For example, a
20 button that is pushed once may select a photo sensor, while a button that is held down
continuously may indicate a video sensor. Additionally, holding a button for a
predetermined time, such as 3 seconds, may indicate that a video has been selected and

video recording on the mobile device will continue until the button is actuated a second time.

Once the appropriate capture sensor is selected, the system then requests a
5 measurement from an inertial sensor 330. The inertial sensor may be a gyroscope, accelerometer, axis orientation sensor, light sensor or the like, which is used to determine a horizontal and/or vertical indication of the position of the mobile device. The measurement sensor may send periodic measurements to the controlling processor thereby continuously indicating the vertical and/or horizontal orientation of the mobile
10 device. Thus, as the device is rotated, the controlling processor can continuously update the display and save the video or image in a way which has a continuous consistent horizon.

After the inertial sensor has returned an indication of the vertical and/or horizontal
15 orientation of the mobile device, the mobile device depicts an inset rectangle on the display indicating the captured orientation of the video or image 340. As the mobile device is rotated, the system processor continuously synchronizes inset rectangle with the rotational measurement received from the inertial sensor 350. The representation of the orientation may be checked, further be refined, or improved by analyzing the image using
20 techniques such as line recognition, facial recognition, or the like.

The user may optionally indicate a preferred final video or image ration, such as 1:1, 9:16, 16:9, or any other ratio selcted by the user. The system may also store user

selections for different ratios according to orientation of the mobile device. For example, the user may indicate a 1:1 ratio for video recorded in the vertical orientation, but a 16:9 ratio for video recorded in the horizontal orientation. In this instance, the system may continuously or incrementally rescale video 360 as the mobile device is rotated. Thus a video may start out with a 1:1 orientation, but could gradually be rescaled to end in a 16:9 orientation in response to a user rotating from a vertical to horizontal orientation while filming. Optionally, a user may indicate that the beginning or ending orientation determines the final ratio of the video.

In certain other embodiments, the framing of the image inside the output box is maintained regardless of the aspect ratio. Thus, no matter how the device is oriented, scene is zoomed in or out to keep consistent framing. In some such cases, the object of interest in the video would stay the same size regardless of orientation and aspect ratio. In other cases, where maximum resolution is desired, the zooming in and out may change the size of the object of interest. Alternately, the image may be cropped to maintain the size regardless of orientation and aspect ratio.

Turning now to FIG. 4, an exemplary mobile device display having a capture initialization 400 is shown. An exemplary mobile device is shown depicting a touch tone display for capturing images or video. According to an aspect of the present invention, the capture mode of the exemplary device may be initiated in response to a number of actions. Any of hardware buttons 410 of the mobile device may be depressed to initiate the capture sequence. Alternatively, a software button 420 may be activated through the

touch screen to initiate the capture sequence. The software button 420 may be overlaid on the image 430 displayed on the touch screen. The image 430 acts as a viewfinder indicating the current image being captured by the image sensor. An inscribed rectangle 440, as described previously, may also be overlaid on the image to indicate an aspect ratio of the image or video to be captured.

Referring now to FIG. 5, an exemplary process for initiating an image or video capture 500 in accordance with the present disclosure is shown. Once the imaging software has been initiated, the system waits for an indication to initiate image capture.

Once the image capture indication has been received by the main processor 510, the device begins to save the data sent from the image sensor 520. In addition, the system initiates a timer. The system then continues to capture data from the image sensor as video data. In response to a second indication from the capture indication, indicating that capture has been ceased 530, the system stops saving data from the image sensor and stops the timer.

The system then compares the timer value to a predetermined time threshold 540. The predetermined time threshold may be a default value determined by the software provider, such as 1 second for example, or it may be a configurable setting determined by a user. If the timer value is less than the predetermined threshold 540, the system determines that a still image was desired and saves 560 the first frame of the video capture as a still image in a still image format, such as jpeg or the like. The system may optionally chose another frame as the still image. If the timer value is greater than the

predetermined threshold 540, the system determines that a video capture was desired. The system then saves 550 the capture data as a video file in a video file format, such as mpeg or the like. The system may then return to the initialization mode, waiting for the capture mode to be initiated again. If the mobile device is equipped with different

5 sensors for still image capture and video capture, the system may optionally save a still image from the still image sensor and start saving capture data from the video image sensor. When the timer value is compared to the predetermined time threshold, the desired data is saved, while the unwanted data is not saved. For example, if the timer value exceeds the threshold time value, the video data is saved and the image data is

10 discarded.

One potential issue that may be encountered is that the measurements from the inertial sensor and the times stamps of the video or still image may not be ideally synchronized. For example, the period for updated positional or rotational measurements

15 and/or data may be too infrequent for the capture of video or images resulting in an inaccurate orientation for the video or image. This can result in choppy looking video. To address this positional or rotational data can be interpolated to determine an intermediate orientation. An example of this can be seen in FIGs. 6 and 7.

20 FIG. 6 depicts a flow diagram 600 of an exemplary methodology for processing a video stream wherein rotation occurs during capture. At the most basic level, the methodology involves seven steps. The first step is initiating capture of a video stream (step 610). The next step is receiving data representing a video stream (step 620). A

representation of the video stream can then be displayed (step 630). The fourth step is receiving data representing an aspect ratio (step 640). The fifth step is receiving data representing rotational position (step 650). The orientation can then be interpolated using the data representing rotational position (step 660). The last step of the basic method is
5 overlaying a graphic representative of said aspect ratio and said orientation over said representation of said video stream (step 670).

FIG. 7 depicts a flow diagram 700 of an exemplary methodology for processing a still image wherein rotation occurs during capture. At the most basic level, the
10 methodology involves seven steps. The first step is initializing a capture mode (step 710). The next step is receiving data representing an image (step 720). During capture data representing rotational position is received (step 730). The capture is then deactivated (step 740). The orientation can then be interpolated using the data representing rotational position (step 750). Once orientation is interpolated, the image
15 can be rotated accordingly (step 760). The last step of the basic method is saving the rotated image (step 770).

In some embodiments positional or rotational measurements can be obtained at the beginning and end of capture and the intermediate orientation can be interpolated.
20 Such interpolation can further include the time stamp information of the video to more accurately orientate the video in accordance with time. Other techniques such as running average velocity can also be used to refine the interpolation. Other estimation techniques can also be used. In other embodiments, the frequency of rotational measurements may

be increased during video capture to provide more accurate positional information in time with the video.

In certain other embodiments, the framing of the image inside the output box is maintained regardless of the aspect ratio. Thus, no matter how the device is oriented, scene is zoomed in or out to keep consistent framing. An example of this can be seen in FIG. 8.

FIG. 8 depicts a flow diagram 800 of an exemplary methodology for processing a video stream wherein rotation occurs during capture. At the most basic level, the methodology involves six steps. The first step is initiating capture of a video stream (step 610). The next step is receiving data representing a video stream (step 820). A representation of the video stream can then be displayed (step 830). The fourth step is receiving data representing an aspect ratio (step 840). The fifth step is receiving data representing rotational position (step 850). The last step of the basic method is overlaying a graphic representative of said aspect ratio and said orientation over said representation of said video stream wherein the framing of the original video is maintained in the overly (step 860).

In some embodiments, the object of interest or subject in the video would stay the same size regardless of orientation and aspect ratio. In other embodiments, where maximum resolution is desired, the zooming in and out may change the size of the object of interest. Alternately, the image may be cropped to maintain the size regardless of orientation and aspect ratio.

It should be understood that the elements shown and discussed above, may be implemented in various forms of hardware, software or combinations thereof. Preferably, these elements are implemented in a combination of hardware and software on one or
5 more appropriately programmed general-purpose devices, which may include a processor, memory and input/output interfaces. The present description illustrates the principles of the present disclosure. It will thus be appreciated that those skilled in the art will be able to devise various arrangements that, although not explicitly described or shown herein, embody the principles of the disclosure and are included within its scope.

10 All examples and conditional language recited herein are intended for informational purposes to aid the reader in understanding the principles of the disclosure and the concepts contributed by the inventor to furthering the art, and are to be construed as being without limitation to such specifically recited examples and conditions. Moreover, all statements herein reciting principles, aspects, and embodiments of the disclosure, as well
15 as specific examples thereof, are intended to encompass both structural and functional equivalents thereof. Additionally, it is intended that such equivalents include both currently known equivalents as well as equivalents developed in the future, i.e., any elements developed that perform the same function, regardless of structure. Thus, for example, it will be appreciated by those skilled in the art that the block diagrams
20 presented herewith represent conceptual views of illustrative circuitry embodying the principles of the disclosure. Similarly, it will be appreciated that any flow charts, flow diagrams, state transition diagrams, pseudocode, and the like represent various processes

which may be substantially represented in computer readable media and so executed by a computer or processor, whether or not such computer or processor is explicitly shown.

CLAIMS:

1. A method of processing a video stream comprising the steps of:

initiating capture of a video stream;

5 receiving data representing a video stream;

displaying a representation of said video stream;

receiving data representing an aspect ratio;

receiving data representing rotational position;

10 interpolating an orientation based on the received data representing
rotational position, and

overlaying a graphic representative of said aspect ratio and said orientation
over said representation of said video stream.

2. The method of claim 1 wherein said aspect ratio changes in response to said
orientation.

15 3. The method of claim 1 wherein the interpolation of the orientation further
comprises determining an average velocity of the rotation.

4. The method of claim 1 wherein the interpolation of the orientation is also based
on time stamp information that is part of the image data.

5. The method of claim 1 wherein the overlaying a graphic representative of said aspect ratio and said orientation over said representation of said video stream further comprises image analysis.
6. The method of claim 1 wherein overlaying a graphic representative of said aspect ratio and said orientation over said representation of said video stream further comprises maintaining framing.
7. The method of claim 7 wherein maintaining framing of the image comprises zooming in or zooming out to maintain the framing.
8. The method of claim 7 wherein maintaining framing of the image comprises cropping the image data to maintain the framing.
9. An apparatus comprising;
- an image sensor that captures a video stream;
- an inertial sensor that determines rotational values;
- a memory that stores data; and
- a processor configured to initiate capture of a video stream, receive data representing a video stream, provide a display of a representation of said video stream, receive data representing an aspect ratio, receive data representing rotational position, interpolate an orientation based on the received data representing rotational position, and provide an overlay of a graphic representative of said aspect ratio and said orientation over said representation of said video stream.

10. The apparatus of claims 9 wherein said aspect ratio changes in response to said orientation.

11. The apparatus of claims 9 wherein the processor interpolates the orientation by determining an average velocity of the rotation.

5 12. The apparatus of claims 9 wherein the processor interpolates the orientation using time stamp information that is part of the image data.

13. The apparatus of claims 9 wherein the processor overlays said graphic representative of said aspect ratio and said orientation over said representation of said video stream further using image analysis.

10 14. The apparatus of claims 9 wherein the processor overlays the graphic representative of said aspect ratio and said orientation over said representation of said video stream such that framing is maintained.

15. The apparatus of claims 14 wherein the framing is maintained by at least one of zooming in and zooming out.

15 16. The apparatus of claims 14 wherein the framing is maintained by cropping the image data.

17. The apparatus of claim 9 further comprising a display for displaying said representation of said video stream and overlay.

18. A method comprising the steps of:

20 initializing a capture mode;

receiving data representing an image;

receiving data representing rotational position;

deactivating said capture mode;

interpolating an orientation of the image based on rotational position data;

5 rotating said image in response to said interpolated orientation to generate a rotated image; and

storing said rotated image.

19. The method of claim 18 further comprising the steps of displaying said image and displaying an indicator indicating said rotational position.

10 20. The method of claim 19 wherein said indicator is a graphic representative of an aspect ratio and said rotational position, wherein said indicator is overlaid over said image in a manner representative of said rotated image.

21. The method of claim 18 wherein said aspect ratio changes in response to said rotational position.

15 22. The method of claim 18 wherein said image is a frame of a video.

23. The method of claim 18 wherein the data representing rotational position is received from the beginning and end of the capture mode and the orientation of the image is interpolated from the data representing rotational position received at the beginning and end the capture mode.

24. The method of claim 18 wherein the interpolation of the orientation further comprises determining and average velocity of the rotation.

25. The method of claim 18 wherein the interpolation of the orientation is also based on time stamp information that is part of the image data.

5 26. The method of claim 18 wherein the rotation of the image further comprises image analysis.

27. The method of claim 18 wherein the rotation of the image data further comprises maintaining framing of the image.

10 28. The method of claim 18 wherein maintaining framing of the image comprises zooming in or zooming out to maintain the framing.

29. The method of claim 18 wherein maintaining framing of the image comprises cropping the image data to maintain the framing.

30. An apparatus comprising;

an image sensor that captures image data;

15 an inertial sensor that determines rotational values;

a memory that stores data; and

a processor configured to initialize a capture mode, receive data representing an image, receive data representing rotational position, deactivate said capture mode, interpolate an orientation of the image based on rotational position data, rotate said image in response to said

20

interpolated orientation to generate a rotated image, and store said rotated image.

31. The apparatus of claims 30 wherein said aspect ratio changes in response to said orientation.

5 32. The apparatus of claims 30 wherein the data representing rotational position is received from the beginning and end of the capture mode and the orientation of the image is interpolated from the data representing rotational position received at the beginning and end the capture mode.

10 33. The apparatus of claims 30 wherein the processor interpolates of the orientation by determining an average velocity of the rotation.

34. The apparatus of claims 30 wherein the processor interpolates of the orientation based on time stamp information that is part of the image data.

35. The apparatus of claims 30 wherein the processor rotates of the image using image analysis.

15 36. The apparatus of claims 30 wherein the rotation of the image data further comprises maintaining framing of the image.

37. The apparatus of claims 36 wherein maintaining framing of the image comprises zooming in or zooming out to maintain the framing.

20 38. The apparatus of claims 36 wherein maintaining framing of the image comprises cropping the image data to maintain the framing.

39. The apparatus of claims 30 further comprising a display for displaying said image
a data.

40. A method of processing a video stream comprising the steps of:

initiating capture of a video stream;

5 receiving data representing a video stream;

displaying a representation of said video stream;

receiving data representing an aspect ratio;

receiving data representing rotational position; and

10 overlaying a graphic representative of said aspect ratio and said rotational
position over said representation of said video stream, wherein framing of the
video is maintained in the overlaid graphic representation.

41. The method of claim 40 wherein said aspect ratio changes in response to said
rotational position.

15 42. The method of claim 40 wherein the framing of the video is maintained by
zooming the video.

43. The method of claim 40 wherein the framing of the video is maintained by
cropping the video.

44. The method of claim 40 further comprising interpolating an orientation based on
the received data representing rotational position

45. The method of claim 44 wherein the interpolation of the orientation further comprises determining an average velocity of the rotation.

46. The method of claim 44 wherein the interpolation of the orientation is also based on time stamp information that is part of the image data.

5 47. The method of claim 1 wherein the overlaying a graphic representative of said aspect ratio and said orientation over said representation of said video stream further comprises image analysis.

48. An apparatus comprising;

an image sensor that captures a video stream;

10 an inertial sensor that determines rotational values;

a memory that stores data; and

a processor configured to initiate capture of a video stream, receive data representing a video stream, provide a display of a representation of said video stream, receive data representing an aspect ratio, receive data representing rotational position, and overlay a graphic representative of said aspect ratio and said rotational position over said representation of said video stream, wherein framing of the video is maintained in the overlaid graphic representation.

15

49. The apparatus of claims 48 wherein said aspect ratio changes in response to said orientation.

50. The apparatus of claims 48 wherein the processor maintains framing by zooming the video.

51. The apparatus of claims 48 wherein the processor maintains framing by cropping the video.

5 52. The apparatus of claims 48 wherein the processor interpolates an orientation based on the received data representing rotational position.

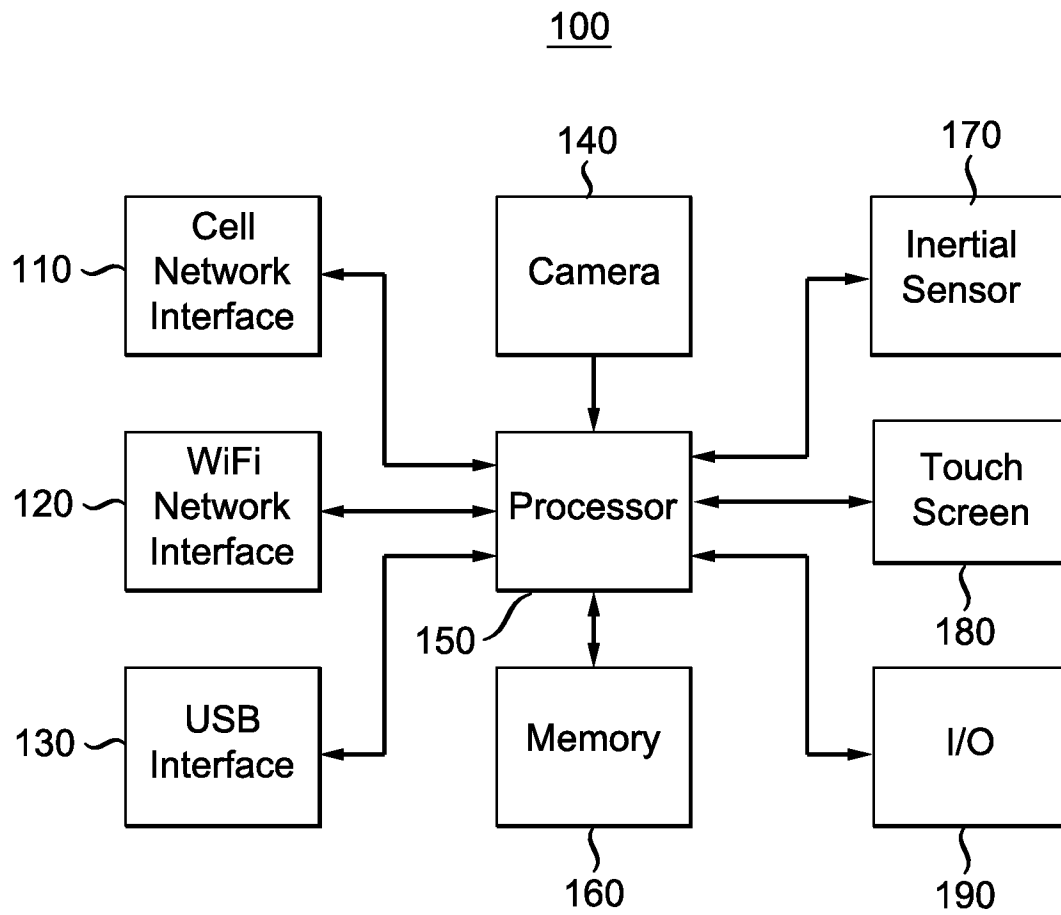
53. The apparatus of claims 52 wherein the processor interpolates the orientation by determining an average velocity of the rotation.

10 54. The apparatus of claims 52 wherein the processor interpolates the orientation based on time stamp information that is part of the image data.

55. The apparatus of claims 48 wherein the processor overlays the graphic representative of said aspect ratio and said orientation over said representation of said video stream using image analysis.

15 56. The apparatus of claims 48 further comprising a display for displaying said representation of said video stream and overlay.

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*FIG. 1*

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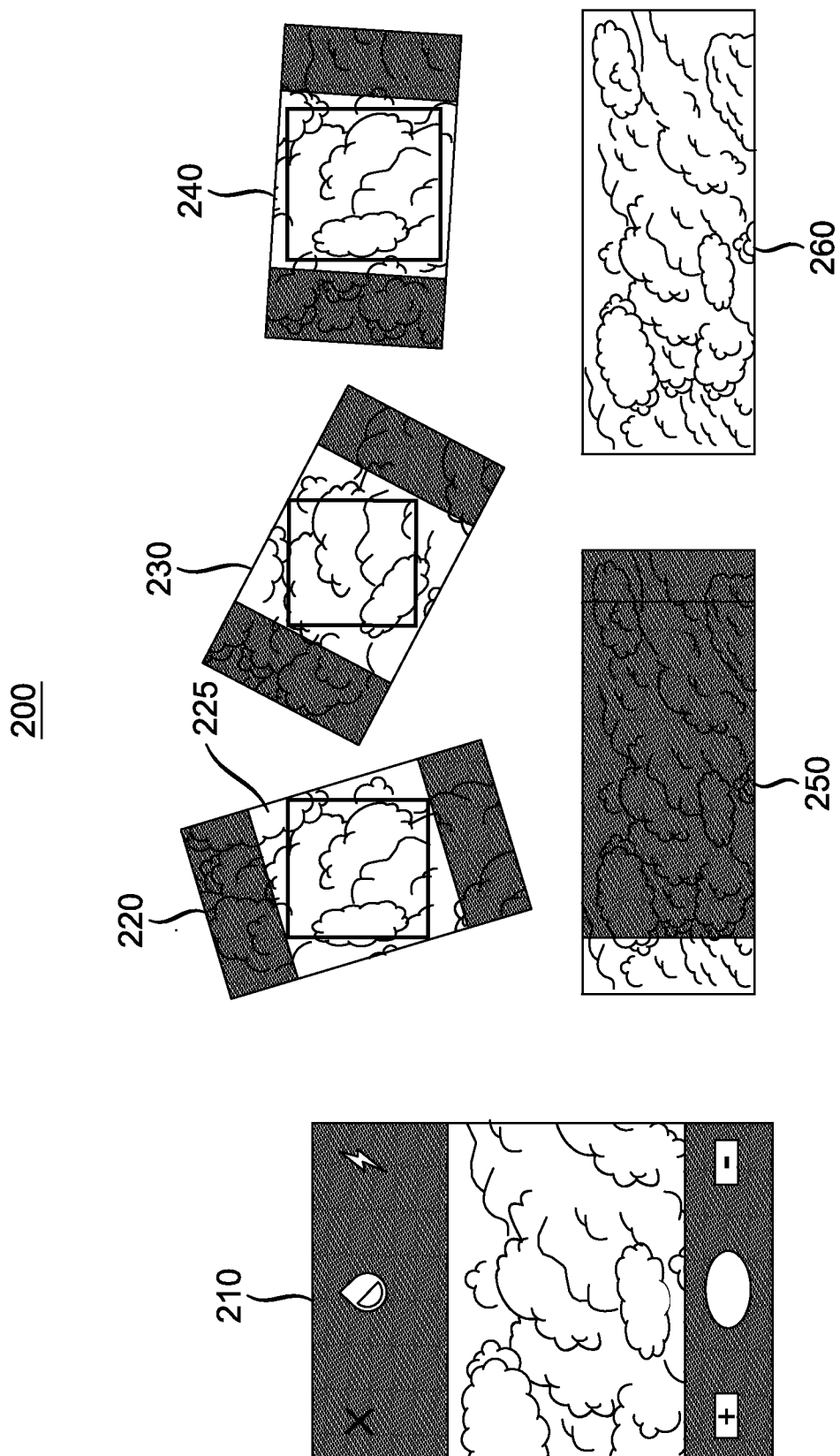
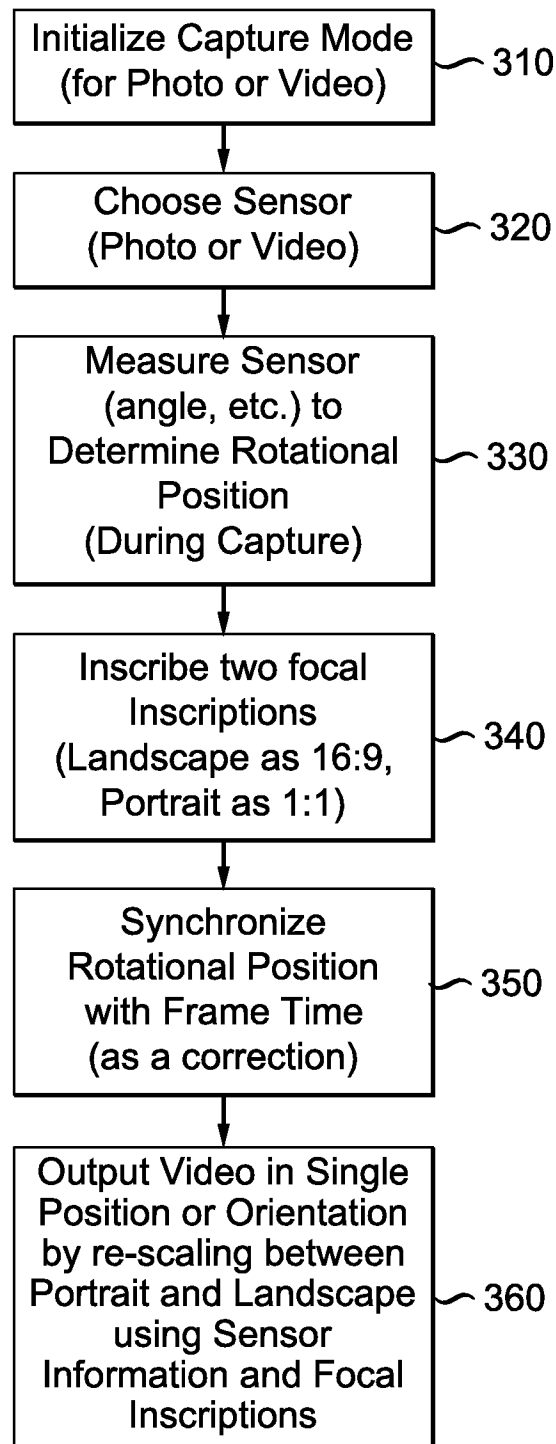


FIG. 2

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300*FIG. 3*

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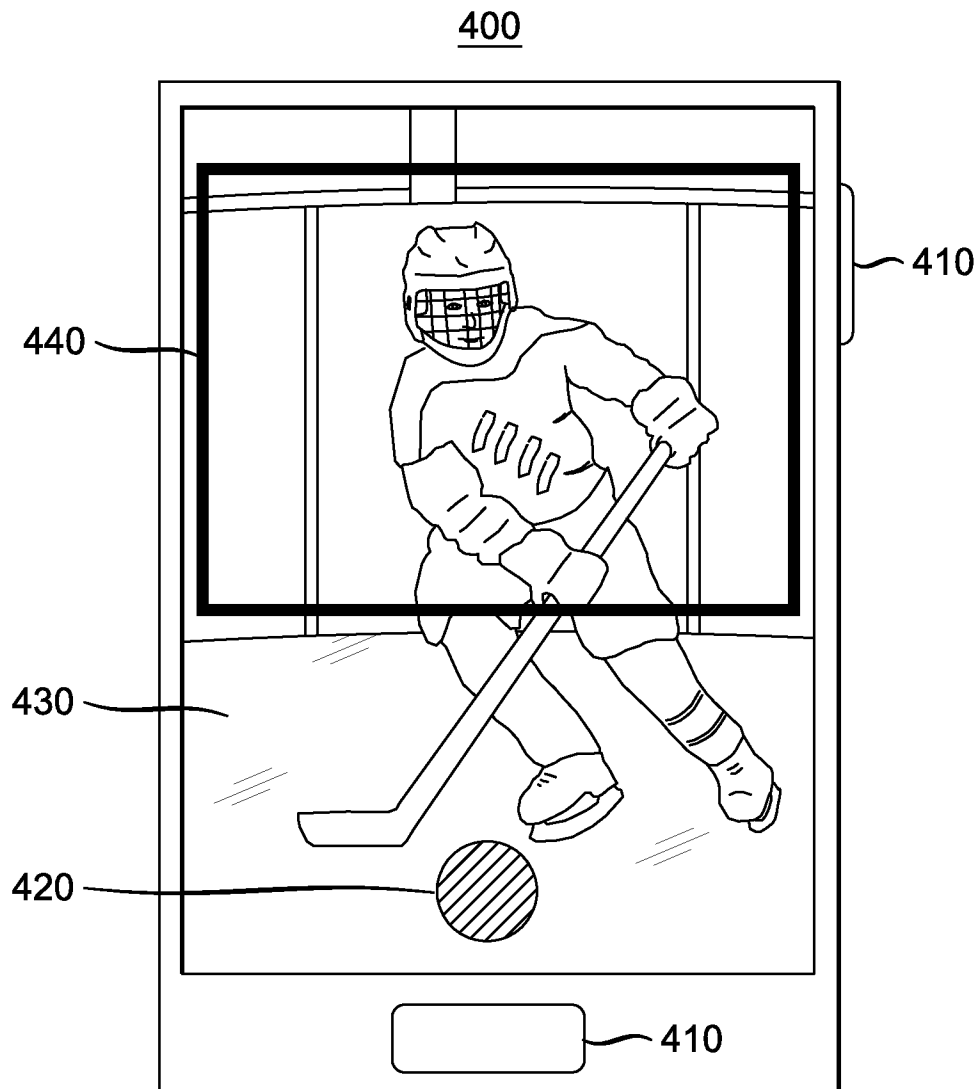
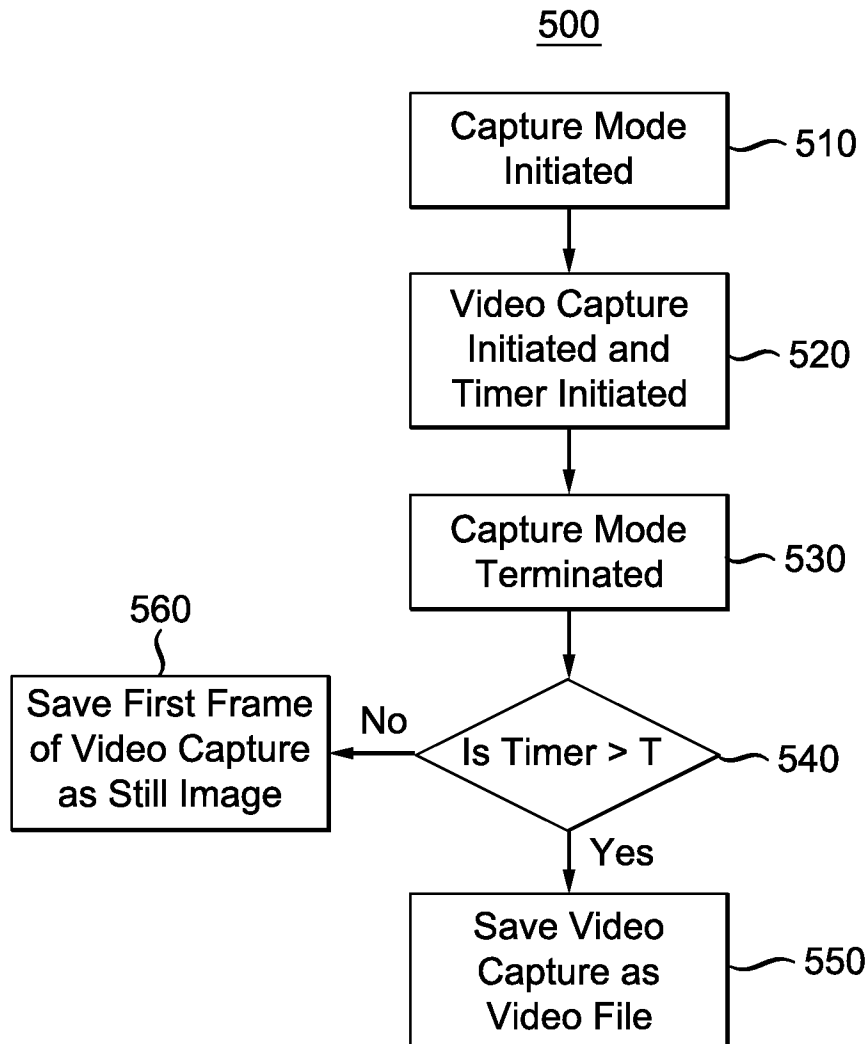
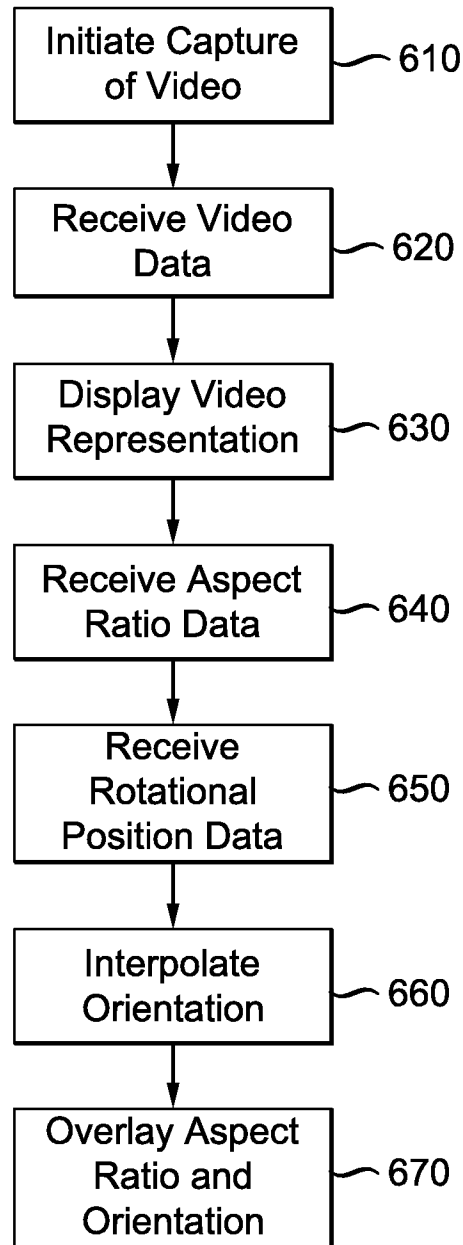


FIG. 4

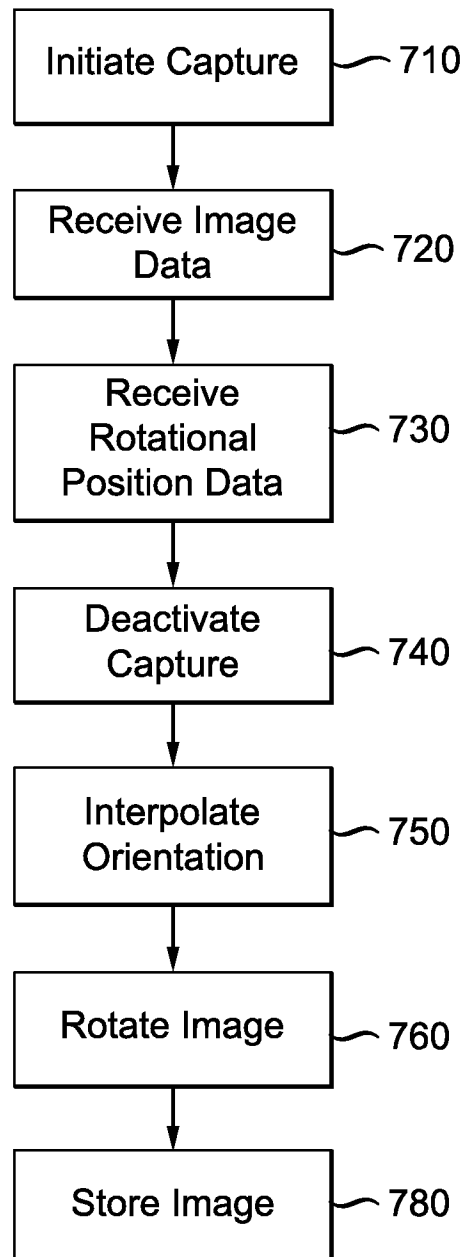
5/8

*FIG. 5*

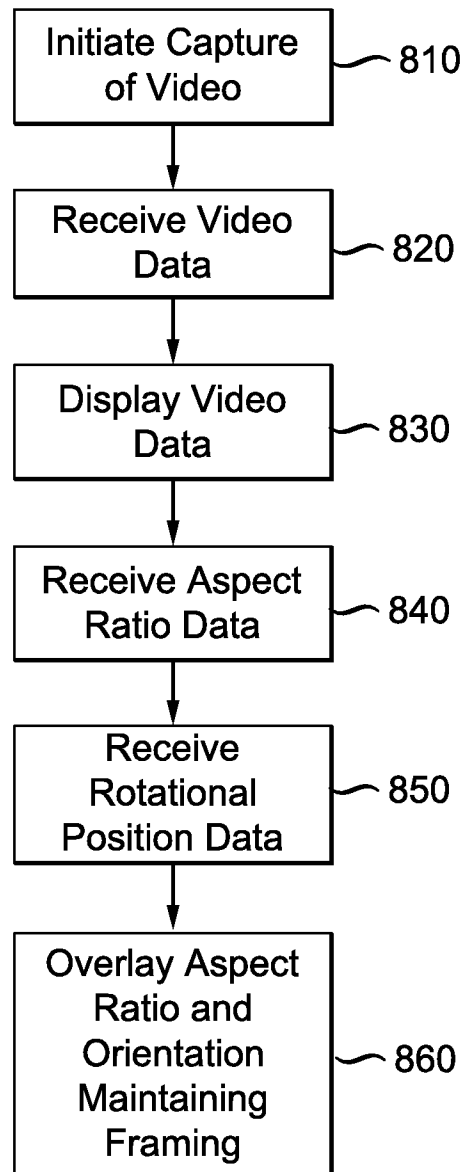
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600*FIG. 6*

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700*FIG. 7*

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800*FIG. 8*

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2015/031600

A. CLASSIFICATION OF SUBJECT MATTER

INV. G06F17/30

ADD. G06F17/00 H04N5/225 G03B19/02 H04N1/21

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H04N G06F H04L G06Q G09G G03B G06T

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,P	WO 2015/038351 A1 (THOMPSON LICENSING [FR]) 19 March 2015 (2015-03-19) video recording and correction for orientation in output; page 7 - page 8; figure 2 user preferred aspect ratio; page 10	1-56
Y	----- MARK ROBINS AND HEATHER BEAN: "Orientation locked video in digital still photography", RESEARCH DISCLOSURE, MASON PUBLICATIONS, HAMPSHIRE, GB, vol. 498, no. 72, 1 October 2005 (2005-10-01), XP007135559, ISSN: 0374-4353	1,6,9, 14,40, 45,48,53
A	generalized horizontal lock; page 2 ----- -/--	18,30



Further documents are listed in the continuation of Box C.



See patent family annex.

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"&" document member of the same patent family

Date of the actual completion of the international search

30 September 2015

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Authorized officer

Glasser, Jean-Marc

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2015/031600

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2005/146620 A1 (MONROE DARRIN D [US] ET AL) 7 July 2005 (2005-07-07)	18,30
Y	changing the orientation of the image to create a rotated image; paragraph [0026]; claim 1; figure 3	5,13,17, 19-23, 27,31, 32,36, 39,47, 55,56
A	claim 1 visual notification; paragraph [0021] image recognition software to determine the orientation; page 3, paragraph 25	24-26, 28,29, 33-35, 37,38
Y	----- US 2008/246830 A1 (MARTIN ALEXIS [FR] ET AL) 9 October 2008 (2008-10-09)	6,14,22, 27,36, 45,53
	reframing of images; paragraph [0018]; claims 1,2 reframing a portion of an image; claim 5; figures 2a, 2b, 3 [Delta]xf and [Delta]yf to transform the movement into a movement of the frame defining the image portion; paragraphs [0051], [0047]	
Y	----- US 2011/279697 A1 (SHINGU JUN [JP] ET AL) 17 November 2011 (2011-11-17)	17,20,56
	additional indications overlaid onto live feed (angle of the camera); claim 12	
X	----- US 2007/171293 A1 (OKAMOTO TEPPEI [JP]) 26 July 2007 (2007-07-26)	18,30
Y	Orientation metadata both in viewfinder and for storing; claims 5, 8 paragraph [0078]	1-17,19, 21,31, 39-56
X	----- EP 0 738 075 A2 (EASTMAN KODAK CO) 16 October 1996 (1996-10-16)	18,30
Y	Portrait or landscape orientation. Storing the rotated image; page 3, left-hand column, last paragraph - right-hand column, paragraph first	2,10,21, 31,41,49
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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2015/031600

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2011/193982 A1 (KOOK SEUNG-RYONG [KR] ET AL) 11 August 2011 (2011-08-11) encodes the rotated image together with additional information to format image into a bitstream.; paragraph [0037]; figure 1 Video captured in horizontal direction, rotated during operation; preview screen; paragraphs [0093], [0098]; figure 8A Determining the aspect ratio based on detected camera gravity direction; claim 2 Displayed aspect ratio maintained; paragraph [0103]; figure 9B Still image; paragraph [0064]; figure 4 -----	1-17,21, 27,31, 36,40-56
X	US 2011/228112 A1 (KAHEEL AYMAN [EG] ET AL) 22 September 2011 (2011-09-22)	18,30
Y	orientation information from accelerometer; storing the adjusted captured video image; claims 1,7; figure 1 for each of multiple video images; paragraph [0006] Calculation of Rotational Angles; paragraph [0031] - paragraph [0038] -----	3,4,6, 11,12, 14,22, 23,27, 32,36, 39, 44-46, 52-54
Y	US 2013/238990 A1 (UBILLOS RANDY [US] ET AL) 12 September 2013 (2013-09-12) rotation button in camera display toolbar; paragraph [0224] GUI in portrait or landscape mode; paragraph [0226] paragraph [0435] -----	6,14,20, 27,36, 45,53

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2015/031600

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US 2005146620 A1	07-07-2005	CN 1642023 A US 2005146620 A1	20-07-2005 07-07-2005
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