determining the third camera as the target camera, and capturing, by using the third camera, at least one image that includes the target scene. The method may be collaboratively performed by the obtaining module, the determining module, and the capturing module.

[0018] Compared with the first camera and the second camera, the third camera is a camera using a tele-photo~~short-focus~~ lens. Under a requirement of a moderate target zoom ratio, the third camera is used, to capture a color image. If the target scene has sufficient light, that is, the target scene is in a non-dark environment, lossless zoom can be approximately achieved by using methods of center cropping and multi-frame zoom. If the target scene has insufficient light, that is, the target scene is in a dark environment, the second camera needs to be enabled to capture a black image to supplement a detail for the color image captured by the third camera, and lossless zoom can be approximately achieved by using methods of center cropping, multi-frame zoom, and fusion of tele-photo, black-and-white, and color, so that clear imaging at a moderate target zoom ratio can be achieved. These algorithms may be performed by the image processing module.

[0019] According to the first aspect or the second aspect, in a possible design, the method includes: when the target zoom ratio is within (5, 10], determining whether illuminance of the target scene is lower than a preset threshold; and if the illuminance of the target scene is lower than the preset threshold, determining the second camera and the third camera as target cameras, and respectively capturing, by using the second camera and the third camera, images that include the target scene; or if the illuminance of the target scene is not lower than the preset threshold, determining the third camera as the target camera, and capturing, by using the third camera, at least one image that includes the target scene. The method may be collaboratively performed by the obtaining module, the determining module, and the capturing module.

[0020] Compared with the first camera and the second camera, the third camera is a camera using a tele-photo~~short-focus~~ lens. Under a requirement of a high target zoom ratio, the third camera is used, to capture a color image. If the target scene has sufficient

that a center of an input image remains unchanged. The cropped area is determined by both a target zoom ratio specified by the user and an equivalent focal length of the camera.

[0089] Therefore, in terms of the user's intuitive perception, the target scene may narrowly mean a preview image at the target zoom ratio or broadly mean an area cropped out of a center area.

[0090] S104. Perform multi-frame zoom on the m_0 frames of color images with a size of w_0*h_0/n^2 to obtain a color multi-frame zoom result, namely, one frame of color zoom image of w_0*h_0/n^2. Perform multi-frame zoom on the m_1 frames of black-and-white images with a size of ~~w_0~~w_1*~~h_0~~h_1/n^2 to obtain a black-and-white multi-frame zoom result, namely, one frame of black-and-white zoom image of ~~w_0~~w_1*~~h_0~~h_1/n^2.

[0091] The target scene is cropped out from an actually captured image and one frame of image of a target scene is obtained by using multi-frame zoom. For an image area of the target scene and a size change, refer to FIG. 5.

[0092] In a specific implementation process, jitter inevitably occurs because the shooting device is held by the user during shooting. Therefore, a plurality of frames of images inevitably have different image content, and different frames of images of a same object in a target scene slightly differ in definition. Therefore, information sampled from positions of the plurality of frames of images may be used to complement each other to fuse into one frame of image with a higher resolving capability, higher definition, and lower noise.

[0093] An optional multi-frame zoom algorithm procedure is as follows:

[0094] (1) Select a reference frame. Common methods include: selecting frame 1, selecting a frame shot at an intermediate moment, or selecting a clearest frame. For example, a clearer frame of the first two frames may be selected as the reference frame.

[0095] (2) Align each of other frames of input images to the reference frame, perform motion compensation on aligned images based on the reference frame, and then perform step (3) or step (4).

content different from the preview image instead of including only a zoom target scene that the user expects to shoot and that is visible to the user in the preview image.

[0124] S303. Perform center area cropping on the m_0 frames of color images to crop m_0 frames of color images with a size of $w_0*h_0/(n/n_0)^2$ from images actually shot by the third camera. Perform center area cropping on the m_1 frames of black-and-white images to crop m_1 frames of black-and-white images with a size of w_1*h_1/n^2 from images actually shot by the second camera. Herein, n_0 is approximately equal to 3.

[0125] S304. Perform multi-frame zoom on the m_0 frames of color images with a size of $w_0*h_0/(n/n_0)^2$ obtained in S303, to obtain a color multi-frame zoom result, namely, one frame of color zoom image of w_0*h_0. Perform multi-frame zoom on the m_1 frames of black-and-white images with a size of ~~w_0~~w_1*~~h_0~~h_1/n^2 obtained in S303, to obtain a black-and-white multi-frame zoom result, namely, one frame of black-and-white zoom image of ~~w_0~~w_1*~~h_0~~h_1/n^2.

[0126] For a multi-frame zoom algorithm in S304, refer to the multi-frame zoom algorithm in S104.

[0127] S305. Perform tele-photo (Tele-photo) and black-and-white fusion on the frame of color zoom image of w_0*h_0 and the frame of black-and-white zoom image of w_0*h_0/n^2 obtained in S304, to obtain one frame of color output image of w_0*h_0, namely, an output image of the target scene. Herein, the resolution of the output image of the target scene is the same as the resolution of the first camera and the resolution of the third camera.

[0128] An optional procedure of an algorithm of the tele-photo and black-and-white fusion is as follows:

[0129] (1) Use a color zoom image (which may be referred to as a telephoto) corresponding to a tele-photo lens as a reference, align a black-and-white zoom image to the telephoto, to obtain a motion area mask.

[0130] (2) Input the telephoto, an aligned black-and-white image, and the motion area mask to a pre-trained convolutional neural network to obtain a fused result.

and/or a block in the flowcharts and/or the block diagrams. These computer program instructions may be provided for a general-purpose computer, a dedicated computer, an embedded processor, or a processor of another programmable data processing device to generate a machine, so that the instructions executed by a computer or a processor of another programmable data processing device generate an apparatus for implementing a specific function in one or more processes in the flowcharts and/or in one or more blocks in the block diagrams.

[0174] These computer program instructions may be stored in a computer readable memory that can instruct the computer or another programmable data processing device to work in a specific manner, so that the instructions stored in the computer readable memory generate an artifact that includes an instruction apparatus. The instruction apparatus implements a specific function in one or more processes in the flowcharts and/or in one or more blocks in the block diagrams.

[0175] These computer program instructions may be loaded onto a computer or another programmable data processing device, so that a series of operations and steps are performed on the computer or the another programmable device, thereby generating computer-implemented processing. Therefore, the instructions executed on the computer or the another programmable device provide steps for implementing a specific function in one or more processes in the flowcharts and/or in one or more blocks in the block diagrams.

[0176] Although some embodiments of the present invention are described, a person skilled in the art can make a change and a modification to these embodiments once he learns the basic inventive concept. Therefore, it is intended to construe the following claims as to cover the embodiments enumerated and all changes and modifications falling within the scope of the present invention. Obviously, a person skilled in the art can make various modifications and variations to the embodiments of the present invention without departing from the ~~spirit and~~ scope of the embodiments of the present invention. The present invention is intended to cover the modifications and variations of the embodiments of the present invention provided that these

CLAIMS

1. A terminal, comprising:

a first camera, a second camera, and a third camera, wherein the first camera and the third camera are color cameras, the second camera is a black-and-white camera, and the first camera, the second camera, and the third camera are cameras using prime lenses, an equivalent focal length of the third camera is greater than both an equivalent focal length of the first camera and an equivalent focal length of the second camera, the first camera, the second camera, and the third camera are located on a rear side of the terminal, and the equivalent focal length of the third camera is 2 to 4 times the equivalent focal length of the first camera;

a processor; and

a memory coupled to the processor to store a computer program and instructions, which when executed by the processor, cause the processor to perform operations, the operations including:

selecting, from the first camera, the second camera and the third camera, at least one camera from the first, second and third cameras to capture at least one image that comprises a target scene; and

obtaining an output image of the target scene based on the at least one image that comprises the target scene.

2. The terminal according to claim 1, wherein the operations further include:

when a current zoom ratio is within a zoom range of (1, 3), respectively capturing, by using the first camera and the second camera, at least one color image and at least one black-and-white image that comprise the target scene.

3. The terminal according to claim 1, wherein the operations further include:

when the current zoom ratio is within a zoom range of [3, 10], and illuminance of the target scene is lower than a preset threshold, respectively capturing, by using the

third camera and the second camera, at least one color image and at least one black-and-white image that comprise the target scene.

4. The terminal according to claim 1, wherein the operations further include:

when the current zoom ratio is within a zoom range of [3, 10], and illuminance of the target scene is not lower than a preset threshold, capturing, by using the third camera, at least one color image that comprises the target scene.

5. The terminal according to claim 1, wherein the equivalent focal length of the first camera is 26 mm or 27 mm.

6. The terminal according to claim 1, wherein an aperture value of the first camera is 1.7 or 1.8.

7. The terminal according to claim 1, wherein an aperture value of the third camera is 2.4 or 2.2.

8. The terminal according to claim 1, wherein resolution of the first camera is 10 M or 12 M, and resolution of the third camera is 8 M, 10 M, or 12 M.

~~What is claimed is:~~

~~1. A shooting method, wherein the method is applied to a terminal, and the terminal comprises a first camera, a second camera, and a third camera; the first camera and the third camera are color cameras, the second camera is a black-and-white camera, and the first camera, the second camera, and the third camera all are cameras using prime lenses; an equivalent focal length of the third camera is greater than both an equivalent focal length of the first camera and an equivalent focal length of the second camera; and the method comprises:~~

~~obtaining a target zoom ratio;~~

~~determining at least one camera from the first camera, the second camera, and the third camera based on the target zoom ratio as a target camera;~~

~~capturing, by using the target camera, at least one image that comprises a target scene; and~~

~~obtaining an output image of the target scene based on the at least one image that comprises the target scene.~~

~~2. The method according to claim 1, wherein resolution of the second camera is higher than resolution of the first camera and higher than resolution of the third camera.~~

~~3. The method according to claim 1, wherein resolution of the second camera is higher than resolution of an output image of the first camera and higher than resolution of an output image of the third camera.~~

~~4. The method according to any one of claims 1 to 3, wherein the determining, at least one camera from the first camera, the second camera, and the third camera based on the target zoom ratio as a target camera comprises:~~

~~when the target zoom ratio is within (1, 3), determining the first camera and the second camera as target cameras; and~~

~~the capturing, by using the target camera, at least one image that comprises a target scene comprises:~~

~~respectively capturing, by using the first camera and the second camera, images that comprise the target scene.~~

~~5. The method according to any one of claims 1 to 3, wherein the determining, at least one camera from the first camera, the second camera, and the third camera based on the target zoom ratio as a target camera comprises:~~

~~when the target zoom ratio is within [3, 5], determining whether illuminance of the target scene is lower than a preset threshold; and~~

~~if the illuminance of the target scene is lower than the preset threshold,~~

~~determining the second camera and the third camera as target cameras; and~~

~~the capturing, by using the target camera, at least one image that comprises a target scene comprises:~~

~~respectively capturing, by using the second camera and the third camera, images that comprise the target scene.~~

~~6. The method according to any one of claims 1 to 3, wherein the determining, at least one camera from the first camera, the second camera, and the third camera based on the target zoom ratio as a target camera comprises:~~

~~when the target zoom ratio is within [3, 5], determining whether illuminance of the target scene is lower than a preset threshold; and~~

~~if the illuminance of the target scene is not lower than the preset threshold, determining the third camera as the target camera; and~~

~~the capturing, by using the target camera, at least one image that comprises a target scene comprises:~~

~~capturing, by using the third camera, at least one image that comprises the target scene.~~

~~7. The method according to any one of claims 1 to 3, wherein the determining, at least one camera from the first camera, the second camera, and the third camera based on the target zoom ratio as a target camera comprises:~~

~~when the target zoom ratio is within (5, 10], determining whether illuminance of the target scene is lower than a preset threshold; and~~

~~if the illuminance of the target scene is lower than the preset threshold, determining the second camera and the third camera as target cameras; and~~

~~the capturing, by using the target camera, at least one image that comprises a target scene comprises:~~

~~capturing, by using the second camera and the third camera, images that comprise the target scene.~~

~~8. The method according to any one of claims 1 to 3, wherein the determining, at least one camera from the first camera, the second camera, and the third camera based on the target zoom ratio as a target camera comprises:~~

~~when the target zoom ratio is within (5, 10], determining whether illuminance of the target scene is lower than a preset threshold; and~~

~~if the illuminance of the target scene is not lower than the preset threshold, determining the third camera as the target camera; and~~

the capturing, by using the target camera, at least one image that comprises a target scene comprises:

capturing, by using the third camera, at least one image that comprises the target scene.

9. The method according to any one of claims 1 to 8, wherein the equivalent focal length of the third camera is 3 times the equivalent focal length of the second camera, and the equivalent focal length of the second camera is equal to the equivalent focal length of the first camera.

10. The method according to any one of claims 1 to 9, wherein the equivalent focal length of the first camera is 27 mm, the equivalent focal length of the second camera is 27 mm, and the equivalent focal length of the third camera is 80 mm.

11. The method according to any one of claims 1 to 10, wherein f-numbers of the first camera, the second camera, and the third camera are respectively 1.8, 1.65, and 2.4.

12. The method according to any one of claims 1 to 11, wherein the resolution of the first camera, the resolution of the second camera, and the resolution of the third camera are respectively 10 M, 20 M, and 10 M.

13. A shooting apparatus, wherein the apparatus is applied to a terminal, and the terminal comprises a first camera, a second camera, and a third camera; the first camera and the third camera are color cameras, the second camera is a black-and-white camera, and the first camera, the second camera, and the third camera all are cameras using prime lenses; an equivalent focal length of the third camera is greater than both an equivalent focal length of the first camera and an equivalent focal length of the second camera; and the apparatus further comprises:

an obtaining module, configured to obtain a target zoom ratio;

a determining module, configured to determine at least one camera from the first camera, the second camera, and the third camera based on the target zoom ratio as a target camera;

a capturing module, configured to capture, by using the target camera, at least one image that comprises a target scene; and

~~an image processing module, configured to obtain an output image of the target scene based on the at least one image that comprises the target scene.~~

~~14. The apparatus according to claim 13, wherein resolution of the second camera is higher than resolution of the first camera and higher than resolution of the third camera.~~

~~15. The apparatus according to claim 14, wherein the resolution of the second camera is higher than resolution of an output image of the first camera and higher than resolution of an output image of the third camera.~~

~~16. The apparatus according to any one of claims 13 to 15, wherein when the zoom ratio is within (1, 3), the determining module is specifically configured to determine the first camera and the second camera as target cameras, and the capturing module is specifically configured to respectively capture, by using the first camera and the second camera, images that comprise the target scene.~~

~~17. The apparatus according to any one of claims 13 to 15, wherein when the zoom ratio is within [3, 5], the determining module determines whether illuminance of the target scene is lower than a preset threshold; if the illuminance of the target scene is lower than the preset threshold, the determining module determines the third camera and the second camera as target cameras; and the capturing module is specifically configured to respectively capture, by using the third camera and the second camera, images that comprise the target scene.~~

~~18. The apparatus according to any one of claims 13 to 15, wherein when the zoom ratio is within [3, 5], the determining module determines whether illuminance of the target scene is lower than a preset threshold; if the illuminance of the target scene is not lower than the preset threshold, the determining module determines the third camera as the target camera; and the capturing module is specifically configured to capture, by using the third camera, at least one image that comprises the target scene.~~

~~19. The apparatus according to any one of claims 13 to 15, wherein when the zoom ratio is within (5, 10], the determining module determines whether illuminance of the target scene is lower than a preset threshold; if the illuminance of the target~~

scene is lower than the preset threshold, the determining module determines the third camera and the second camera as target cameras; and the capturing module is specifically configured to respectively capture, by using the third camera and the second camera, images that comprise the target scene.

20. The apparatus according to any one of claims 13 to 15, wherein when the zoom ratio is within (5, 10], the determining module determines whether illuminance of the target scene is lower than a preset threshold; if the illuminance of the target scene is not lower than the preset threshold, the determining module determines the third camera as the target camera; and the capturing module is specifically configured to capture, by using the third camera, at least one image that comprises the target scene.

21. The apparatus according to any one of claims 13 to 20, wherein the equivalent focal length of the first camera is 27 mm, the equivalent focal length of the second camera is 27 mm, and the equivalent focal length of the third camera is 80 mm.

22. The apparatus according to any one of claims 13 to 21, wherein the resolution of the first camera, the resolution of the second camera, and the resolution of the third camera are respectively 10 M, 20 M, and 10 M.

23. A terminal device, wherein the terminal device comprises a memory, a processor, a bus, a first camera, a second camera, and a third camera; the memory, the first camera, the second camera, the third camera, and the processor are connected by using the bus; the first camera and the third camera are color cameras, the second camera is a black-and-white camera, and the first camera, the second camera, and the third camera all are cameras using prime lenses; and an equivalent focal length of the third camera is greater than both an equivalent focal length of the first camera and an equivalent focal length of the second camera;

the camera is configured to capture an image signal under control of the processor;

the memory is configured to store a computer program and an instruction; and

~~the processor is configured to invoke the computer program and the instruction stored in the memory, so that the terminal device performs the method according to any one of claims 1 to 12.~~

~~24. The terminal device according to claim 23, wherein the terminal device further comprises an antenna system, the antenna system transmits and receives, under control of the processor, a wireless communication signal to implement wireless communication with a mobile communications network, and the mobile communications network comprises one or more of the following: a GSM network, a CDMA network, a 3G network, a 4G network, an FDMA, a TDMA network, a PDC network, a TACS network, an AMPS network, a WCDMA network, a TD-SCDMA network, a Wi-Fi network, and an LTE network.~~