

METHOD AND APPARATUS FOR PROCESSING IMAGES, MOBILE METHOD AND APPARATUS FOR PROCESSING VIDEOS, COMPUTER DEVICE AND MEDIUM

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims priorities to Chinese Patent Application No. 201910667696.6, filed with the China National Intellectual Property Administration on July 23, 2019 and Chinese Patent Application No. 202010348909.1, filed with the China National Intellectual Property Administration on April 28, 2020, the disclosures of which are incorporated herein by reference in their entireties.

TECHNICAL FIELD

[0002] The present disclosure relates to the field of image processing, and in particular relates to a method and apparatus for processing images, a method and apparatus for processing videos on a mobile terminal, and a computer device and a medium thereof.

BACKGROUND

[0003] A video is typically encoded by means of lossy compression for storage and transmission, and this produces encoding noise when the video is decoded. The types of encoding noise include blocking, ringing, and aliasing effects. For example, when a user watches a video, a video application on a mobile terminal pulls a video stream from a server, and decodes and plays the video stream locally. Due to restrictions of network conditions, the video stream pulled to the mobile terminal is generally highly compressed, and visible encoding noise generally appears when the user watches the video, especially in a poor network condition.

[0004] In the field of image/video denoising, a common solution is to eliminate Gaussian white noise generated by a camera photoreceptor. Some other solutions are also available for eliminating the encoding noise. However, in these solutions, a specific type of encoding noise, such as the blocking effect, is only addressed. Moreover, in recent years, efforts have been witnessed to explore an encoding noise eliminating algorithm based on neural network, which truly achieves the effect of eliminating the encoding noise to an extent. However, the neural network brings enormous computation and thus has a low real-time performance.

SUMMARY

[0005] Embodiments of the present disclosure provide a method and apparatus for processing images, a method and apparatus for processing videos on a mobile terminal, and a computer device and a medium thereof, which enable real-time denoising of an image and adaptive filtering of each image block, thereby improving the definition of a video.

[0006] Embodiments of the present disclosure provide a method for processing images. The method includes:

[0007] determining an image attribute of each image block of a plurality of image blocks in a to-be-processed image;

[0008] determining a filter model corresponding to each of the image blocks based on the image attribute of each of the image blocks; and

[0009] acquiring a filtered image of the to-be-processed image by filtering image block by the filter model corresponding to each of the image blocks.

[0010] Embodiments of the present disclosure provide a method for processing videos on a mobile terminal. The method includes:

[0011] decoding a to-be-processed video pulled from a video stream;

[0012] extracting a video frame from the to-be-processed video;

[0013] acquiring a filtered image corresponding to the video frame by processing the video frame as a to-be-processed image with the method described in any one of the above embodiments; and

[0014] playing the video with the filtered image.

[0015] Embodiments of the present disclosure provide an apparatus for processing images. The apparatus includes:

[0016] a first determining module, configured to determine an image attribute of each image block of a plurality of image blocks in a to-be-processed image;

[0017] a second determining module, configured to determine a filter model corresponding to each of the image blocks based on the image attribute of each of the image blocks; and

[0018] a first filtering module, configured to acquire a filtered image of the to-be-processed image by filtering each of the image blocks by the filter model corresponding to each of the image blocks.

[0019] Embodiments of the present disclosure provide an apparatus for processing videos on a mobile terminal. The apparatus includes:

[0020] a decoding module, configured to decode a to-be-processed video pulled from a video stream;

[0021] an extracting module, configured to extract a video frame from the to-be-processed video;

[0022] a processing module, configured to acquire a filtered image corresponding to the video frame by processing the video frame as the to-be-processed image by the method described in any one of the above embodiments; and

[0023] a playing module, configured to play the video with the filtered image.

[0024] Embodiments of the present disclosure provide a computer device. The computer device includes:

[0025] one or more processors; and

[0026] a memory, configured to store one or more programs; wherein

[0027] wherein the one or more processors, when running the one or more programs, is caused to perform the method for processing images as described in any one of the embodiments herein, or perform the method for processing videos on the mobile terminal as defined in any one of the embodiments herein.

[0028] Embodiments of the present disclosure provide a non-volatile computer-readable storage medium storing a computer program thereon, wherein the computer program, when run by a processor, causes the processor to perform the method for processing images as defined in any one of the embodiments of the present disclosure, or perform the method for processing videos on the mobile terminal as defined in any one of the embodiments of the present disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029] FIG. 1 is a flowchart of a method for processing images according to an embodiment of the present disclosure;

[0030] FIG. 2 is a schematic diagram for displaying a division of a to-be-processed image into image blocks according to an embodiment of the present disclosure;

[0031] FIG. 3 is a flowchart of another method for processing images according to an embodiment of the present disclosure;

[0032] FIG. 4 is a flowchart of still another method for processing images according to an embodiment of the present disclosure;

[0033] FIG. 5 is a flowchart of still another method for processing images according to an embodiment of the present disclosure;

[0034] FIG. 6 is a flowchart of filtering the image block in the method for processing images according to an embodiment of the present disclosure;

[0035] FIG. 7 is a flowchart of a method for processing videos on a mobile terminal according to an embodiment of the present disclosure;

[0036] FIG. 8 is a schematic structural diagram of an apparatus for processing images according to an embodiment of the present disclosure;

[0037] FIG. 9 is a schematic structural diagram of an apparatus for processing videos on a mobile terminal according to an embodiment of the present disclosure; and

[0038] FIG. 10 is a schematic structural diagram of a computer device according to an embodiment of the present disclosure.

image block from the plurality of filter models corresponding to the to-be-processed image based on the image attribute of each of the image blocks in the to-be-processed image.

[00190] The apparatus for processing images is applicable to the method for processing images according to any embodiment of the present disclosure.

[00191] FIG. 9 is a schematic structural diagram of an apparatus for processing videos on a mobile terminal according to an embodiment of the present disclosure. As shown in FIG. 9, the apparatus includes a decoding module 810, an extracting module 820, a processing module 830, and a playing module 840.

[00192] The decoding module 810 is configured to decode a to-be-processed video pulled from a video stream, the extracting module 820 is configured to extract a video frame from the to-be-processed video, the processing module 830 is configured to acquire a filtered image corresponding to the video frame by processing the video frame as a to-be-processed image by the method described in any one of the above embodiments, and the playing module 840 is configured to play the video with the filtered image.

[00193] The technical solution according to the embodiment improves the efficiency of denoising a video by denoising the current video frame in the video, realizing the real-time denoising of the video, and renders a higher definition of the video watched by the user, thereby improving the user experience.

[00194] The apparatus for processing videos on the mobile terminal is applicable to the method for processing videos on the mobile terminal according to any embodiment of the present disclosure.

[00195] FIG. 10 is a schematic structural diagram of a computer device according to an embodiment of the present disclosure. As shown in FIG. 10, the computer device includes a processor 910, a memory 920, an input device 930, and an output device 940. The processor 910 in the computer device may be one or more. One processor 910 is exemplified in FIG. 10, and the processor 910, the memory 920, the input device 930, and the output device 940 in the computer device may be connected via a bus or otherwise, and the connection via is exemplified a bus in FIG. 10.

[00196] The memory 920 in the computer device, as a computer-readable storage medium, can be configured to store one or more programs, wherein the programs can be software programs, computer-executable programs and modules, such as the program instructions/modules corresponding to the method for processing images according to an embodiment of the present disclosure (for example, the modules in the apparatus for processing images shown in FIG. 8 including the first determining module 710, the second determining module 720 and the first filtering module 730). The processor 910 executes various functional applications of the device and data processing by running software

programs, instructions and modules stored in the memory 920, that is, to implement the method for processing images in the above method embodiment.

[00197] The memory 920 may include a program storage partition and a data storage partition, wherein the program storage partition may store an operating system and an application program required for at least one function, and the data storage partition may store data created according to the use of the computer device or the like. In addition, the memory 920 may include a high-speed random-access memory and a non-volatile memory, such as at least one magnetic disk storage device, flash memory device, or other non-volatile solid state storage device. In some embodiments, the memory 920 may further include a memory arranged remotely relative to the processor 910, which may be connected to the computer device via a network. Examples of such networks include, but are not limited to, the Internet, intranets, local area networks, mobile communication networks, and combinations thereof.

[00198] The input device 930 may be configured to receive numeric or character information input by a user to generate key signal inputs related to user settings and function controls of the terminal device. The output device 940 may include a display device such as a monitor.

[00199] Furthermore, in the case that one or more programs included in the device are executed by one or more processors 910, the programs perform the following operation, including determining the image attribute of each image block of a plurality of image blocks in the to-be-processed image, determining the filter model corresponding to each of the image blocks based on the image attribute of each of the image blocks, and acquiring the filtered image of the to-be-processed image by filtering each of the image blocks by the filter model corresponding to each image block.

[00200] The computer device may be configured to perform the method for processing images according to any one of the embodiments of the present disclosure.

[00201] In an embodiment, the computer device may be configured to perform the method for processing videos on the mobile terminal according to any embodiment of the present disclosure.

[00202] An embodiment of the present disclosure further provides a non-volatile computer-readable storage medium storing a computer program therein. The computer program, when run by a processor, causes the processor to perform the method for processing images or the method for processing videos on the mobile terminal according to any one of the embodiments of the present disclosure. The method for processing images may include: determining the image attribute of each image block of a plurality of image blocks in the to-be-processed image, determining the filter model corresponding to each of the image blocks based on the image attribute of each of the image blocks, and acquiring the filtered image of the to-be-processed image by filtering each of the image block by the filter model corresponding to each of the image blocks.

CLAIMS

What is claimed is:

1. A method for processing images, comprising:

determining an image attribute of each image block of a plurality of image blocks in a to-be-processed image;

determining a filter model corresponding to each of the image blocks based on the image attribute of each of the image blocks; and

acquiring a filtered image of the to-be-processed image by filtering each of the image blocks by the filter model corresponding to each of the image blocks,

wherein the image attribute comprises a first hash value and a second hash value; wherein

the first hash value is configured to indicate a direction of an image gradient corresponding to each of the image blocks weighs more; and the second hash value is configured to indicate a proximity between the image gradient corresponding to each of the image blocks in a first direction and the image gradient corresponding to each of the image blocks in a second direction.

2. The method according to claim 1, wherein determining the image attribute of each image block of the plurality of image blocks in the to-be-processed image comprises:

calculating, based on the image gradient of each of the image blocks in the first direction and the image gradient of each of the image blocks in the second direction, a square value of the image gradient corresponding to each of the image blocks in the first direction, a square value of the image gradient corresponding to each of the image blocks in the second direction, and a product value of the image gradient corresponding to each of the image blocks in the first direction and the image gradient corresponding to each of the image blocks in the second direction; and

acquiring the first hash value and the second hash value corresponding to each of the image blocks by calculating the square value of the image gradient corresponding to the first direction, the square value of the image gradient corresponding to the second direction, and the product value of the image gradient corresponding to the first direction and the image gradient corresponding to the second direction based on an integral image algorithm.

3. The method according to claim 1, wherein determining the filter model corresponding to each of the image blocks based on the image attribute of each of the image blocks comprises:

determining a bucket sequence number based on the first hash value and the second hash value corresponding to each of the image blocks; and

determining the filter model corresponding to each of the image blocks based on the bucket sequence number.

4. The method according to any one of claims 1 to 3, further comprising:

determining the filter model of each image block according to an encoding noise intensity of the to-be-processed image; and

acquiring the filtered image of the to-be-processed image by filtering each of the image blocks by the filter model corresponding to each of the image blocks comprises:

acquiring the filtered image of the to-be-processed image by filtering each of the image blocks with a target model corresponding to each of the image blocks, wherein the target model corresponding to each of the image blocks comprises the filter model of each of the image blocks determined according to the encoding noise intensity of the to-be-processed image and the filter model corresponding to each of the image blocks determined based on the image attribute of each of the image blocks.

5. The method according to claim 4, wherein determining the encoding noise intensity of the to-be-processed image comprises:

acquiring a quality parameter of video encoding corresponding to the to-be-processed image; and

determining the encoding noise intensity of the to-be-processed image based on the quality parameter.

6. The method according to any one of claims 1 to 3, further comprising:

acquiring a binarized image of the to-be-processed image by binarizing the to-be-processed image.

7. The method according to claim 6, wherein acquiring the binarized image of the to-be-processed image by binarizing the to-be-processed image comprises:

acquiring a text boundary image by performing Laplace filtering on the to-be-processed image;

acquiring a first image by performing threshold segmentation on the text boundary image based on a preset pixel threshold, wherein the first image is an image with a non-text boundary region removed from the text boundary image; and

acquiring the binarized image by performing a morphological close operation on the first image.

8. The method according to claim 7, wherein upon acquiring the binarized image, the method further comprises:

performing mean filtering on the binarized image.

9. The method according to claim 7, wherein acquiring the binarized image by performing the morphological close operation on the first image comprises:

acquiring a dilated image by dilating the first image; and

acquiring the binarized image by eroding the dilated image.

10. The method according to claim 7, wherein acquiring the first image by performing threshold segmentation on the text boundary image based on the preset pixel threshold comprises:

comparing a pixel value corresponding to each pixel point in the text boundary image with the preset pixel threshold;

adjusting the pixel value corresponding to the pixel point greater than the pixel threshold to a first pixel value;

adjusting the pixel value corresponding to the pixel point less than or equal to the pixel threshold to a second pixel value; and

determining the text boundary image with the pixel values adjusted as the first image.

11. The method according to claim 10, further comprising:

determining a ratio of a difference value between the first pixel value and the pixel value of the binarized image to the first pixel value as a first weight;

determining a ratio of the pixel value of the binarized image to the first pixel value as a second weight; and

acquiring a denoised image of the to-be-processed image by adding a product value of the pixel value of the filtered image and the first weight to a product value of the pixel value of the to-be-processed image and the second weight.

12. The method according to any one of claims 1 to 3, wherein training of the filter model comprises:

acquiring a high-definition image of a first preset size and a low-definition image carrying an encoding noise, wherein the high-definition image and the low-definition image have a same resolution;

extracting a plurality of image blocks of a second preset size from the high-definition image and the low-definition image to compose a first matrix and a second matrix respectively, wherein the second preset size is less than the first preset size; and

acquiring the filter model based on the first matrix and the second matrix according to a normal equation of a Least Square method.

13. The method according to any one of claims 1 to 3, wherein the filter model and the image block have a same size.

14. The method according to any one of claims 1 to 3, wherein

prior to determining the filter model corresponding to each of the image blocks based on the image attribute of each of the image blocks, the method further comprises:

determining a plurality of filter models corresponding to the to-be-processed image according to the encoding noise intensity of the to-be-processed image; and
determining the filter model corresponding to each of the image blocks based on the image attribute of each of the image blocks comprises:

determining the filter model corresponding to each of the image blocks from the plurality of filter models corresponding to the to-be-processed image based on the image attribute of each of the image blocks in the to-be-processed image.

15. A method for processing videos on a mobile terminal, comprising:
decoding a to-be-processed video pulled from a video stream;
extracting a video frame from the to-be-processed video;
acquiring a filtered image corresponding to the video frame by processing the video frame as a to-be-processed image by the method as defined in any one of claims 1 to 14; and
playing the video with the filtered image.

16. An apparatus for processing images, comprising:
a first determining module, configured to determine an image attribute of each image block of a plurality of image blocks in a to-be-processed image;
a second determining module, configured to determine a filter model corresponding to each of the image blocks based on the image attribute of each of the image blocks; and
a first filtering module, configured to acquire a filtered image of the to-be-processed image by filtering each of the image blocks by the filter model corresponding to each of the image blocks.

17. An apparatus for processing videos on a mobile terminal, comprising:
a decoding module, configured to decode a to-be-processed video pulled from a video stream;
an extracting module, configured to extract a video frame from the to-be-processed video;
a processing module, configured to acquire a filtered image corresponding to the video frame by processing the video frame as a to-be-processed image by the method as defined in any one of claims 1 to 14; and
a playing module, configured to play the video with the filtered image.

18. A computer device, comprising:
at least one processor; and
a memory, configured to store at least one program;
wherein the at least one processor, when running the at least one program, is caused to perform the method for processing images as defined in any one of claims 1 to 14, or to perform the method for processing videos on the mobile terminal as defined in claim 15.

19. A non-volatile computer-readable storage medium storing a computer program, wherein the computer program, when run by a processor, causes the processor to perform the method for processing images as defined in any one of claims 1 to 14, or perform the method for processing videos on the mobile terminal as defined in claim 15.