

METHOD FOR ASSESSING IMAGE QUALITY AND DEVICE THEREOF

The present disclosure claims priority to the Chinese patent application No. 201710854415.9 filed on September 20, 2017, the entire content of which is hereby
5 incorporated by reference in its entirety.

TECHNICAL FIELD

The present disclosure relates to the technical field of digital image processing, and specifically to a method for assessing image quality and a device thereof.

BACKGROUND

10 As digital devices such as digital cameras, surveillance cameras and mobile phones prevail, digital image applications are becoming wider and wider. In practical applications, such as face recognition, OCR, image classification, intelligent surveillance, etc., there are certain requirements on the quality of images, and how to effectively assess the quality of an image has become more and more important. The
15 current methods for assessing image quality, whether with or without reference, are basically based on processing the whole image to obtain its corresponding quality indicator. In fact, when a computer uses this method to assess the quality, the process of human vision isn't really reflected. The human vision system implements autofocus when assessing a surrounding scene, and such focusing process is equivalent to
20 seeking for a really interesting target region, namely, target detection. The quality of a region of interest (ROI) in the image is more significant for the practical applications.

Therefore, it is desirable to provide a method for assessing image quality and a device thereof, which enable the image quality assessment process to concern the target regions of interest more and ignore the image quality of insignificant regions.

SUMMARY

In view of the above problems, the present disclosure provides a method for assessing image quality and a device thereof.

5 An aspect of the present disclosure provides a method for assessing image quality, including: performing quality assessment on at least one target region in an image to be assessed respectively, to determine at least one quality assessment result of the at least one target region; performing quality assessment on the image to be assessed, based on the determined at least one quality assessment result of the at least one target region.

10 In an embodiment, the method further includes: performing target detection on the image to be assessed, to determine the at least one target region.

In an embodiment, a means of the performing target detection on the image to be assessed includes any one of following manners: a conventional feature extraction manner and a depth feature extraction manner.

15 In an embodiment, the performing target detection on the image to be assessed includes: classifying contours of a binary image obtained from the image to be assessed, to determine text contours; combining texts in a specified direction based on the determined text contours, to determine the at least one target region.

In an embodiment, the contours of the binary image are classified based on
20 parameters determined by at least one of following operations: determining the number of non-zero pixels within the contour of the binary image; determining a height-width ratio and a width-height ratio of the contour of the binary image; determining the number of similar-width contours and the number of similar-height contours existing within a specified direction neighborhood range within the specified
25 direction of the contour of the binary image.

In an embodiment, the combining texts in a specified direction based on the determined text contours includes: performing a dilation operation and an erosion operation on the determined text contours in the specified direction by setting a dilation operator and an erosion operator.

In an embodiment, the performing quality assessment on at least one target region in an image to be assessed respectively includes: determining the at least one quality assessment result of the at least one target region based on the at least one target region and an image quality assessment model.

5 In an embodiment, the determining the at least one quality assessment result of the at least one target region based on the at least one target region and an image quality assessment model includes: determining the image quality assessment model by using a training approach based on deep learning, and determining the at least one quality assessment result of the at least one target region based on the determined at
10 least one target region and the image quality assessment model.

In an embodiment, the performing quality assessment on the at least one target region respectively includes: performing quality assessment on the at least one target region based on statistics of gray values of pixels.

In an embodiment, the performing quality assessment on the image to be
15 assessed, based on the determined at least one quality assessment result of the at least one target region includes: performing quality assessment on the image to be assessed in a quality weighted average manner based on the determined at least one quality assessment result of the at least one target region.

In an embodiment, the performing quality assessment on the at least one target
20 region respectively to determine the at least one quality assessment result of the at least one target region includes: performing quality assessment on the at least one target region respectively by using a non-reference quality assessment indicator, to determine the at least one quality assessment result of the at least one target region, and the non-reference quality assessment indicator includes at least one of
25 Edge-Strength, Noise-rate and Uniform Brightness-Distribution.

Another aspect of the present disclosure provides a device for assessing image quality, including: a target region quality assessment unit configured to perform quality assessment on at least one target region in an image to be assessed respectively, to determine at least one quality assessment result of the at least one target region; a
30 to-be-assessed image quality assessment unit configured to perform quality

assessment on the image to be assessed, based on the determined quality assessment result of the target region.

In an embodiment, the device further includes: a target detection unit configured to perform target detection on the image to be assessed, to determine the at least one
5 target region.

In an embodiment, a means of the target detection unit performing target detection on the image to be assessed includes any one of following manners: a conventional feature extraction manner and a depth feature extraction manner.

In an embodiment, the target detection unit includes: a contour classification
10 unit configured to classify contours of a binary image obtained from the image to be assessed, to determine text contours; a text combination unit configured to combine texts in a specified direction based on the determined text contours, to determine the at least one target region.

In an embodiment, the contour classification unit is further configured to:
15 classify the contours of the binary image based on parameters determined by at least one of following operations: determining the number of non-zero pixels within the contour of the binary image; determining a height-width ratio and a width-height ratio of the contour of the binary image; and determining the number of similar-width contours and the number of similar-height contours existing within a specified
20 direction neighborhood range within the specified direction of the contour of the binary image.

In an embodiment, the text combination unit is further configured to: perform a dilation operation and an erosion operation on the determined text contour in the specified direction by setting a dilation operator and an erosion operator.

25 In an embodiment, the target region quality assessment unit is further configured to: determine the at least one quality assessment result of the at least one target region based on the at least one target region and an image quality assessment model.

In an embodiment, the target region quality assessment unit is further
30 configured to: determine the image quality assessment model by using a training

approach based on deep learning, and determine the at least one quality assessment result of the at least one target region based on the at least one target region and the image quality assessment model.

In an embodiment, the target region quality assessment unit is further
5 configured to: perform quality assessment on the at least one target region based on statistics of gray values of pixels.

In an embodiment, the to-be-assessed image quality assessment unit is further
configured to: perform quality assessment on the image to be assessed in a quality
weighted average manner based on the determined at least one quality assessment
10 result of the at least one target region.

In an embodiment, the target region quality assessment unit is further
configured to: perform quality assessment on the at least one target region
respectively by using a non-reference quality assessment indicator, to determine the at
least one quality assessment result of the at least one target region, and the
15 non-reference quality assessment indicator includes at least one of Edge-Strength,
Noise-rate and Uniform Brightness-Distribution.

A further aspect of the present disclosure further provides a computer device,
including a memory, a processor and a computer program stored on the memory and
executed by the processor, when the computer program is executed by the processor,
20 the method according to any one of the first aspect is implemented.

A further aspect of the present disclosure further provides a computer storage
medium on which an executable program executed by a processor is stored, wherein
when the executable program is executed by the processor, the method according to
any one of the first aspect is implemented.

25 The method for assessing image quality according to the present disclosure
enables the image quality assessment process to concern the target regions of interest
and ignore the image quality of insignificant regions, so that quality assessment is
performed on the image to be assessed in a fast assessment speed and with more high
assessment accuracy, the quality of the image to be assessed is assessed objectively
30 and effectively, and the quality assessment result is kept consistent with human eye

perception as much as possible.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a flow chart of a method for assessing image quality according to an embodiment of the present disclosure.

5 FIG. 2 is a flow chart of a method for assessing image quality according to another embodiment of the present disclosure.

FIG. 3 is a flow chart of a method for assessing text image quality according to an embodiment of the present disclosure.

10 FIG. 4 is an example of a text image according to an embodiment of the present disclosure.

FIG. 5 is a binary image of the text image of FIG. 4.

FIG. 6 is a schematic diagram of text line regions obtained after performing target detection on FIG. 4.

15 FIG. 7 is a schematic diagram of a composite image of an image quality assessment model according to an embodiment of the present disclosure.

FIG. 8 is an assessment result of the text image of FIG. 4.

FIG. 9 is an example of another text image according to an embodiment of the present disclosure.

FIG. 10 is a binary image of the text image of FIG. 9.

20 FIG. 11 is a schematic diagram of text line regions obtained after performing target detection on FIG. 9.

FIG. 12 is an assessment result of the text image of FIG. 9.

FIG. 13 is a schematic diagram of a device for assessing image quality according to an embodiment of the present disclosure.

25 DETAILED DESCRIPTION

The present disclosure will be described in more detail with reference to the drawings to make purposes, technical means and advantages of the present disclosure

more apparent.

FIG. 1 is a flow chart of a method for assessing image quality according to an embodiment of the present disclosure.

5 S101: quality assessment is performed on at least one target region in an image to be assessed respectively to determine a quality assessment result of each target region in the at least one target region;

S102: quality assessment is performed on the image to be assessed based on the determined quality assessment result of each target region in the at least one target region.

10 It is first necessary to know the target region in the image in order to assess the quality of the image. In the present disclosure, the target region may be determined by predefining, or by detecting before each assessment.

FIG. 2 is a flow chart of another method for assessing image quality according to an embodiment of the present disclosure.

15 The present disclosure provides a method for assessing quality which includes the steps shown in FIG. 2:

S201: target detection is performed on an image to be assessed to determine at least one target region;

20 S202: quality assessment is performed on the at least one target region respectively to determine a quality assessment result of each target region in the at least one target region;

S203: quality assessment is performed on the image to be assessed based on the determined quality assessment result of each target region in the at least one target region.

25 In order to assess the quality of the image, it is first necessary to detect the target region in the image. It should be understood that the target regions of interest are different, and target detection methods used are different. It is possible to perform target detection on the image to be assessed based on a conventional feature extraction manner, a depth feature extraction manner (such as CTPN method, Haar classifier, or Fater-rcnn), or the like. The image to be assessed may include any object, such as an

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animal, a human face, food, a car, a text line image or the like. The text image to be assessed herein may be a color image or a grayscale image. The results returned after the target detection are a plurality of target regions of interest, and these target regions are saved in an image form.

5 In the present disclosure, the quality assessment uses a non-reference quality assessment indicator, specifically including Edge-Strength, Noise-rate, Uniform Brightness-Distribution or the like. In addition, it is possible to, before the quality assessment, use a machine learning-based method to train a quality assessment model to perform quality assessment on the input image to be assessed. Various target region
10 images need to be collected in advance for the model training, and quality labeling is performed. For example, the level of the quality labeling is represented by an integer within a range of 0-100. The larger the labeling value, the better the corresponding image quality. It should be understood that other appropriate manners may also be used to define the level of the quality labeling. In an embodiment, a training approach
15 based on deep learning (convolutional neural network, CNN) is used for the model training to determine an image quality model with more high accuracy.

 In addition, in the present disclosure, when quality assessment on the image to be assessed is performed based on the determined quality assessment result of each target region in the at least one target region, weighted average is performed on the
20 quality assessment result of each target quality region in the at least one target region, and weights may be assigned respectively according to importance of each target region. The importance of the target region depends on the size of the target region, the definition of the target region, the degree of interest in the target region, or the like. When the target regions are considered to have the same importance, the weighted
25 average manner evolves into arithmetic mean of the quality assessment result of each target region.

 Embodiments are described in more detail below with reference to the accompanying drawings.

 FIG. 3 is a flow chart of a method for assessing text image quality according to
30 an embodiment of the present disclosure. As shown in FIG. 3, the method includes the

following steps:

S301: an image to be assessed is input;

In this step, the image to be assessed is a text image, e.g., as shown in FIG. 4 or FIG. 9. Text lines are targets of interest in the image. The purpose of performing target
5 detection on the text lines is to detect positions of the text lines in the image.

S302: if the image to be assessed is a color image, step S303 is performed.
Otherwise, S303 is skipped to perform step S304;

S303: grayscale processing is performed on the color image;

S304: binarization processing is performed on a grayscale image to be
10 processed;

In this step, when the input image to be assessed is a grayscale image, e.g., as shown in FIG. 4 and FIG. 9, the image to be assessed is the grayscale image to be processed, and after step S302 is performed, step S303 is skipped to perform step S304 directly, and the binarization processing is performed on the image to be
15 assessed; when the input image to be assessed is a color image, the grayscale image to be assessed is an image obtained after the grayscale processing in step S303. In this embodiment, a local self-adaption binarization method is used to perform the binarization processing on the grayscale image to be processed, i.e., a binarization threshold on a pixel position is determined according to pixel value distribution of
20 neighborhood of the pixel, and the following operations are performed on all pixels in the grayscale image to be processed:

Taking a pixel as a center, an $N \times N$ neighborhood region is selected. In an embodiment, the N is within a range of $[2, 5]$;

An average value of all pixels in the neighborhood is calculated;

25 A compensation constant Q is subtracted from the average value calculated in the previous step to obtain a threshold of the pixel. In an embodiment, Q is within a range of $[2, 7]$;

The value of the pixel is compared with the threshold obtained from the previous step. If the value of the pixel is larger than the threshold, the value of the
30 pixel is set to 255 in the image. Otherwise, the value of the pixel is set to 0 in the

image. The corresponding binary images shown in FIG. 5 and FIG. 10 may be obtained after performing the binarization processing on the images shown in FIG. 4 and FIG. 9.

S305: all contours of the binary image are classified, and non-text contours are removed, so that text contours can be determined. The following operations are performed on each contour in the binary image:

The number nonz of non-zero pixel within a contour range is determined.

A height-width ratio hw and a width-height ratio wh of the contour are determined.

10 Within a horizontal neighborhood range within a horizontal contour range of the contour, the number SW of similar-width contours and the number SH of similar-height contours are determined. It should be understood that the horizontal may be replaced by the vertical or any suitable direction.

If the nonz is less than a first threshold, and/or the hw is greater than a second threshold and the SH is less than a third threshold, and/or the wh is greater than a fourth threshold and the SW is less than a fifth threshold, the above mentioned contour is considered to be a non-text contour, and values of all pixels within the contour range are set to 0 in the binary image. In an embodiment, the first threshold is within a range of [2, 5], the second threshold is within a range of [8, 12], the third threshold is within a range of [2, 5], and the fourth threshold is within a range of [8, 12], and the fifth threshold is in a range of [2, 5]. A similar-width contour of a contour with a width of W and a height of H is defined that a width of the similar-width contour is within a range of [0.7W, 1.3W], and a height of a similar-height contour is within a range of [0.7H, 1.3H].

25 S306: texts are combined based on the determined text contours to determine text line regions;

In this step, specifically, a dilation operation and an erosion operation in a horizontal direction (it should be understood that it is also possible in a vertical direction or any suitable direction) are performed on the contours in the binary image after the process performed in step S305 to obtain the text line regions. The dilation

operation is to add a boundary to an operation object, the erosion is to delete some pixels of an object boundary, and definition of the boundary is given by a corresponding operation operator. For example, if a size of a dilation operator is 5×1 , a pixel is taken as a center, and pixels within a 5×1 neighborhood are set as target pixels. After the steps S304 and S305, the dilation operation is performed 20 times by using the dilation operator with the size of 5×1 , and the erosion operation is performed 15 times by using an erosion operator with a size of 5×1 . Bounding rectangles of all the contours are used as masks to obtain the text line regions of the image. It should be understood that in specific operations, those skilled in the art may appropriately adjust the dilation operator, the times of the dilation operation and the times of the erosion. FIG. 6 and FIG. 11 are text line regions obtained after step S306 is completed in the images to be assessed.

S307: quality assessment is performed on the text line regions detected in S306.

Before the step of quality assessment, an image quality assessment model oriented to text line regions is pre-trained by using an approach based on deep learning. Text line data for training may be combined by itself, or annotations may be directly intercepted from text images. To the self-composite text lines, candidate characters are randomly selected from commonly used Chinese characters, English words and punctuation marks commonly used in Chinese and English first to form a character string, and then the character string is combined with different background images, blur with different degrees are added, and compressing operation and saving operation are performed. In the process, the compressing operation is performed to different quality levels. According to quality parameters of the composite images, the quality of the corresponding image is labeled, and the level is within a range of 0-100. FIG. 7 is a schematic diagram of a composite image.

The ten text line regions in FIG. 6 and the four text line regions in FIG. 11 are respectively input into the trained image quality assessment model oriented to text line regions to obtain corresponding text line region quality assessment results. FIG. 8 shows the quality assessment results of all the text line regions line_1, line_2, line_3, line_4, line_5, line_6, line_7, line_8, line_9 and line_10 of FIG. 6, and FIG. 12 shows

the quality assessment results of all text line regions line_1a, line_2a, line_3a and line_4a of FIG. 11.

S308: quality assessment is performed on the image to be assessed in a quality weighted average manner based on the quality assessment results of the text line regions obtained in S307;

A weighted value is determined according to importance of a target region. In this embodiment, assuming that the importance of the target region is the same, so the weighted average manner is simplified to the arithmetic mean manner. The quality assessment result of the text image of FIG. 4 is 16 which is an average value of the quality assessment results of all the text line regions line_1, line_2, line_3, line_4, line_5, line_6, line_7, line_8, line_9 and line_10 shown in FIG. 7. The quality assessment result of the text image of FIG. 9 is 97 which is an average value of the quality assessment results of all the text line regions line_1a, line_2a, line_3a, and line_4a shown in FIG. 12.

It can be seen from the above depictions that the method for assessing quality of the above embodiment is used, so that target regions of interest are concerned, the speed of the assessment is fast, the accuracy of the assessment is high, the quality of the text image is assessed effectively, and it is convenient for subsequent processing of text images with different quality.

In another embodiment, the flow of the quality assessment may also include the steps S201, S202 and S203. Specifically, an algorithm based on deep learning may be used in the target detection step. In the step of quality assessment of the target region, quality assessment may be performed on the target region based on statistics of gray values of the pixels, for example, the Laplacian variance algorithm. In the step of quality assessment of the image to be assessed, quality assessment may be performed on the image to be assessed in a quality weighted average manner based on the quality assessment results of the target regions.

FIG. 13 is a schematic diagram of a device for assessing image quality according to an embodiment of the present disclosure.

The present disclosure further provides a device 1200 for assessing quality as

shown in FIG. 13. The device includes a target detection unit 1201, a target region quality assessment unit 1202 and a to-be-assessed image quality assessment unit 1203. Specifically, the target detection unit 1201 is configured to detect an image to be assessed to determine a target region. The target region quality assessment unit 1202 is configured to perform quality assessment on the target region determined by the target detection unit 1201 to determine a quality assessment result of the target region. The to-be-assessed image quality assessment unit 1203 is configured to perform quality assessment on the image to be assessed based on the quality assessment result of the target region determined by the target region quality assessment unit 1202. For example, the to-be-assessed image quality assessment unit 1203 may perform quality assessment on the image to be assessed in a quality weighted average manner.

In addition, the target detection unit 1201 includes a contour classification unit 1202a and a text combination unit 1202b. The contour classification unit 1202a is configured to classify contours of a binary image based on parameters determined by at least one of the following operations to determine text contours: determining the number nonz of non-zero pixels within a contour of the binary image; determining a height-width ratio hw and a width-height ratio wh of the contour of the binary image; and determining the number SW of similar-width contours and the number SH of similar-height contours existing within a specified direction neighborhood range within a specified direction of the contour of the binary image. The text combination unit 1202b is configured to perform a dilation operation and an erosion operation on the determined text contour in the specified direction by setting a dilation operator and an erosion operator. The text combination unit 1202b is further configured to combine the texts in the specified direction based on the text contours determined by the contour classification unit 1202a to determine the target region.

In an embodiment, the target region quality assessment unit 1202 is further configured to determine a quality assessment result of the target region based on the determined target region and an image quality assessment model.

In another embodiment, the target region quality assessment unit 1202 is further configured to perform quality assessment on the target region based on statistics of

pixel grayscale values.

The process of the method for assessing quality of FIGS. 1, 2 and 3 also represents machine-readable instructions including a program executed by a processor. The program can be embodied in software stored on a tangible computer-readable medium such as a CD-ROM, a floppy disk, a hard disk, a digital versatile disk (DVD),
5 a Blu-ray disk or other form of memory. Alternatively, some or all steps of the example method shown in FIGS. 1 and 2 may be implemented by using any combination of an Application Specific Integrated Circuit (ASIC), a Programmable Logic Device (PLD), a Field Programmable Logic Device (EPLD), discrete logic,
10 hardware, firmware and so on. In addition, although the flow charts shown in FIGS. 1 and 2 describe the method for assessing quality, the steps in the method for assessing quality may be modified, deleted, or merged.

As described above, the example processes of FIGS. 1 and 2 may be implemented by using coded instructions, such as computer-readable instructions,
15 which are stored on a tangible computer-readable medium, such as a hard disk, a flash memory, a Read Only Memory (ROM), a Compact Disk (CD), a Digital Versatile Disk (DVD), a cache, a Random Access Memory (RAM) and/or any other storage medium on which information can be stored for any time (e.g., a long period of time, permanently, transiently, temporarily-buffered, and/or buffer of information). As used
20 herein, the term tangible computer-readable medium is expressly defined to include any type of computer-readable stored signal. Additionally or alternatively, the example processes of FIGS. 1 and 2 may be implemented with encoded instructions, such as computer-readable instructions, which are stored on a non-transitory computer-readable medium, such as a hard disk, a flash memory, a read only memory,
25 a compact disk, a digital versatile disc, a cache, a random access memory and/or any other storage medium in which information can be stored at any time (e.g., a long period of time, permanently, transiently, temporarily-buffered, and/or buffer of information).

The above are only preferred embodiments of the present disclosure and are not
30 intended to limit the scope of the present disclosure. Any modifications, equivalent

substitutions, improvements, etc. made within the spirit and scope of the present disclosure are intended to be included in the scope of the present disclosure.

What is claimed is:

1. A method for assessing image quality, comprising:

performing quality assessment on at least one target region in an image to be assessed respectively, to determine at least one quality assessment result of the at least one target region;

performing quality assessment on the image to be assessed, based on the determined at least one quality assessment result of the at least one target region.

2. The method for assessing image quality according to claim 1, wherein further comprises:

performing target detection on the image to be assessed, to determine the at least one target region.

3. The method for assessing image quality according to claim 2, wherein a means of the performing target detection on the image to be assessed comprises any one of following manners:

a conventional feature extraction manner and a depth feature extraction manner.

4. The method for assessing image quality according to claim 2 or 3, wherein the performing target detection on the image to be assessed comprises:

classifying contours of a binary image obtained from the image to be assessed, to determine text contours;

combining texts in a specified direction based on the determined text contours, to determine the at least one target region.

5. The method for assessing image quality according to claim 4, wherein the contours of the binary image are classified based on parameters determined by at least one of following operations:

determining the number of non-zero pixels within the contour of the binary image;

determining a height-width ratio and a width-height ratio of the contour of the binary image;

determining the number of similar-width contours and the number of similar-height contours existing within a specified direction neighborhood range within the specified direction of the contour of the binary image.

6. The method for assessing image quality according to claim 4 or 5, wherein
5 the combining texts in a specified direction based on the determined text contours comprises:

performing a dilation operation and an erosion operation on the determined text contours in the specified direction by setting a dilation operator and an erosion operator.

10 7. The method for assessing image quality according to any one of claims 1-6, wherein the performing quality assessment on at least one target region in an image to be assessed respectively comprises:

determining the at least one quality assessment result of the at least one target region based on the at least one target region and an image quality assessment model.

15 8. The method for assessing image quality according to claim 7, wherein the determining the at least one quality assessment result of the at least one target region based on the at least one target region and an image quality assessment model comprises:

determining the image quality assessment model by using a training approach
20 based on deep learning, and determining the at least one quality assessment result of the at least one target region based on the at least one target region and the image quality assessment model.

9. The method for assessing image quality according to any one of claims 1-8, wherein the performing quality assessment on the at least one target region
25 respectively comprises:

performing quality assessment on the at least one target region based on statistics of gray values of pixels.

10. The method for assessing image quality according to any one of claims 1-9, wherein the performing quality assessment on the image to be assessed, based on the
30 determined at least one quality assessment result of the at least one target region

comprises:

performing quality assessment on the image to be assessed in a quality weighted average manner based on the determined at least one quality assessment result of the at least one target region.

- 5 11. The method for assessing image quality according to any one of claims 1-10, wherein the performing quality assessment on the at least one target region respectively to determine the at least one quality assessment result of the at least one target region comprises:

performing quality assessment on the at least one target region respectively by
10 using a non-reference quality assessment indicator, to determine the at least one quality assessment result of the at least one target region,

wherein the non-reference quality assessment indicator comprises at least one of Edge-Strength, Noise-rate and Uniform Brightness-Distribution.

12. A device for assessing image quality, comprising:

- 15 a target region quality assessment unit, configured to perform quality assessment on at least one target region in an image to be assessed respectively, to determine at least one quality assessment result of the at least one target region;

a to-be-assessed image quality assessment unit, configured to perform quality assessment on the image to be assessed, based on the determined at least one quality
20 assessment result of the at least one target region.

13. The device for assessing image quality according to claim 12, wherein the device further comprises:

a target detection unit, configured to perform target detection on the image to be assessed, to determine the at least one target region.

- 25 14. The device for assessing image quality according to claim 13, wherein a means of the target detection unit performing target detection on the image to be assessed comprises any one of following manners: a conventional feature extraction manner and a depth feature extraction manner.

15. The device for assessing image quality according to claim 13 or 14, wherein
30 the target detection unit comprises:

a contour classification unit, configured to classify contours of a binary image obtained from the image to be assessed, to determine text contours;

a text combination unit, configured to combine texts in a specified direction based on the determined text contours, to determine the at least one target region.

5 16. The device for assessing image quality according to claim 15, wherein the contour classification unit is further configured to: classify the contours of the binary image based on parameters determined by at least one of following operations:

 determining the number of non-zero pixels within the contour of the binary image;

10 determining a height-width ratio and a width-height ratio of the contour of the binary image;

 determining the number of similar-width contours and the number of similar-height contours existing within a specified direction neighborhood range within the specified direction of the contour of the binary image.

15 17. The device for assessing image quality according to claim 15 or 16, wherein the text combination unit is further configured to: perform a dilation operation and an erosion operation on the determined text contour in the specified direction by setting a dilation operator and an erosion operator.

 18. The device for assessing image quality according to any one of claims 12-17,
20 wherein the target region quality assessment unit is further configured to: determine the at least one quality assessment result of the at least one target region based on the at least one target region and an image quality assessment model.

 19. The device for assessing image quality according to claim 18, wherein the target region quality assessment unit is further configured to:

25 determine the image quality assessment model by using a training approach based on deep learning, and determine the at least one quality assessment result of the at least one target region based on the at least one target region and the image quality assessment model.

 20. The device for assessing image quality according to any one of claims 12-19,
30 wherein the target region quality assessment unit is further configured to: perform

quality assessment on the at least one target region based on statistics of gray values of pixels.

21. The device for assessing image quality according to any one of claims 12-20, wherein the to-be-assessed image quality assessment unit is further configured to:

- 5 perform quality assessment on the image to be assessed in a quality weighted average manner based on the determined at least one quality assessment result of the at least one target region.

22. The device for assessing image quality according to any one of claims 12-21, wherein the target region quality assessment unit is further configured to: perform

- 10 quality assessment on the at least one target region respectively by using a non-reference quality assessment indicator, to determine the at least one quality assessment result of the at least one target region, wherein the non-reference quality assessment indicator comprises at least one of Edge-Strength, Noise-rate and Uniform Brightness-Distribution.

- 15 23. A computer device, comprising a memory, a processor and a computer program stored on the memory and executed by the processor, wherein when the computer program is executed by the processor, the method according to any one of claims 1-11 is implemented.

- 20 24. A computer storage medium on which an executable program executed by a processor is stored, wherein when the executable program is executed by the processor, the method according to any one of claims 1-11 is implemented.