

CLAIMS

What is claimed is:

- 1 1. A computer-executed method for ~~improving the quality-~~
2 ~~enhancing~~ a vehicle damage image, the method comprising:
3 ~~acquiring~~obtaining, by a computer, a first vehicle damage image; and
4 inputting the first vehicle damage image being to a pre-trained
5 generative adversarial network (GAN) model to obtain a second vehicle
6 damage image, which has a better quality than the first vehicle damage image;
7 wherein the pre-trained GAN model comprises a pre-trained generative
8 model and a pre-trained quality discriminative model configured to determine
9 whether an image is a high-quality image;
10 wherein the pre-trained quality discriminative model is obtained by
11 training a classification model using a plurality of positive samples
12 comprising high-quality vehicle damage images and a plurality of negative
13 samples comprising low-quality vehicle damage imageimages; and
14 wherein the pre-trained generative model is trained using at least a
15 plurality of low-quality vehicle damage images and the pre-trained quality
16 discriminative model inputting the first image into an image enhancement-
17 model to obtain a second image from an output of the image enhancement-
18 model, wherein the image enhancement model outputs the second image by-
19 improving a quality of the first image.
- 20 2. The method according to claim 1, wherein at least one of the
21 following of the first vehicle damage image is of low quality: color-and,
22 texture.

1 3. ~~—The method according to claim 2, wherein at least one of the~~
2 ~~following of the first image is of low quality: brightness, contrast, saturation,~~
3 ~~clarity, and smoothness.~~

2 34. The method according to claim 1, wherein a distortion degree
3 of the second vehicle damage image with respect to the first vehicle damage
4 image is less than a predetermined threshold.

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2 45. The method according to claim 1, wherein ~~the image~~
3 ~~enhancement model is obtained by training a generative model in a GAN model,~~
4 ~~and the GAN model further comprises a quality-pre-trained distortion degree~~
5 ~~discriminative model, wherein the quality discriminator model is configured to~~
6 ~~determine whether a distortion degree of an output image of the generative~~
7 ~~model is with respect to a high corresponding low-quality vehicle damage~~
8 ~~image, and wherein pre-training the generative model in the GAN model~~
9 ~~further comprises:~~

10 ~~acquiring a plurality of third images, the third images being low-quality~~
11 ~~vehicle damage images; and~~

12 ~~training, using the generative model based on at least the plurality of~~
13 ~~low-quality vehicle damage images and the distortion degree discriminative~~
14 ~~model third images and on the basis of the quality discriminative model, the~~
15 ~~generative model to be used as the image enhancement model.~~

1 6. ~~—The method according to claim 5, wherein the quality-~~
2 ~~discriminative model is trained by:~~

3 ~~acquiring a plurality of positive samples and a plurality of negative~~
4 ~~samples, the positive samples being high quality vehicle damage images, the~~
5 ~~negative samples being low quality vehicle damage images; and~~
6 ~~using at least the plurality of positive samples and the plurality of~~
7 ~~negative samples to train a classification model to be used as the quality-~~
8 ~~discriminative model.~~

1 ~~7. — The method according to claim 5, wherein the GAN model~~
2 ~~further comprises a distortion degree discriminative model, wherein the~~
3 ~~distortion degree discriminative model is configured to acquire a distortion-~~
4 ~~degree of the output image of the generative model with respect to a~~
5 ~~corresponding third image, wherein training the generative model in the GAN~~
6 ~~model further comprises: training the generative model by using at least the~~
7 ~~plurality of third images and on the basis of the distortion degree discriminative~~
8 ~~model.~~

1 58. The method according to claim 74, wherein the distortion degree
2 discriminative model comprises a semantic recognition model and a
3 reconstruction model, wherein the reconstruction model is a deconvolution
4 model of the generative model, and wherein pre-training the generative model
5 ~~on the basis of the distortion degree discriminative~~ model further comprises:
6 inputting the output image of the generative model into the
7 reconstruction model to obtain a reconstructed image;
8 inputting the reconstructed image and a the corresponding third low-
9 quality vehicle damage image respectively into the semantic recognition
10 model to determine a semantic similarity between the reconstructed image
11 and the corresponding third low-quality vehicle damage image; and

12 ~~acquiring~~determining the distortion degree of the output image with
13 respect to the corresponding ~~third~~low-quality vehicle damage image on the
14 basis of the semantic similarity.

1 69. The method according to claim ~~8~~5, wherein ~~determining the~~
2 semantic similarity between the reconstructed image and the corresponding
3 ~~third~~low-quality vehicle damage image comprises: ~~determining the semantic~~
4 ~~one or more of: a similarity between the reconstructed image and the~~
5 ~~corresponding third image on the basis of at least one of the following: whether~~
6 ~~vehicle parts in the two images are similar, whether vehicle models in the two~~
7 ~~images are the same, and whether vehicle damage~~part, a similarity in the two
8 ~~images is similar.~~

1 10.—The method according to claim 1, further comprising: using the
2 second image to train a vehicle damage identification model, ~~after obtaining the~~
3 second image, wherein the ~~and a similarity in~~ vehicle damage identification
4 model is configured to identify damage to a vehicle on the basis of a vehicle
5 damage image.

1 11.—The method according to claim 1, further comprising: inputting
2 the second image into a vehicle damage identification model after obtaining the
3 second image, so as to perform loss assessment on a corresponding vehicle.

1 712. A computer-executed apparatus for ~~improving the quality~~
2 of ~~enhancing~~ a vehicle damage image, comprising:

3 ~~a first~~an image-acquisition unit, configured to acquire a first vehicle
4 damage image;

5 a pre-trained generative adversarial network (GAN) model configured
6 to generate a second vehicle damage image based on the first vehicle damage

7 image, wherein the second vehicle damage image has a better quality than the
8 first image being a vehicle damage image, wherein the pre-trained GAN model
9 comprises a pre-trained generative model and a pre-trained quality
10 discriminative model configured to determine whether an image is a high-
11 quality image;

12 a first training unit configured to pre-train a quality discriminative
13 model by training a classification model using a plurality of positive samples
14 comprising high-quality vehicle damage images and a plurality of negative
15 samples comprising low-quality vehicle damage images; and
16 a second training unit configured to pre-train a generative model using
17 at least a plurality of low-quality vehicle damage images and the pre-trained
18 quality discriminative model;
19 a first input unit, configured to input the first
20 image into an image enhancement model to obtain a second image from an
21 output of the image enhancement model, wherein the image enhancement model
outputs the second image by improving a quality of the first image.

1 813. The apparatus according to claim 127, wherein at least one of
2 the following of the first vehicle damage image is of low quality: color and,
3 texture;

1 14. The apparatus according to claim 13, wherein at least one of the
2 following of the first image is of low quality: brightness, contrast, saturation,
3 clarity, and smoothness.

1 915. The apparatus according to claim 127, wherein a distortion
2 degree of the second vehicle damage image with respect to the first vehicle
3 damage image is less than a predetermined threshold.
4

1 ~~1046.~~ The apparatus according to claim ~~12~~7, wherein the image-
2 enhancement model is pre-trained by a first training apparatus, wherein the first
3 training apparatus is configured to train a generative model in a GAN model,
4 wherein the GAN model further comprises a quality pre-trained distortion
5 degree discriminative model, wherein the quality discriminative model is
6 configured to determine ~~whether a~~ a distortion degree of an output image of the
7 generative model ~~is with respect to a high~~ corresponding low-quality vehicle
8 damage image, and wherein the first, while pre-training apparatus comprises:
9 a the generative model in the GAN model, the second acquisition unit,
10 configured to acquire a plurality of third images, the third images being low-
11 quality vehicle damage images; and
12 a first training unit, is further configured to: train, using at least the
13 plurality of third images on the basis of the quality discriminative model, the the
14 generative model using at least the plurality of low-quality vehicle damage
15 images and the distortion degree discriminative model to be used as the image-
16 enhancement model.

1 ~~17.~~—The apparatus according to claim ~~16~~, wherein the quality-
2 discriminative model is trained by a second training apparatus, wherein the
3 second training apparatus comprises:
4 a third acquisition unit, configured to acquire a plurality of positive
5 samples and a plurality of negative samples, the positive samples being high-
6 quality vehicle damage images, the negative samples being low-quality vehicle-
7 damage images; and
8 a second training unit, configured to use at least the plurality of positive
9 samples and the plurality of negative samples to train a classification model to be
10 used as the quality discriminative model.

1 18. —The apparatus according to claim 16, wherein the GAN model
2 further comprises a distortion degree discriminative model, wherein the
3 distortion degree discriminative model is configured to acquire a distortion-
4 degree of the output image of the generative model with respect to a
5 corresponding third image, wherein the first training unit is further configured to
6 train the generative model by using at least the plurality of third images and on
7 the basis of the distortion degree discriminative model.

1 1119. The apparatus according to claim 1810, wherein the
2 distortion degree discriminative model comprises a semantic recognition
3 model and a reconstruction model, wherein the reconstruction model is a
4 deconvolution model of the generative model, and wherein, while pre-
5 training the first generative model, the second training unit is further
6 comprises:
7 an input subunit, configured to input the output image of the
8 generative model into the reconstruction model to obtain a reconstructed
9 image;
10 a determination subunit, configured to input the reconstructed image
11 and the corresponding third low-quality vehicle damage image respectively
12 into the semantic recognition model to determine a semantic similarity
13 between the reconstructed image and the corresponding third image;
14 and low-quality vehicle damage image; and determine
15 an acquisition subunit, configured to acquire the distortion degree of the
16 output image with respect to the corresponding low-quality vehicle damage
17 third image on the basis of the semantic similarity.

1 1220. The apparatus according to claim 1911, wherein the
2 determination subunit is further configured to determine the semantic similarity

3 between the reconstructed image and the corresponding ~~third image on the~~
4 ~~basis of at least one of the following: whether vehicle parts in the two images are~~
5 ~~similar, whether vehicle models in the two images are the same, and whether low-~~
6 quality vehicle damage in the two images is similar comprises one or more of:
7 a similarity in vehicle part, a similarity in vehicle model, and a
8 similarity in vehicle damage.

1 1321. A non-transitory computer-readable storage medium storing
2 instructions that when executed by a computer cause the computer to perform
3 a method for enhancing a vehicle damage image, the method ~~The apparatus-~~
4 according to claim 12, further comprising:

5 obtaining a first vehicle damage image; and
6 inputting the first vehicle damage image to use the a pre-trained
7 generative adversarial network (GAN) model to obtain a second image to train
8 a vehicle damage identification model after obtaining image, which has a better
9 quality than the second first vehicle damage image;

10 wherein the vehicle damage identification model is pre-trained GAN
11 model comprises a pretrained generative model and a pre-trained quality
12 discriminative model configured to identify damage to determine whether an
13 image is a high-quality image;

14 wherein the pre-trained quality discriminative model is obtained by
15 training a classification model using a plurality of positive samples
16 comprising high-quality vehicle on the basis of a damage images and a
17 plurality of negative samples comprising low-quality vehicle damage images;
18 and

19 wherein the pre-trained generative model is trained using at least a
20 plurality of low-quality vehicle damage images and the pre-trained quality
21 discriminative model.

1 22.—The apparatus according to claim 12, further comprising: a
2 second using unit, configured to input the second image into a vehicle damage
3 identification model after obtaining the second image, so as to perform loss
4 assessment on a corresponding vehicle.

1 23.—A computing device, comprising a memory and a processor,
2 wherein the memory comprises an executable code stored therein, and when the
3 executable code is executed by the processor, the method described in any one of
4 claims 1-11 is implemented.