CLAIMS

1. An image-based method for assessing vehicle damage, wherein the method comprises:

obtaining, at a cloud server and from a mobile device, to-be-processed images, wherein the to-be-processed images comprise photographs of a damaged vehicle part taken using the mobile device and uploaded to the cloud server using a mobile application;

examining the to-be-processed images to identify a vehicle component in the to-be-processed images;

performing image matching between a component image that comprises an identified vehicle component and a local image in the to-be-processed images that comprises an unidentified vehicle component, and identifying a vehicle component in the local image;

examining the to-be-processed images to identify a damaged part and a damage type in the to-be-processed images; and

determining, based on the identified vehicle component in the to-be-processed images, the identified vehicle component in the local image, the identified damaged part, and the identified damage type, a damaged component in the to-be-processed images and a damaged part, damage type and damage degree that correspond to the damaged component,

wherein the to-be-processed images are examined using an identification model comprising a deep neural network, wherein the deep neural network is:

constructed and generated through sample data training, and

based on network models comprising a convolutional layer and a region proposal layer.

2. The image-based vehicle loss assessment method according to claim 1, wherein the method further comprises:

generating a maintenance plan based on information that comprises the determined damaged component in the to-be-processed images and the determined damaged part and damage type that correspond to the damaged component, and optionally one or more of:

returning, by the cloud server and to the mobile device, the generated maintenance plan; or

initiating the generated maintenance plan by transmitting work assignment data to a selected vehicle maintenance shop to conduct maintenance operations.

3. The image-based vehicle loss assessment method according to claim 1, wherein the performing image matching between a component image that comprises an identified vehicle component and the local image in the to-be-processed images that comprises an unidentified vehicle component, and determining a vehicle component in the local image comprises:

extracting first convolutional feature data of the local image using a convolutional neural network, and extracting a first local feature point set of the local image using a predetermined algorithm such as a scale-invariant feature transform;

comparing the first convolutional feature data with convolutional feature data of a sampling region in the component image, and obtaining a similar region whose convolutional feature data is the most similar to the first convolutional feature data;

extracting a second local feature point set of the similar region using the predetermined algorithm, matching the first local feature point set and the second local feature point set, to obtain a matching point pair, and obtaining affine transformation between the local image and the component image by minimizing a location error of the matching point pair during affine transformation; and

selecting, as the vehicle component in the local image, a component that is in the component image and that corresponds to an image region that has a smallest location error.

4. The image-based vehicle loss assessment method according to claim 3, wherein the comparing the first convolutional feature data with convolutional feature data of a sampling region in the component image, and obtaining a similar region whose convolutional feature data is the most similar to the first convolutional feature data comprises:

for the component image, extracting second convolutional feature data of a sliding window region in the component image using a sliding window, and obtaining a second convolutional feature data set, wherein the second convolutional feature data is obtained using a convolutional neural network the same as the convolutional neural network used for extracting the first convolutional feature data; and

selecting, from the second convolutional feature data set, the similar region whose convolutional feature data is the most similar to the first convolutional feature data, wherein similarity is calculated using cosine similarity.

5. The image-based vehicle loss assessment method according to claim 3, wherein the method further comprises:

expanding an image region range of the similar region in a predetermined manner, wherein

correspondingly, the second local feature point set comprises an extracted local feature point set of the similar region whose image region range is expanded.

6. The image-based vehicle loss assessment method according to claim 5, wherein the expanding an image region range of the similar region in a predetermined manner comprises extending a left side, a right side, an upper side, and a lower side of the similar region by a predetermined percentage, wherein a value range of the predetermined percentage comprises 50%.

7. The image-based vehicle loss assessment method according to claim 1, wherein after the obtaining to-be-processed images, at least one type of the following image processing is further performed:

if the to-be-processed images comprise a plurality of types of image information, classifying the to-be-processed images using an image classification algorithm, and selecting, as an image for vehicle loss assessment processing, an image related to vehicle loss assessment processing information; or

determining image quality of the to-be-processed images, and deleting a to-be-processed image whose image quality does not meet a requirement; or

performing deduplication processing on to-be-processed images whose similarity reaches a predetermined threshold.

8. The image-based vehicle loss assessment method according to claim 2, wherein the method further comprises obtaining information about a maintenance strategy of the damaged component, wherein correspondingly, the maintenance plan further comprises an estimated repair price corresponding to the maintenance strategy; and the estimated repair price is an estimated repair price of the damaged component that is obtained through calculation based on the damaged component, the damaged part, the damage type, and the information about the maintenance strategy after price data of a product and/or a repair service of the damaged component in the maintenance strategy is queried.

9. The image-based vehicle loss assessment method according to claim 1, wherein the damaged component in the to-be-processed images and the damaged part and the damage type that correspond to the damaged component are determined using the following manners:

obtaining a set of to-be-processed images that comprise a damaged part;

extracting a feature vector of the to-be-processed images in the set using a convolutional neural network, performing image clustering processing for a same vehicle component based on the feature vector, and determining the damaged component;

combining damaged parts in the same damaged component, and obtaining damage cluster feature data of the damaged parts; and

determining, based on the damage cluster feature data, the damaged part comprised in the damaged component and the damage type corresponding to the damaged part.

10. The image-based vehicle loss assessment method according to claim 9, wherein the combining damaged parts in the same damaged component, and obtaining damage cluster feature data of the damaged parts comprises:

combining damaged parts in K to-be-processed images that are selected in descending order of confidence levels from to-be-processed images for a same damage sample component in an image cluster, wherein $K \geq 2$; and

selecting, from the combined image cluster, damage cluster feature data of C to-be-processed images in descending order of weighted values of damaged parts, wherein $C \geq 2$, and a weight factor of the weighted value is a confidence level of a damaged part.

11. The image-based vehicle loss assessment method according to claim 10, wherein identifying a damaged part in a damage sample image and a damage type based on the damage cluster feature data comprises identifying the damaged part and the damage type using the damage cluster feature data as input data of a predetermined multi-classification gradient boosting decision tree model.

12. The method of claim 1, wherein examining the to-be-processed images to identify a vehicle component in the to-be-processed images and examining the to-be-processed images to identify a damaged part and a damage type in the to-be-processed images is performed in parallel.

13. An image-based vehicle loss assessment apparatus, comprising a processor and a memory that is configured to store a processor executable instruction, wherein when executing the instruction, the processor implements operations according to any one of claims 1 to 12.

14. A computer readable storage medium, wherein the computer readable storage medium stores a computer instruction, and when the instruction is executed, steps according to any one of claims 1 to 12 are implemented.

15. An apparatus for assessing vehicle damage, the apparatus comprising a cloud server in communication with a mobile device, wherein

the cloud server comprises a processor and a memory configured to store an instruction that can be executed by the processor, wherein when executing the instruction, the processor implements operations comprising:

obtaining, at a cloud server and from a mobile device, to-be-processed images;

examining the to-be-processed images to identify a vehicle component in the to-be-processed images;

performing image matching between a component image that comprises an identified vehicle component and a local image in the to-be-processed images that comprises an unidentified vehicle component, and identifying a vehicle component in the local image;

examining the to-be-processed images to identify a damaged part and a damage type in the to-be-processed images;

determining, based on the identified vehicle component in the to-be-processed images, the identified vehicle component in the local image, the identified damaged part, and the identified damage type, a damaged component in the to-be-processed images and a damaged part and a damage type that correspond to the damaged component;

generating a maintenance plan based on information that comprises the determined damaged component in the to-be-processed images and the determined damaged part and damage type that correspond to the damaged component; and

returning, by the cloud server and to the mobile device, the generated maintenance plan,

wherein the to-be-processed images are examined using an identification model comprising a deep neural network, wherein the deep neural network is:

constructed and generated through sample data training, and

based on network models comprising a convolutional layer and a region proposal layer; and

the mobile device comprises a processor and a memory configured to store an instruction that can be executed by the processor, wherein when executing the instruction, the processor implements operations comprising:

requesting, by a mobile application installed on the mobile device, a vehicle loss assessment service, comprising:

taking multiple photographs of a damaged vehicle part using the mobile device;

uploading the photographs as to-be-processed images to the cloud server using a mobile application;

receiving, from the cloud server, a maintenance plan for the vehicle.