CLAIMS

What is claimed is:

1. A method for performing damage segmentation on a vehicle damage image, the method comprising:

acquiringobtaining a plurality of labeled segmentation samples labeled with both a target detection result and a target segmentation resultof vehicle images, wherein the target detection result comprises a classification and a a respective labeled segmentation sample includes a boundary box of a target object, and a classification of the target segmentation result comprises object, and an outline of the target object; wherein a plurality of classifications with which the target objects are labeled in the plurality of segmentation samples constitute a first classification subset;

acquiringobtaining a plurality of damage detection samples labeled with a target detection samples of vehicle images, wherein a respective labeled target detection result but not labeled withsample includes a target segmentation result, wherein a plurality of classifications with which boundary box of a target objects are labeled in the plurality of damage detection samples constitute a second object and a classification subset, and the second classification subset comprises classifications not belonging to the first classification subsetof the target object; and

training, by a computer, a segmentation model, whichusing the plurality of segmentation samples and the plurality of damage detection samples to train a damage segmentation model, the damage segmentation model comprising a target detection parameter for detecting a damage object and a target segmentation parameter for determining an outline of the damage object, wherein training a damage segmentation model comprises:

~~determining, on the basis of the target detection results in the plurality of segmentation samples and the target detection results in the plurality of damage detection samples, a target detection parameter corresponding to each classification in a classification set consisting of the first classification subset and the second classification subset;~~

determining, based on the ~~basis of the target detection results and the target segmentation results in the~~ plurality of labeled segmentation samples, a weight-~~-~~transfer function~~, the weight transfer function~~ indicating a mapping ~~from the target detection~~ between a target detection parameter for detecting target objects associated with a respective classification and a target segmentation parameter for determining outlines of the target objects of the corresponding classification;

determining a target detection parameter corresponding to each classification; and

obtaining a target segmentation parameter ~~to the target segmentation parameter; and~~

~~inputting the target detection parameter corresponding to each classification into the weight transfer function to obtain a target segmentation parameter~~ for each classification based on the corresponding ~~to each classification, so as to determine~~target detection parameter and the ~~damage~~weight-transfer function, thereby determining the segmentation model ~~used to perform damage~~for performing segmentation on ~~a~~the vehicle damage image.

2. The method according to claim 1, wherein ~~the first classification subset comprises a first classification, and wherein~~ determining ~~a~~the weight~~-~~-transfer function further comprises:

~~acquiring~~obtaining a target detection parameter corresponding to ~~the~~a first classification;

~~inputting the target detection parameter corresponding to the first classification to an initial weight transfer function to obtain~~obtaining a corresponding predictive target segmentation parameter~~;~~

~~determining,~~ based on ~~the basis of the~~ an initial weight-transfer function and the target detection parameter corresponding to the first classification;

determining, based on the predictive target segmentation parameter, a predicted outline of a target ~~segmentation result~~object corresponding to a labeled segmentation sample ~~of~~associated with the first classification; and

adjusting the initial weight~~-~~-transfer function based at least on the ~~basis of the~~ predicted outline and the labeled outline of the target object~~ target segmentation result and the target segmentation result with which the segmentation sample of the first classification is labeled~~.

3. The method according to claim 2, wherein the target detection parameter corresponding to the first classification comprises a target classification parameter and a target boundary box parameter, and ~~inputting the~~wherein obtaining a corresponding predictive target ~~detection~~segmentation parameter ~~corresponding to the first classification to the initial weight transfer function~~ comprises:

~~inputting~~obtaining the corresponding predictive target segmentation parameter based on the target classification parameter and/or the target boundary box parameter ~~to~~, and the initial weight~~-~~-transfer function.

4. The method according to claim 1, wherein determining the weight -transfer function ~~is implemented by means of a~~ comprises training a convolutional neural network using the plurality of labeled segmentation samples.

5. The method according to claim 1, wherein the plurality of ~~segmentation~~labeled target detection samples comprise a plurality of ~~component segmentation~~labeled damage detection samples in which target objects are ~~component~~ objects indicating vehicle damage, and wherein the segmentation model is used to perform damage segmentation on the vehicle damage image.

6. The method according to claim 1, wherein the plurality of ~~segmentation~~labeled target detection samples comprise a plurality of ~~damage segmentation~~labeled component detection samples in which target objects are ~~damage objects~~vehicle components, and wherein the segmentation model is used to perform component segmentation on the vehicle damage image.

7. The method according to claim ~~6~~1, wherein ~~acquiring a~~the plurality of labeled segmentation samples comprise a plurality of labeled ~~with both a target detection result and a target~~damage segmentation ~~result comprises:~~samples in which target objects are objects indicating vehicle damage

~~acquiring a predetermined quantity of damage detection samples from a damage sample library;~~

~~extracting, on the basis of salience detection, a plurality of salient regions from a plurality of boundary boxes labeled in the predetermined quantity of damage detection samples, so that a staff member labels a portion of the predetermined quantity of damage detection samples with segmentation results according to the plurality of salient regions;~~

~~determining, as the plurality of damage segmentation samples, the portion of the predetermined quantity of damage detection samples labeled with the segmentation results; and determining rest of the predetermined quantity of damage detection samples as the plurality of damage detection samples~~.

8. The~~A~~ method according to claim 7, wherein obtaining the plurality of labeled segmentation samples~~for performing component segmentation on a vehicle damage image, the method~~ comprises~~ing~~:

obtaining a predetermined quantity of labeled damage detection samples from a sample library~~acquiring a plurality of segmentation samples labeled with both a target detection result and a target segmentation result, wherein the target detection result comprises a classification and a boundary box of a target object, and the target segmentation result comprises an outline of the target object; a plurality of classifications with which the target objects are labeled in the plurality of segmentation samples constitute a third classification subset~~;

extracting, using a salience detection technique, a salient region from a boundary box in each labeled damage detection sample from the predetermined quantity of labeled damage detection samples~~acquiring a plurality of component detection samples labeled with a target detection result but not labeled with a target segmentation result, wherein a plurality of classifications with which target objects are labeled in the plurality of component detection samples constitute a fourth classification subset, and the fourth classification subset comprises classifications not belonging to the third classification subset~~; ~~and~~

receiving a manual segmentation result for a portion of the predetermined quantity of labeled damage detection samples according to salient regions extracted from the portion of the predetermined quantity of labeled damage detection samples;

including the portion of the predetermined quantity of labeled damage detection samples in the plurality of labeled segmentation samples; and

including rest of the predetermined quantity of labeled damage detection samples in the plurality of labeled damage detection samples~~using the plurality of segmentation samples and the plurality of component detection samples to train a component segmentation model, the component segmentation model comprising a target detection parameter for detecting a component object and a target segmentation parameter for determining an outline of the component object, wherein training a component segmentation model comprises:~~

~~determining, on the basis of the target detection results in the plurality of segmentation samples and the target detection results in the plurality of component detection samples, a target detection parameter corresponding to each classification in a classification set consisting of the third classification subset and the fourth classification subset;~~

~~determining, on the basis of the target detection results and the target segmentation results in the plurality of segmentation samples, a weight transfer function, the weight transfer function indicating a mapping from the target detection parameter to the target segmentation parameter; and~~

~~inputting the target detection parameter corresponding to each classification to the weight transfer function to obtain a target segmentation parameter corresponding to each classification, so as to determine the component segmentation model used to perform component segmentation on a vehicle damage image~~.

9. The method according to claim 1~~8~~, wherein the plurality of labeled segmentation samples comprise a plurality of labeled component segmentation samples in which target objects are vehicle components~~ objects~~.

10. An apparatus for performing damage segmentation on a vehicle damage image, the apparatus comprising:

a first sample-acquisition unit~~,~~ configured to acquire a plurality of labeled segmentation samples ~~labeled with both a target detection result and a target segmentation result~~of vehicle images, wherein ~~the target detection result comprises a classification and a~~ a respective labeled segmentation sample includes a boundary box of a target object, ~~and~~ a classification of the target ~~segmentation result comprises~~ object, and an outline of the target object; ~~wherein a plurality of classifications with which the target objects are labeled in the plurality of segmentation samples constitute a first classification subset;~~

a second sample-acquisition unit~~,~~ configured to acquire a plurality of ~~damage detection samples~~ labeled ~~with a~~ target detection ~~result but not~~samples of vehicle images, wherein a respective labeled ~~with a target segmentation result, wherein a plurality of classifications with which target objects are labeled in the plurality~~target detection sample includes a boundary box of ~~damage detection samples constitute a second classification subset, and the second classification subset comprises classifications not belonging to the first classification subset~~a target object and a classification of the target object; and

a training unit~~,~~ configured to ~~use the plurality of segmentation samples and the plurality of damage detection samples to~~ train a ~~damage~~ segmentation model, ~~the damage segmentation model comprising a target detection parameter for detecting a damage object and a target segmentation parameter for determining an outline of the damage object,~~ wherein the training unit ~~specifically~~ comprises:

a first determination module~~,~~ configured to determine, based on the ~~basis of the target detection results in the plurality of segmentation samples and the target detection results in the plurality of damage detection samples, a target detection parameter corresponding to each classification in a classification set consisting of the first classification subset and the second classification subset;~~

~~a second determination module, configured to determine, on the basis of the target detection results and the target segmentation results in the plurality of~~ plurality of labeled segmentation samples, a weight-transfer function~~, the weight transfer function~~ indicating a mapping ~~from the target detection~~between a target detection parameter for detecting target objects associated with a respective classification and a target segmentation parameter for determining outlines of the target objects of the corresponding classification;

a second determination module configured to determine a target detection parameter corresponding to each classification associated with the labeled target detection samples; and

a parameter ~~to the target segmentation parameter; and~~

~~an input~~-obtaining module~~,~~ configured to ~~input the target detection parameter corresponding to each classification to the weight transfer function to~~ obtain a target segmentation parameter for each classification associated with the labeled target detection samples based on the corresponding ~~to each classification, so as to determine~~target detection parameter and the ~~damage~~weight-transfer function, thereby determining the segmentation model ~~used to perform damage~~for performing segmentation on ~~a~~the vehicle damage image.

11. The apparatus according to claim 10, wherein, while determining the weight-transfer function, the first ~~classification subset comprises a first classification, and wherein the second~~ determination module is specifically configured to:

~~acquire~~obtain a target detection parameter corresponding to ~~the~~a first classification;

~~input the target detection parameter corresponding to the first classification to an initial weight transfer function to~~ obtain a corresponding predictive target segmentation parameter~~;~~

determine, based on the basis of the an initial weight-transfer function and the target detection parameter corresponding to the first classification;

determine, based on the predictive target segmentation parameter, a predicted outline of a target segmentation resultobject corresponding to a labeled segmentation sample ofassociated with the first classification; and

adjust the initial weight--transfer function based at least on the basis of the predicted outline and the labeled outline of the target object target segmentation result and the target segmentation result with which the segmentation sample of the first classification is labeled.

12. The apparatus according to claim 11, wherein the target detection parameter corresponding to the first classification comprises a target classification parameter and a target boundary box parameter;, and wherein, while obtaining the inputcorresponding predictive target segmentation parameter, the first determination module is specifically configured to:

inputobtain the corresponding predictive target segmentation parameter based on the target classification parameter and/or the target boundary box parameter to, and the initial weight--transfer function.

13. The apparatus according to claim 10, wherein-, while determining the weight--transfer function is implemented by means of, the first determination module trains a convolutional neural network using the plurality of labeled segmentation samples.

14. The apparatus according to claim 10, wherein the plurality of segmentationlabeled target detection samples comprise a plurality of component segmentationlabeled damage detection samples in which target objects are

~~component~~ objects indicating vehicle damage, and wherein the segmentation model is used to perform damage segmentation on the vehicle damage image.

15. The apparatus according to claim 10, wherein the plurality of ~~segmentation~~labeled target detection samples comprise a plurality of ~~damage segmentation~~labeled component detection samples in which target objects are vehicle components, and wherein the segmentation model is used to perform component segmentation on the vehicle damage image ~~damage objects~~.

16. The apparatus according to claim 10~~15~~, wherein the plurality of labeled segmentation samples comprise a plurality of labeled damage segmentation samples in which target objects are objects indicating vehicle damage~~first acquisition unit is specifically configured to:~~

~~acquire a predetermined quantity of damage detection samples from a damage sample library;~~

~~extract, on the basis of salience detection, a plurality of salient regions from a plurality of boundary boxes labeled in the predetermined quantity of damage detection samples, so that a staff member labels a portion of the predetermined quantity of damage detection samples with segmentation results according to the plurality of salient regions;~~

~~determine, as the plurality of damage segmentation samples, the portion of the predetermined quantity of damage detection samples labeled with the segmentation results; and determine rest of the predetermined quantity of damage detection samples as the plurality of damage detection samples~~.

17. The~~An~~ apparatus according to claim 16, wherein, while acquiring the plurality of labeled~~for performing component~~ segmentation samples, the first

sample-acquisition unit is configured to ~~on a vehicle damage image, the apparatus comprising~~:

acquire a predetermined quantity of labeled damage detection samples from a sample library;

extract, using a salience detection technique, a salient region from a boundary box in each labeled damage detection sample from the predetermined quantity of labeled damage detection samples;

receive a manual segmentation result for a portion of the predetermined quantity of labeled damage detection samples according to salient regions extracted from the portion of the predetermined quantity of labeled damage detection samples;

include the portion of the predetermined quantity of labeled damage detection samples ~~a first acquisition unit, configured to acquire a plurality of segmentation samples labeled with both a target detection result and a target segmentation result, wherein the target detection result comprises a classification and a boundary box of a target object, and the target segmentation result comprises an outline of the target object; a plurality of classifications with which the target objects are labeled~~ in the plurality of labeled segmentation samples ~~constitute a third classification subset~~; and

include rest of the predetermined quantity of labeled damage detection samples ~~a second acquisition unit, configured to acquire a plurality of component detection samples labeled with a target detection result but not labeled with a target segmentation result, wherein a plurality of classifications with which target objects are labeled~~ in the plurality of labeled damage~~component~~ detection samples ~~constitute a fourth classification subset, and the fourth classification subset comprises classifications not belonging to the third classification subset; and~~

~~a training unit, configured to use the plurality of segmentation samples and the plurality of component detection samples to train a component~~

~~segmentation model, the component segmentation model comprising a target detection parameter for detecting a component object and a target segmentation parameter for determining an outline of the component object, wherein the training unit specifically comprises:~~

~~a first determination module, configured to determine, on the basis of the target detection results in the plurality of segmentation samples and the target detection results in the plurality of component detection samples, a target detection parameter corresponding to each classification in a classification set consisting of the third classification subset and the fourth classification subset;~~

~~a second determination module, configured to determine, on the basis of the target detection results and the target segmentation results in the plurality of segmentation samples, a weight transfer function, the weight transfer function indicating a mapping from the target detection parameter to the target segmentation parameter; and~~

~~an input module, configured to input the target detection parameter corresponding to each classification to the weight transfer function to obtain a target segmentation parameter corresponding to each classification, so as to determine the component segmentation model used to perform component segmentation on a vehicle damage image~~.

18. The apparatus according to claim 10~~17~~, wherein the plurality of labeled segmentation samples comprise a plurality of labeled component segmentation samples in which target objects are vehicle component~~s objects~~.

19. A non-transitory computer-readable storage medium storing instructions that when executed by a computer cause the computer to perform a method for performing segmentation on a vehicle damage image, ~~on which a computer program is stored, wherein the computer program, when executed on a~~

~~computer, causes the computer to perform~~ the method comprising:~~ according to any one of claims 1-9~~

obtaining a plurality of labeled segmentation samples of vehicle images, wherein a respective labeled segmentation sample includes a boundary box of a target object, a classification of the target object, and an outline of the target object;

obtaining a plurality of labeled target detection samples of vehicle images, wherein a respective labeled target detection sample includes a boundary box of a target object and a classification of the target object; and

training a segmentation model, which comprises:

determining, based on the plurality of labeled segmentation samples, a weight-transfer function indicating a mapping between a target detection parameter for detecting target objects associated with a respective classification and a target segmentation parameter for determining outlines of the target objects of the corresponding classification;

determining a target detection parameter corresponding to each classification associated with the labeled target detection samples; and

obtaining a target segmentation parameter for each classification associated with the labeled target detection samples based on the corresponding target detection parameter and the weight-transfer function, thereby determining the segmentation model for performing segmentation on the vehicle damage image.

20. The~~A~~ non-transitory computer-readable storage medium of claim 19, wherein determining the weight-transfer function further comprises:~~computing device, comprising a memory and a processor, characterized in that the memory stores executable code, and the processor, when executing the executable code, implements the method according to any one of claims 1-9~~

obtaining a target detection parameter corresponding to a first classification;

obtaining a corresponding predictive target segmentation parameter based on an initial weight-transfer function and the target detection parameter corresponding to the first classification;

determining, based on the predictive target segmentation parameter, a predicted outline of a target object corresponding to a labeled segmentation sample associated with the first classification; and

adjusting the initial weight-transfer function based at least on the predicted outline and the labeled outline of the target object.