

CLAIMS

1. A vehicle lamp detection method, comprising:

obtaining an image block comprising an image of a vehicle; and
performing vehicle lamp detection on the image block by means of a deep neural network, to obtain a vehicle lamp detection result,

wherein the vehicle lamp detection result comprises vehicle lamp external frame information, a vehicle lamp on-and-off state and a vehicle lamp orientation, wherein the vehicle lamp external frame information is information capable of showing a position of a vehicle lamp external frame in the image block;

performing vehicle lamp external frame leak detection on multiple image blocks having a timing sequence relation according to the vehicle lamp detection results, to obtain corrected vehicle lamp external frame information in the multiple image blocks, which comprises:

obtaining a vehicle lamp identifier corresponding to at least one vehicle lamp external frame according to the multiple image blocks having the timing sequence relation and the vehicle lamp external frame information in the multiple image blocks,

for a vehicle lamp identifier, predicting a position of a vehicle lamp external frame having the vehicle lamp identifier in an m1-th image block according to positions of vehicle lamp external frames having the vehicle lamp identifier in n1 image blocks in front of the m1-th image block, and

adding the vehicle lamp external frame to the m1-th image block according to the predicted position of the vehicle lamp external frame under the condition that no vehicle lamp external frame having the vehicle lamp identifier exists in the m1-th image block; and

determining vehicle lamp indication information according to the vehicle lamp detection results of the multiple image blocks having a timing sequence relation.

2. The method according to claim 1, further comprising:

generating drive control information or drive early warning prompt information according to the vehicle lamp indication information.

3. The method according to claim 1, wherein before the determining the vehicle lamp indication information according to the vehicle lamp detection results of the multiple image blocks having the timing sequence relation, the method further comprises:

performing vehicle lamp external frame smoothing processing on the multiple image blocks having the timing sequence relation according to the vehicle lamp detection results, to obtain corrected vehicle lamp external frame information in the multiple image blocks.

4. The method according to claim 3, wherein the performing the vehicle lamp external frame leak detection and the vehicle lamp external frame smoothing processing on the multiple image blocks having the timing sequence relation according to the vehicle lamp detection results comprises:

performing the vehicle lamp external frame leak detection and the vehicle lamp external frame smoothing processing on at least one of the multiple image blocks according to the vehicle lamp identifier corresponding to the at least one vehicle lamp external frame.

5. The method according to claim 4, wherein the performing the vehicle lamp external frame leak detection and the vehicle lamp external frame smoothing processing on at least one of the multiple image blocks according to the vehicle lamp identifier corresponding to the at least one vehicle lamp external frame comprises:

performing vehicle lamp external frame position correction processing on the m1-th image block based on the predicted position of the vehicle lamp external frame.

6. The method according to claim 5, wherein the performing vehicle lamp external frame position correction processing on the m1-th image block based on the predicted position of the vehicle lamp external frame comprises:

performing weighted average processing on the predicted position of the vehicle lamp external frame and the position of the vehicle lamp external frame having the vehicle lamp identifier in the m1-th image block under the condition that the vehicle lamp external frame having the vehicle lamp identifier exists in the m1-th image block.

7. The method according to claim 1, wherein the determining the vehicle lamp indication information according to the vehicle lamp detection results of the multiple image blocks having the timing sequence relation comprises:

collecting statistics about vehicle lamp on-and-off states for multiple vehicle lamp external frames having a timing sequence relation corresponding to a same vehicle lamp of a same vehicle and determining the vehicle indication information according to a statistical result.

8. The method according to claim 1, wherein

the image block is an image to be processed; or

the image block is a partial image comprising an image of a vehicle in the image to be processed; or

the image block is an image block obtained by processing the partial image comprising the image of the vehicle in the image to be processed.

9. The method according to claim 8, wherein the obtaining the image block comprising the image of the vehicle comprises:

performing vehicle detection on the image to be processed; and

segmenting the image to be processed according to the vehicle detection result, to obtain the image block comprising the image of the vehicle.

10. The method according to claim 9, wherein the performing vehicle detection on the image to be processed comprises:

performing the vehicle detection on the image to be processed using a vehicle detection model, to obtain vehicle external frame information in the image to be processed.

11. The method according to claim 10, wherein the performing vehicle detection on the image to be processed further comprises:

performing at least one of vehicle external frame leak detection or vehicle external frame smoothing processing on the multiple images to be processed having a timing sequence relation, to obtain corrected vehicle external frame information in the multiple images to be processed.

12. The method according to claim 11, wherein the performing at least one of the vehicle external frame leak detection or the smoothing processing on the multiple images to be processed having the timing sequence relation comprises:

obtaining a vehicle identifier corresponding to at least one vehicle external frame according to the multiple images to be processed having the timing sequence relation and the vehicle external frame information thereof; and

performing at least one of the vehicle external frame leak detection or the vehicle external frame smoothing processing on at least one of the multiple images to be processed according to the vehicle identifier corresponding to the at least one vehicle external frame.

13. The method according to claim 12, wherein the performing at least one of the vehicle external frame leak detection or the vehicle external frame smoothing processing on the at least one of the multiple images to be processed according to the vehicle identifier corresponding to the at least one vehicle external frame comprises:

for a vehicle identifier, predicting a position of a vehicle external frame having the vehicle identifier in an m2-th image to be processed according to positions of vehicle external frames having the vehicle identifier in n2 images to be processed in front of the m2-th image to be processed; and

performing vehicle external frame addition or vehicle external frame position correction processing on the m2-th image to be processed based on the predicted position of the vehicle external frame.

14. The method according to claim 13, wherein the performing vehicle external frame addition or vehicle external frame position correction processing on the m2-th image to be processed based on the predicted position of the vehicle external frame comprises:

adding the vehicle external frame to the m2-th image to be processed according to the predicted position of the vehicle external frame under the condition that no vehicle external frame having the vehicle identifier exists in the m2-th image to be processed; or

performing weighted average processing on the predicted position of the vehicle external frame and the position of the vehicle external frame having the vehicle identifier in the m2-th image to be processed under the condition that the

vehicle external frame having the vehicle identifier exists in the m2-th image to be processed.

15. The method according to claim 1, wherein the deep neural network is obtained by training using a sample image block having vehicle lamp annotation information; and
wherein the process of training the deep neural network comprises:
obtaining a sample image block comprising an image of a vehicle;
performing vehicle lamp detection on the sample image block by means of a deep neural network to be trained, to obtain a vehicle lamp detection result; and
using a difference between the vehicle lamp detection result and the vehicle lamp annotation information of the sample image block as guidance information to perform supervised learning on the deep neural network to be trained.

16. The method according to claim 15, wherein the vehicle lamp annotation information comprises at least one of: vehicle lamp external frame information annotation information, vehicle lamp on-and-off state annotation information, or vehicle lamp orientation annotation information.

17. A vehicle lamp detection apparatus, comprising:
a memory storing processor-executable instructions; and
a processor arranged to execute the stored processor-executable instructions to perform steps of:
obtaining an image block comprising an image of a vehicle; and
performing vehicle lamp detection on the image block by means of a deep neural network, to obtain a vehicle lamp detection result,
wherein the vehicle lamp detection result comprises vehicle lamp external frame information, a vehicle lamp on-and-off state and a vehicle lamp orientation, wherein the vehicle lamp external frame information is information capable of showing a position of a vehicle lamp external frame in the image block;
performing vehicle lamp external frame leak detection on multiple image blocks having a timing sequence relation according to the vehicle lamp detection results, to obtain corrected vehicle lamp external frame information in the multiple image blocks, which comprises:

obtaining a vehicle lamp identifier corresponding to at least one vehicle lamp external frame according to the multiple image blocks having the timing sequence relation and the vehicle lamp external frame information in the multiple image blocks,

for a vehicle lamp identifier, predicting a position of a vehicle lamp external frame having the vehicle lamp identifier in an m1-th image block according to positions of vehicle lamp external frames having the vehicle lamp identifier in n1 image blocks in front of the m1-th image block, and

adding the vehicle lamp external frame to the m1-th image block according to the predicted position of the vehicle lamp external frame under the condition that no vehicle lamp external frame having the vehicle lamp identifier exists in the m1-th image block; and

determining vehicle lamp indication information according to the vehicle lamp detection results of the multiple image blocks having a timing sequence relation.

18. The apparatus according to claim 17, wherein the processor is arranged to execute the stored processor-executable instructions to further perform a step of:

generating drive control information or drive early warning prompt information according to the vehicle lamp indication information.

19. The apparatus according to claim 1, wherein the processor is arranged to execute the stored processor-executable instructions to further perform a step of:

performing vehicle lamp external frame smoothing processing on the multiple image blocks having the timing sequence relation according to the vehicle lamp detection results, to obtain corrected vehicle lamp external frame information in the multiple image blocks.

20. A non-transitory computer-readable storage medium having stored thereon computer-readable instructions that, when executed by a processor, cause the processor to execute a vehicle lamp detection method according to any one of claims 1 to 16.