CLAIMS

1. A method for detecting a lane, comprising:

i) receiving one or more source detecting images captured by an image capturing device, each of the one or more source detecting images including a source road region having lane features;

ii) generating a translated source image corresponding to each of the one or more source detecting images by using a lane feature enhancement module, with the lane features of the source road region being enhanced in the translated source image; and

iii) detecting the lane from the translated source image;

wherein the lane feature enhancement module is trained by a plurality of training images and comprises a generator network, to:

a) identify a road region of a corresponding training image of the plurality of training images;

b) translate the road region of the corresponding training image to a translated road region using the generator network to minimize a loss function that quantifies a dissimilarity between the road region and the translated road region to generate the translated source image.

2. The method of claim 1, wherein the generator network comprises a first generator network and a second generator network inverse the first generator network, and the lane feature enhancement module is trained to:

translate the road region of the corresponding training image to a first translated road region using the first generator network;

translate the first translated road region to a second translated road region using the second generator network; and

adjust one or more parameters of the lane feature enhancement module to minimize the loss function based on the road region, the first translated road region and the second translated road region.

3. The method according to claim 1 or 2, wherein the plurality of training images comprises a plurality of source training images from a source domain captured in a first weather and a plurality of target training images from a target domain, the plurality of target training images comprises at least a few target training images captured in the first weather that have one or more lane features being labelled, and the plurality of target training images further comprises a plurality of unlabelled target training images captured in a second weather.

4. The method according to claim 3, wherein a number of the unlabelled target training images is more than a number of the labelled target training images.

5. The method according to any preceding claim, wherein the road region is identified using at least one vanishing point.

6. The method according to claim 5, wherein the image capturing device is calibrated, and the method comprises identifying the at least one vanishing point based on an information of a calibration matrix of the image capturing device.

7. The method according to claim 3 or 4, wherein the at least a few target training images captured in the first weather is labelled by indicating one or more lane features in white lines.

8. A method for training a lane feature enhancement module for detecting a lane, the lane feature enhancement module comprising a generator network, the method comprising:

i) receiving a plurality of training images;

ii) identifying a road region of a corresponding training image of the plurality of training images;

iii) translating the road region of the corresponding training image to a translated road region using the generator network to minimize a loss function that quantifies a dissimilarity between the road region and the translated road region.

9. The method of claim 8, wherein the generator network comprises a first generator network and a second generator network inverse the first generator network, and the method further comprises:

translating the road region of the corresponding training image to a first translated road region using the first generator network;

translating the first translated road region to a second translated road region using the second generator network; and

adjusting one or more parameters of the lane feature enhancement module to minimize the loss function based on the road region, the first translated road region and the second translated road region.

10. The method according to claim 8 or 9, wherein the plurality of training images comprises a plurality of source training images from a source domain captured in a first weather and a plurality of target training images from a target domain, the plurality of target training images comprises at least a few target training images captured in the first weather that have one or more lane features being labelled, and the plurality of target training images further comprises a plurality of unlabelled target training images captured in a second weather.

11. The method according to claim 10, wherein a number of the unlabelled target training images is more than a number of the labelled target training images.

12. The method according to any of claims 8 to 11, wherein the road region is identified using at least one vanishing point.

13. The method according to claim 12, an image capturing device used for capturing the plurality of training images is calibrated, and the method comprises identifying the at least one vanishing point based on an information of a calibration matrix of the image capturing device.

14. The method according to claim 10 or 11, wherein the at least a few target training images captured in the first weather is labelled by indicating one or more lane features in white lines.

15. A system for detecting a lane on a road, comprising:

i) an image capturing device operable to capture one or more images of the road; and

ii) a processor configured to detect the lane on the road from the one or more images captured by the image capturing device using a method for detecting a lane according to any of claims 1 to 7.

16. A vehicle, comprising:

i) a system for detecting a lane on a road according to claim 15; and

ii) a controller configured to control an operation of the vehicle based on an information of the lane detected by the system.

17. A system for training a lane feature enhancement module for detecting a lane, comprising:

i) an image capturing device configured to capture a plurality of training images of a road;

ii) a processor configured to perform a method for training a lane feature enhancement module for detecting a lane according any one of claims 8 to 14; and

iii) an output configured to output the lane feature enhancement module.

18. A non-transitory computer-readable storage medium storing a computer program, when executed by a processor, performs the method for detecting a lane according to any one of claims 1 to 7.

19. A non-transitory computer-readable storage medium for storing a computer program, when executed by a processor, performs the method for training a lane feature enhancement module for detecting a lane according to any one of claims 8-14.