

CLAIMS

1. A lane line attribute detection method, comprising:

obtaining a pavement image collected by an image acquisition device mounted on an intelligent device;

5 determining probability maps according to the pavement image, wherein the probability maps comprise at least two of: a set of color attribute probability maps, a set of line type attribute probability maps, and a set of edge attribute probability maps, wherein,

there are N1 color attribute probability maps, N2 line type attribute probability
10 maps, and N3 edge attribute probability maps, N1, N2, and N3 are all integers greater than 0;

each of the color attribute probability maps represents a probability of each point in the pavement image belonging to a color corresponding to the color attribute probability map,

15 each of the line type attribute probability maps represents a probability of each point in the pavement image belonging to a line type corresponding to the line type attribute probability map, and

each of the edge attribute probability maps represents a probability of each point in the pavement image belonging to an edge corresponding to the edge attribute
20 probability map; and

determining an attribute of a lane line in the pavement image according to the probability maps.

2. The method according to claim 1, wherein the N1 color attribute probability maps correspond to colors comprising at least one of:

- white,
- yellow, or
- 5 blue.

3. The method according to claim 1 or 2, wherein the N2 line type attribute probability maps correspond to line types comprising at least one of:

- a dashed line,
- 10 a solid line,
- a double dashed line,
- a double solid line,
- a dashed solid line,
- a solid dashed line,
- 15 a triple dashed line, or
- a dashed solid dashed line.

4. The method according to any one of claims 1 to 3, wherein the N3 edge attribute probability maps correspond to edges comprising at least one of:

- 20 a curb type edge,
- a fence type edge,
- a wall or flower bed type edge,
- a virtual edge, or
- non-edge.

5. The method according to any one of claims 1 to 4, wherein the probability maps comprise a set of first attribute probability maps and a set of second attribute probability maps, the set of first attribute probability maps and the set of second attribute probability maps are two sets in the set of color attribute probability maps, the set of line type attribute probability maps, and the set of edge attribute probability maps, and the set of first attribute probability maps is different set with the set of second attribute probability maps; and

wherein determining the attribute of the lane line in the pavement image according to the probability maps comprises:

for each point at a position of the lane line in the pavement image, determining a probability value of the point at a corresponding position in each of L first attribute probability maps;

for the point, taking a first attribute value corresponding to a first attribute probability map with a largest probability value of the point as a first attribute value of the point;

determining a first attribute value of the lane line according to first attribute values of respective points at positions of the lane line in the pavement image;

for each point at a position of the lane line in the pavement image, determining a probability value of the point at a corresponding position in each of S second attribute probability maps;

for the point, taking a second attribute value corresponding to a second attribute probability map with a largest probability value of the point as a second attribute value of the point;

determining a second attribute value of the lane line according to second attribute values of respective points at the positions of the lane line in the pavement image;

combining the first attribute value of the lane line and the second attribute value
5 of the lane line; and

taking the combined attribute value as a value of the attribute of the lane line;

wherein, in response to that the set of first attribute probability maps is the set of color attribute probability maps, L equals $N1$, and a first attribute is a color attribute;

in response to that the set of first attribute probability maps is the set of line
10 type attribute probability maps, L equals $N2$, and the first attribute is a line type attribute;

in response to that the set of first attribute probability maps is the set of edge attribute probability maps, L equals $N3$, and the first attribute is an edge attribute;

in response to that the set of second attribute probability maps is the set of color attribute probability maps, S equals $N1$, and a second attribute is the color
15 attribute;

in response to that the set of second attribute probability maps is the set of line type attribute probability maps, S equals $N2$, and the second attribute is the line type attribute; and

in response to that the set of second attribute probability maps is the set of edge attribute probability maps, S equals $N3$, and the second attribute is the edge
20 attribute.

6. The method according to claim 5, wherein determining the first attribute value of the lane line according to the first attribute values of the respective points at the positions of the lane line in the pavement image comprises:

5 in response to that the first attribute values of the respective points at the positions of the lane line are different, taking a first attribute value of points, which, among the respective points at the positions of the lane line, belong to a greatest number of points with an identical first attribute value, as the first attribute value of the lane line.

7. The method according to claim 5 or 6, wherein determining the first attribute
10 value of the lane line according to the first attribute values of the respective points at the positions of the lane line in the pavement image comprises:

in response to that the first attribute values of the respective points at the positions of the lane line are the same, taking a first attribute of a point at a position of the lane line as the first attribute value of the lane line.

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8. The method according to any one of claims 5 to 7, wherein determining the second attribute value of the lane line according to the second attribute values of the respective points at the positions of the lane line in the pavement image comprises:

20 in response to that the second attribute values of the respective points at the positions of the lane line are different, taking a second attribute value of points, which, among the respective points at the positions of the lane line, belong to a greatest number of points with an identical second attribute value, as the second attribute value of the lane line.

9. The method according to any one of claims 5 to 8, wherein determining the second attribute value of the lane line according to the second attribute values of the respective points at the positions of the lane line in the pavement image comprises:

5 in response to that the second attribute values of the respective points at the positions of the lane line are the same, taking a second attribute of a point at a position of the lane line as the second attribute value of the lane line.

10. The method according to any one of claims 5 to 9, wherein the probability maps further comprise a set of third attribute probability maps, the set of third attribute probability maps is one set in the set of color attribute probability maps, the set of line type attribute probability maps, and the set of edge attribute probability maps, and any two of the set of first attribute probability maps, the set of second attribute probability maps, and the set of third attribute probability maps are sets of probability maps with different attributes; and

15 before combining the first attribute value of the lane line and the second attribute value of the lane line, the method further comprises:

for each point at a position of the lane line in the pavement image, determining a probability value of the point at a corresponding position in each of U third attribute probability maps;

20 for the point, taking a third attribute value corresponding to a third attribute probability map with a largest probability value of the point as a third attribute value of the point; and

determining a third attribute value of the lane line according to third attribute values of the respective points at the positions of the lane line in the pavement image;

wherein, in response to that the set of third attribute probability maps is the set of color attribute probability maps, U equals $N1$, and a third attribute is the color attribute;

5 in response to that the set of third attribute probability maps is the set of line type attribute probability maps, U equals $N2$, and the third attribute is the line type attribute; and

in response to that the set of third attribute probability maps is the set of edge attribute probability maps, U equals $N3$, and the third attribute is the edge attribute; and

10 wherein combining the first attribute value of the lane line and the second attribute value of the lane line comprises:

combining the first attribute value of the lane line, the second attribute value of the lane line, and the third attribute value of the lane line.

15 11. The method according to claim 10, wherein determining the third attribute value of the lane line according to the third attribute values of the respective points at the positions of the lane line in the pavement image comprises:

in response to that the third attribute values of the respective points at the positions of the lane line are different, taking a third attribute value of points, which, among the
20 respective points at the positions of the lane line, belong to a greatest number of points with an identical third attribute value, as the third attribute value of the lane line.

12. The method according to claim 10 or 11, wherein determining the third attribute value of the lane line according to the third attribute values of the respective points at the positions of the lane line in the pavement image comprises:

5 in response to that the third attribute values of the respective points at the positions of the lane line are the same, taking a third attribute of a point at a position of the lane line as the third attribute value of the lane line.

13. The method according to any one of claims 1 to 12, wherein determining the probability maps according to the pavement image comprises:

10 inputting the pavement image into a neural network which outputs the probability maps;

wherein, the neural network is obtained by supervised training using a pavement training image set comprising annotation information as color type, line type, and edge type.

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14. The method according to claim 13, wherein before inputting the pavement image into the neural network, the method further comprises:

eliminating distortion of the pavement image.

20 15. A lane line attribute detection apparatus, comprising:

a first obtaining module configured to obtain a pavement image collected by an image acquisition device mounted on an intelligent device;

a first determining module configured to determine probability maps according to the pavement image, wherein the probability maps comprise at least two of: a set of

color attribute probability maps, a set of line type attribute probability maps, and a set of edge attribute probability maps, wherein,

there are N1 color attribute probability maps, N2 line type attribute probability maps, and N3 edge attribute probability maps, N1, N2, and N3 are all integers greater than 0;

each of the color attribute probability maps represents a probability of each point in the pavement image belonging to a color corresponding to the color attribute probability map,

each of the line type attribute probability maps represents a probability of each point in the pavement image belonging to a line type corresponding to the line type attribute probability map, and

each of the edge attribute probability maps represents a probability of each point in the pavement image belonging to an edge corresponding to the edge attribute probability map; and

a second determining module configured to determine an attribute of a lane line in the pavement image according to the probability maps.

16. The apparatus according to claim 15, wherein the probability maps comprise a set of first attribute probability maps and a set of second attribute probability maps, the set of first attribute probability maps and the set of second attribute probability maps are two sets in the set of color attribute probability maps, the set of line type attribute probability maps, and the set of edge attribute probability maps, and the set of first attribute probability maps is different set with the set of second attribute probability maps; and

wherein the second determining module is further configured to:

for each point at a position of the lane line in the pavement image, determine a probability value of the point at a corresponding position in each of L first attribute probability maps;

5 for the point, take a first attribute value corresponding to a first attribute probability map with a largest probability value of the point as a first attribute value of the point;

determine a first attribute value of the lane line according to first attribute values of respective points at positions of the lane line in the pavement image;

10 for each point at a position of the lane line in the pavement image, determine a probability value of the point at a corresponding position in each of S second attribute probability maps;

for the point, take a second attribute value corresponding to a second attribute probability map with a largest probability value of the point as a second attribute value

15 of the point;

determine a second attribute value of the lane line according to second attribute values of respective points at the positions of the lane line in the pavement image;

combine the first attribute value of the lane line and the second attribute value of the lane line; and

20 take the combined attribute value as a value of the attribute of the lane line;

wherein, in response to that the set of first attribute probability maps is the set of color attribute probability maps, L equals N1, and a first attribute is a color attribute;

in response to that the set of first attribute probability maps is the set of line type attribute probability maps, L equals N2, and the first attribute is a line type attribute;

in response to that the set of first attribute probability maps is the set of edge attribute probability maps, L equals N3, and the first attribute is an edge attribute;

in response to that the set of second attribute probability maps is the set of color attribute probability maps, S equals N1, and a second attribute is the color attribute;

in response to that the set of second attribute probability maps is the set of line type attribute probability maps, S equals N2, and the second attribute is the line type attribute; and

in response to that the set of second attribute probability maps is the set of edge attribute probability maps, S equals N3, and the second attribute is the edge attribute.

17. An electronic device, comprising:

a memory for storing program instructions, and

a processor configured to invoke and execute the program instructions in the memory to implement the method according to any one of claims 1 to 14.

18. An intelligent driving method, being applicable to an intelligent device, comprising:

obtaining a pavement image;

detecting an attribute of a lane line in the obtained pavement image by using the lane line attribute detection method according to any one of claims 1 to 14; and

outputting prompt information or performing driving control on the intelligent device according to the detected attribute of the lane line.

19. An intelligent device, comprising:
- an image acquisition device configured to collect a pavement image;
 - a memory configured to store program instructions, wherein the program
 - 5 instructions are executed to implement the lane line attribute detection method according to any one of claims 1 to 14; and
 - a processor configured to
 - detect an attribute of a lane line in the pavement image by executing the program
 - instructions stored in the memory according to the pavement image collected by the
 - 10 image acquisition device, and
 - output prompt information or perform driving control on the intelligent device according to the detected attribute of the lane line.
20. A non-transitory readable storage medium storing a computer program, wherein
- 15 the computer program is configured to execute the method according to any one of claims 1 to 14.