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(54) **SPEED LIMIT CONTROL METHOD AND APPARATUS, AND VEHICLE**

(57) The present application discloses a speed limit control method and apparatus, and a vehicle. The method includes: acquiring map-based speed limit information and vision-based speed limit information, and then selecting, based on one or more of the following information: current position information of the vehicle, a ramp entry intention, a relative position between a road speed limit sign and the vehicle, and a distance between the road speed limit sign and the vehicle, the map-based speed limit information or the vision-based speed limit information as current speed limit information of the vehicle, thereby improving accuracy of vision-based recognition, and the speed limit control method requires relatively low computational power.

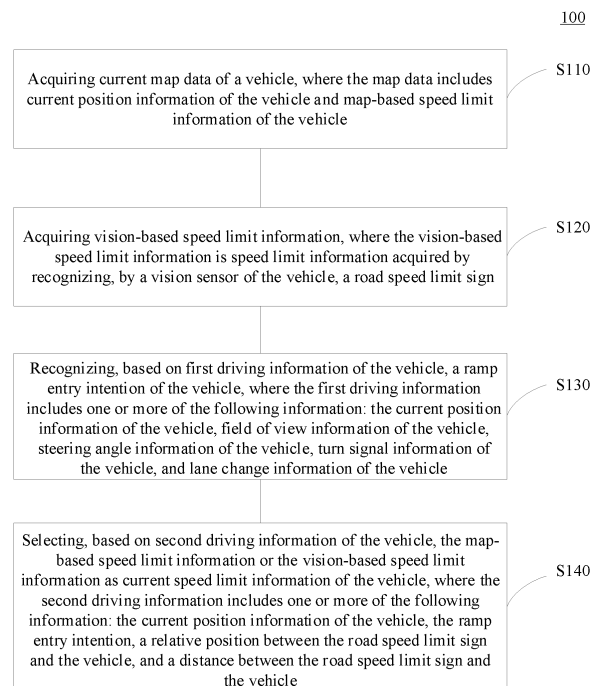


FIG. 1

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Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to Chinese Patent Application No. 202411011744.3, filed with the China National Intellectual Property Administration on July 25, 2024, and titled "SPEED LIMIT CONTROL METHOD AND APPARATUS, AND VEHICLE". The disclosure of the aforementioned application is hereby incorporated by reference in its entirety.

TECHNICAL FIELD

[0002] The present application relates to the field of vehicle technologies, and in particular, to a speed limit control method and apparatus, and a vehicle.

BACKGROUND

[0003] With the development of intelligent transportation technologies, accurate recognition of speed limit signs has become increasingly important. Domestic passenger vehicles are currently equipped with intelligent speed limit recognition functions at an increasing rate, and such functions are gradually being extended to commercial vehicles.

[0004] In related technologies, a speed limit value may be determined by recognizing a road speed limit sign using a camera. However, current vision-based speed limit sign recognition methods suffer from a relatively high error rate and the problem of relatively high requirements.

SUMMARY

[0005] Embodiments of the present application provide a speed limit control method and apparatus, and a vehicle. The following describes various aspects involved in the embodiments of the present application.

[0006] In a first aspect, a speed limit control method is provided, including: acquiring current map data of a vehicle, where the map data includes current position information of the vehicle and map-based speed limit information of the vehicle; acquiring vision-based speed limit information, where the vision-based speed limit information is speed limit information acquired by recognizing, by a vision sensor of the vehicle, a road speed limit sign; recognizing, based on first driving information of the vehicle, a ramp entry intention of the vehicle, where the first driving information includes one or more of the following information: the current position information of the vehicle, field of view information of the vehicle, steering angle information of the vehicle, turn signal information of the vehicle, and lane change information of the vehicle; and selecting, based on second driving information of the vehicle, the map-based speed limit information or the vision-based speed limit information

as current speed limit information of the vehicle, where the second driving information includes one or more of the following information: the current position information of the vehicle, the ramp entry intention, a relative position between the road speed limit sign and the vehicle, and a distance between the road speed limit sign and the vehicle.

[0007] As a possible implementation, the selecting, based on the second driving information of the vehicle, the map-based speed limit information or the vision-based speed limit information as the current speed limit information of the vehicle includes: selecting the vision-based speed limit information as the current speed limit information of the vehicle if the vehicle is approaching a ramp, the vehicle is on a main road, and the speed limit sign is located on a non-regulatory side of the vehicle or in front of and above the vehicle.

[0008] As a possible implementation, the selecting, based on the second driving information of the vehicle, the map-based speed limit information or the vision-based speed limit information as the current speed limit information of the vehicle includes: selecting, based on the ramp entry intention and the distance between the road speed limit sign and the vehicle, the map-based speed limit information or the vision-based speed limit information as the current speed limit information of the vehicle, if the vehicle is approaching a ramp and the speed limit sign is located on a regulatory side of the vehicle or in front of and above the vehicle.

[0009] As a possible implementation, the selecting, based on the second driving information of the vehicle, the map-based speed limit information or the vision-based speed limit information as the current speed limit information of the vehicle includes: selecting the vision-based speed limit information as the current speed limit information of the vehicle if the vehicle is approaching the ramp, the speed limit sign is located on the regulatory side of the vehicle or in front of and above the vehicle, the ramp entry intention is not recognized, and the distance between the road speed limit sign and the vehicle is less than a first threshold; or selecting the vision-based speed limit information as the current speed limit information of the vehicle if the vehicle is approaching the ramp, the speed limit sign is located on the regulatory side of the vehicle or in front of and above the vehicle, the ramp entry intention is recognized, and the distance between the road speed limit sign and the vehicle is less than a second threshold; where the first threshold is less than the second threshold.

[0010] As a possible implementation, the selecting, based on the second driving information of the vehicle, the map-based speed limit information or the vision-based speed limit information as the current speed limit information of the vehicle includes: selecting the vision-based speed limit information as the current speed limit information of the vehicle if the vehicle has already entered a ramp and the speed limit sign is located on a regulatory side of the vehicle or in front of and above the

vehicle; or selecting the vision-based speed limit information as the current speed limit information of the vehicle if the vehicle has already entered a ramp, the speed limit sign is located on a non-regulatory side of the vehicle, and the distance between the road speed limit sign and the vehicle is less than a third threshold.

[0011] As a possible implementation, before the selecting the current speed limit information of the vehicle, the method further includes: determining a regulatory side of the vehicle and the non-regulatory side of the vehicle based on the current position information of the vehicle; where the regulatory side of the vehicle is a right side or a left side of the vehicle, and the non-regulatory side of the vehicle is the left side or the right side of the vehicle.

[0012] As a possible implementation, the method further includes: selecting the map-based speed limit information as the current speed limit information of the vehicle if the speed limit sign is not recognized by the vision sensor of the vehicle.

[0013] As a possible implementation, the map-based speed limit information includes one or more of the following information: speed camera speed limit information, and speed limit information of the vehicle at a current position queried through an offline map or an online map.

[0014] In a second aspect, a speed limit control apparatus is provided, including: a first acquiring module, configured to acquire current map data of a vehicle, where the map data includes current position information of the vehicle and map-based speed limit information of the vehicle; a second acquiring module, configured to acquire vision-based speed limit information, where the vision-based speed limit information is speed limit information acquired by recognizing, by a vision sensor of the vehicle, a road speed limit sign; a recognition module, configured to recognize, based on first driving information of the vehicle, a ramp entry intention of the vehicle, where the first driving information includes one or more of the following information: the current position information of the vehicle, field of view information of the vehicle, steering angle information of the vehicle, turn signal information of the vehicle, and lane change information of the vehicle; and a selection module, configured to select, based on second driving information of the vehicle, the map-based speed limit information or the vision-based speed limit information as current speed limit information of the vehicle, where the second driving information includes one or more of the following information: the current position information of the vehicle, the ramp entry intention, a relative position between the road speed limit sign and the vehicle, and a distance between the road speed limit sign and the vehicle.

[0015] In a third aspect, a chip is provided, including: a processor, configured to invoke and execute a computer program from a memory, so that a device installed with the chip performs the method according to the first aspect.

[0016] In a fourth aspect, a vehicle is provided, including a processor and a memory, where the memory is

configured to store a computer program, and the processor is configured to invoke and execute the computer program stored in the memory to control the vehicle to perform the method according to the first aspect.

[0017] In a fifth aspect, a computer-readable storage medium is provided, having executable code stored thereon. When the executable code is executed, the method according to the first aspect may be implemented.

[0018] The present application provides a speed limit control method, including: acquiring current map data of a vehicle, where the map data includes current position information of the vehicle and map-based speed limit information of the vehicle; acquiring vision-based speed limit information, where the vision-based speed limit information is speed limit information acquired by recognizing, by a vision sensor of the vehicle, a road speed limit sign; recognizing, based on first driving information of the vehicle, a ramp entry intention of the vehicle, where the first driving information includes one or more of the following information: the current position information of the vehicle, field of view information of the vehicle, steering angle information of the vehicle, turn signal information of the vehicle, and lane change information of the vehicle; and selecting, based on second driving information of the vehicle, the map-based speed limit information or the vision-based speed limit information as current speed limit information of the vehicle, where the second driving information includes one or more of the following information: the current position information of the vehicle, the ramp entry intention, a relative position between the road speed limit sign and the vehicle, and a distance between the road speed limit sign and the vehicle. The embodiments of the present application utilize simple position information (such as a relative position between a road speed limit sign and a vehicle) and distance information (such as a distance between the road speed limit sign and the vehicle) of the road speed limit sign to assist in recognizing or selecting speed limit information of the vehicle, thereby improving accuracy of vision-based recognition, and the method requires relatively low computational power.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019]

FIG. 1 is a schematic flowchart of a speed limit control method provided by an embodiment of the present application.

FIG. 2 is a schematic flowchart of a speed limit control method provided by another embodiment of the present application.

FIG. 3 is a schematic structural diagram of a vehicle provided by an embodiment of the present application.

FIG. 4 is a schematic structural diagram of a speed limit control apparatus provided by an embodiment

of the present application.

FIG. 5 is a schematic structural diagram of a vehicle provided by another embodiment of the present application.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0020] In order to enable those skilled in the art to better understand the solutions of the present application, the technical solutions in the embodiments of the present application will be clearly and completely described below with reference to the accompanying drawings in the embodiments of the present application. Obviously, the described embodiments are only a part of the embodiments of the present application, rather than all the embodiments. Based on the embodiments in the present application, all other embodiments obtained by a person of ordinary skill in the art without creative efforts shall fall within the scope of protection of the present application.

[0021] Reference to "an embodiment" herein means that a particular feature, structure, or characteristic described in connection with the embodiment may be included in at least one embodiment of the present application. The appearances of the phrase in various places in the specification are not necessarily all referring to the same embodiment, nor are the appearances independent or alternative embodiments that are mutually exclusive with other embodiments. It is explicitly and implicitly understood by those skilled in the art that the embodiments described herein may be combined with other embodiments.

[0022] Currently, automatic recognition of road speed limit values is gradually becoming a standard feature for vehicles. Domestic passenger vehicles are currently equipped with intelligent speed limit recognition functions at an increasing rate, and commercial vehicles will gradually follow suit. European regulations require that all vehicles exported to Europe be equipped with an intelligent speed assistance function, and accuracy rate of recognized mileage needs to be greater than 90%. Currently, in domestic solutions, the word ramp or a ramp symbol on a sign are recognized to identify a ramp speed limit sign, and the approach is difficult and has poor recognition accuracy. Secondly, using high computational power to recognize Chinese characters and diverse symbols on speed limit signs is costly and not conducive to mass production. In addition, the approach of recognizing Chinese characters is only applicable to China. In many foreign countries, ramp speed limit signs do not have such characters. If a ramp speed limit sign is left unprocessed and what is seen is taken as is, it will result in a high recognition error rate.

[0023] In view of the above problems, the present application provides a speed limit control method, including: acquiring current map data of a vehicle, where the map data includes current position information of the vehicle and map-based speed limit information of the vehicle; acquiring vision-based speed limit information,

where the vision-based speed limit information is speed limit information acquired by recognizing, by a vision sensor of the vehicle, a road speed limit sign; recognizing, based on first driving information of the vehicle, a ramp entry intention of the vehicle, where the first driving information includes one or more of the following information: the current position information of the vehicle, field of view information of the vehicle, steering angle information of the vehicle, turn signal information of the vehicle, and lane change information of the vehicle; and selecting, based on second driving information of the vehicle, the map-based speed limit information or the vision-based speed limit information as current speed limit information of the vehicle, where the second driving information includes one or more of the following information: the current position information of the vehicle, the ramp entry intention, a relative position between the road speed limit sign and the vehicle, and a distance between the road speed limit sign and the vehicle. The embodiments of the present application utilize simple position information (such as a relative position between a road speed limit sign and a vehicle) and distance information (such as a distance between the road speed limit sign and the vehicle) of the road speed limit sign to assist in recognizing or selecting speed limit information of the vehicle, thereby improving accuracy of vision-based recognition, and the method requires relatively low computational power.

[0024] The speed limit control method in the embodiment of the present application is described in detail below with reference to FIG. 1. As shown in FIG. 1, the speed limit control method 100 may include steps S110 to S150.

[0025] In step S110: acquiring current map data of a vehicle, where the map data includes current position information of the vehicle and map-based speed limit information of the vehicle.

[0026] The map-based speed limit information includes one or more of the following information: speed camera speed limit information, and speed limit information of the vehicle at a current position queried through an offline map or an online map. The speed camera speed limit information may refer to a speed limit value of a speed camera ahead of the vehicle position, and the speed limit information of the vehicle at the current position queried through the offline map or the online map may refer to road speed limit information on a map.

[0027] Exemplarily, the map-based speed limit information of the vehicle at the current position may be acquired from a map application based on an inter-process communication technology.

[0028] In step S120: acquiring vision-based speed limit information, where the vision-based speed limit information is speed limit information acquired by recognizing, by a vision sensor of the vehicle, a road speed limit sign.

[0029] Exemplarily, the vision sensor may be a camera on the vehicle. One or more vision sensors on the vehicle are used to acquire visual image data ahead of the

vehicle in real time; the road speed limit sign is recognized according to the visual image data; and the vision-based speed limit information is determined according to the recognized road speed limit sign.

[0030] In some embodiments, the above steps S110 and S120 may be performed in a switched order or simultaneously.

[0031] In step S130: recognizing, based on first driving information of the vehicle, a ramp entry intention of the vehicle, where the first driving information includes one or more of the following information: the current position information of the vehicle, field of view information of the vehicle, steering angle information of the vehicle (for example, a steering wheel angle), turn signal information of the vehicle (for example, left turn signal flashing information or right turn signal flashing information), and lane change information of the vehicle (for example, left lane change information or right lane change information of the vehicle, and lane change information of the vehicle may be determined based on a wheel-over-line condition of the vehicle).

[0032] In the embodiment of the present application, the current position of the vehicle may be acquired through a positioning system such as BeiDou or GPS. The current position of the vehicle may refer to a position of the vehicle on a road, for example, the vehicle is located on a main road, or the vehicle is located on a ramp; the current position of the vehicle may also refer to a geographic location of the vehicle, for example, the vehicle is located in China, or the vehicle is located in Hong Kong, or the vehicle is located in a certain country or region in Europe. The present application does not impose specific limitations in this regard.

[0033] In the embodiments of the present application, the ramp entry intention of the vehicle may be determined based on more or less information in the first driving information, and the present application does not impose specific limitations in this regard. For example, if a regulatory side is a right side, and the vehicle is near a ramp entrance, the vehicle turns on a right turn signal, and changes lane to the right side or a far-right side, then the vehicle is determined to have an intention to enter the ramp.

[0034] For another example, if the regulatory side is a left side, if the vehicle is near the ramp entrance, the vehicle turns on a left turn signal, and changes lane to the left side or a far-left side, then the vehicle is determined to have the intention to enter the ramp.

[0035] For yet another example, if the vehicle is near the ramp entrance, and the steering wheel angle of the vehicle is greater than 45 degrees, then the vehicle is determined to have the intention to enter the ramp.

[0036] It should be noted that the regulatory side in the embodiments of the present application is a driving side determined based on laws or regulations of a region in which the vehicle is traveling. For example, if the vehicle is traveling in mainland China, where laws or regulations stipulate that vehicles drive on the right, the regulatory

side of the vehicle is the right side. For another example, if the vehicle is traveling in Hong Kong, where laws or regulations stipulate that vehicles drive on the left, the regulatory side of the vehicle is the left side. For yet another example, if the vehicle is traveling in a certain region of Europe, where laws or regulations stipulate that vehicles drive on the left, the regulatory side of the vehicle is the left side.

[0037] It should be understood that if the regulatory side is the left side, a non-regulatory side is the right side; if the regulatory side is the right side, the non-regulatory side is the left side.

[0038] That is to say, the regulatory side of the vehicle and the non-regulatory side of the vehicle may be determined based on the current position information of the vehicle (that is, a current geographic location, such as the vehicle is in Europe, or the vehicle is in China, and so on); the regulatory side of the vehicle is the right side or the left side of the vehicle, and the non-regulatory side of the vehicle is the left side or the right side of the vehicle.

[0039] In some implementations, a mapping relationship between a geographic location of the vehicle and the regulatory side of the vehicle may be pre-established.

[0040] In some implementations, the field of view information of the vehicle may refer to field of view information ahead of the vehicle collected by the vision sensor on the vehicle. The field of view information may include speed limit sign information within the field of view of the vehicle, or road information ahead of the vehicle, and so on.

[0041] In step S140: selecting, based on second driving information of the vehicle, the map-based speed limit information or the vision-based speed limit information as current speed limit information of the vehicle, where the second driving information includes one or more of the following information: the current position information of the vehicle, the ramp entry intention, a relative position between the road speed limit sign and the vehicle, and a distance between the road speed limit sign and the vehicle.

[0042] In some implementations, if the vehicle is approaching a ramp, the vehicle is on a main road, and the speed limit sign is located on a non-regulatory side of the vehicle or in front of and above the vehicle, the vision-based speed limit information is selected as the current speed limit information of the vehicle.

[0043] Of course, before selecting the current speed limit information of the vehicle, it may be determined whether the vehicle is on the main road based on map positioning information of the vehicle and the field of view information of the vehicle.

[0044] In some implementations, if the vehicle is approaching a ramp and the speed limit sign is located on a regulatory side of the vehicle or in front of and above the vehicle, the map-based speed limit information or the vision-based speed limit information is selected as the current speed limit information of the vehicle based on the ramp entry intention and the distance between the road

speed limit sign and the vehicle.

[0045] As an example, if the vehicle is approaching the ramp, the speed limit sign is located on the regulatory side of the vehicle or in front of and above the vehicle, the ramp entry intention is not recognized, and the distance between the road speed limit sign and the vehicle is less than a first threshold (such as a distance of one lane), the vision-based speed limit information is selected as the current speed limit information of the vehicle.

[0046] That is to say, if the vehicle has no ramp entry intention, and the road speed limit sign on the regulatory side or in front of and above the vehicle is a ramp speed limit sign, a closest distance between the vehicle and the road speed limit sign on the regulatory side or in front of and above the vehicle will be greater than or equal to the first threshold. If the distance between the vehicle and the road speed limit sign on the regulatory side or in front of and above the vehicle is less than the first threshold, it indicates that the road speed limit sign on the regulatory side or in front of and above the vehicle is a speed limit sign of a main road. Of course, if the distance between the vehicle and the road speed limit sign on the regulatory side or in front of and above the vehicle is greater than or equal to the first threshold, the map-based speed limit information is selected as the current speed limit information of the vehicle.

[0047] As another example, if the vehicle is approaching the ramp, the speed limit sign is located on the regulatory side of the vehicle or in front of and above the vehicle, the ramp entry intention is recognized, and the distance between the road speed limit sign and the vehicle (for example, with reference to a center of the front of the vehicle) is less than a second threshold (for example, a distance of two lanes), the vision-based speed limit information is selected as the current speed limit information of the vehicle; where the first threshold is less than the second threshold. The first threshold and the second threshold may be set according to requirements.

[0048] That is to say, if the vehicle has the ramp entry intention, and the road speed limit sign on the regulatory side or in front of and above the vehicle is a speed limit sign of a main road, a closest distance between the vehicle and the road speed limit sign on the regulatory side or in front of and above the vehicle will be greater than or equal to the second threshold. If the distance between the vehicle and the road speed limit sign on the regulatory side or in front of and above the vehicle is less than the second threshold, it indicates that the road speed limit sign on the regulatory side or in front of and above the vehicle is a speed limit sign of the ramp. Of course, if the distance between the vehicle and the road speed limit sign on the regulatory side or in front of and above the vehicle is greater than or equal to the second threshold, the map-based speed limit information is selected as the current speed limit information of the vehicle.

[0049] In some implementations, if the vehicle has

already entered a ramp and the speed limit sign is located on a regulatory side of the vehicle or in front of and above the vehicle, the vision-based speed limit information is selected as the current speed limit information of the vehicle.

[0050] In some implementations, if the vehicle has already entered a ramp, the speed limit sign is located on a non-regulatory side of the vehicle, and the distance between the road speed limit sign and the vehicle is less than a third threshold, the vision-based speed limit information is selected as the current speed limit information of the vehicle.

[0051] That is to say, if the vehicle has already entered the ramp, and the road speed limit sign on the non-regulatory side is a speed limit sign of a main road, a closest distance between the vehicle and the road speed limit sign on the non-regulatory side will be greater than or equal to the third threshold. If the distance between the vehicle and the road speed limit sign on the non-regulatory side is less than the third threshold, it indicates that the road speed limit sign on the non-regulatory side is a speed limit sign of the ramp. Of course, if the distance between the vehicle and the road speed limit sign on the non-regulatory side is greater than or equal to the third threshold, the map-based speed limit information is selected as the current speed limit information of the vehicle. The third threshold may be set according to requirements, and the present application does not impose specific limitations in this regard.

[0052] In some implementations, if the speed limit sign is not recognized by the vision sensor of the vehicle, the map-based speed limit information is selected as the current speed limit information of the vehicle.

[0053] It should be noted that, in the embodiments of the present application, in front of and above the vehicle, on the regulatory side of the vehicle, and on the non-regulatory side of the vehicle are all referenced to a traveling direction of the vehicle. For example, the speed limit sign being located in front of and above the vehicle may mean that, in the traveling direction of the vehicle, the speed limit sign is located in front of and above the vehicle. For another example, the speed limit sign being located on the regulatory side of the vehicle may mean that, in the traveling direction of the vehicle, the speed limit sign is located on the regulatory side of the vehicle. For another example, the speed limit sign being located on the non-regulatory side of the vehicle may mean that, in the traveling direction of the vehicle, the speed limit sign is located on the non-regulatory side of the vehicle.

[0054] The embodiments of the present application are described in more detail below with reference to specific examples. In the following examples, FIG. 2 is only for helping those skilled in the art to understand the embodiments of the present application, and is not intended to limit the embodiments of the present application to specific numerical values or specific scenarios illustrated. Those skilled in the art will obviously be able to make various equivalent modifications or variations based on

the examples given, and such modifications or variations also fall within the scope of the embodiments of the present application.

[0055] FIG. 2 is another speed limit control method provided by an embodiment of the present application. Referring to FIG. 2, the speed limit control method may include the following steps: S201 to S211. It should be noted that the speed limit control method in FIG. 2 is described by way of example with a regulatory side being a right side.

[0056] In step S201: determining whether a road speed limit sign is detected. For example, the road speed limit sign (also referred to simply as a speed limit sign) may be recognized through field of view information of a vehicle. If the speed limit sign is recognized, the process jumps to step S203; if the speed limit sign is not recognized, the process jumps to step S202.

[0057] In step S202: determining whether map-based speed limit information (also referred to simply as map speed limit) has changed. If the map speed limit has changed, the process jumps to step S211; if the map speed limit has not changed, the process jumps to step S208.

[0058] In step S203: determining whether the vehicle is near a ramp. If the vehicle is not near the ramp, the process jumps to step S206; if the vehicle is near the ramp, the process jumps to step S204.

[0059] In step S204: determining whether the vehicle has already entered the ramp. If the vehicle has not entered the ramp, the process jumps to step S205; if the vehicle has already entered the ramp, the process jumps to step S209.

[0060] In step S205: determining a position of the speed limit sign. If the speed limit sign is located on a left side or a top of the vehicle, the process jumps to step S206; if the speed limit sign is located on a right side of the vehicle, the process jumps to step S207.

[0061] In step S206: updating current speed limit of the vehicle to speed limit of the speed limit sign.

[0062] In step S207: determining an intention to enter the ramp of the vehicle and a distance between the vehicle and the speed limit sign.

[0063] If conditions are satisfied (a ramp entry intention is not recognized, and the distance between the speed limit sign and the vehicle is less than a first threshold; or, the ramp entry intention is recognized, and the distance between the speed limit sign and the vehicle is less than a second threshold), the process jumps to step S206. If conditions are not satisfied (the ramp entry intention is not recognized, and the distance between the speed limit sign and the vehicle is greater than or equal to the first threshold; or, the ramp entry intention is recognized, and the distance between the speed limit sign and the vehicle is greater than or equal to the second threshold), the process jumps to step S208.

[0064] In step S208: the vehicle does not update current speed limit information.

[0065] In step S209: determining the position of the

speed limit sign. If the speed limit sign is located on the right side or the top of the vehicle, the process jumps to step S206; if the speed limit sign is located on the left side of the vehicle, the process jumps to step S210.

[0066] In step S210: determining the distance between the vehicle and the speed limit sign.

[0067] If condition is satisfied (the distance between the speed limit sign and the vehicle is less than a third threshold), the process jumps to step S206; if condition is not satisfied (the distance between the speed limit sign and the vehicle is greater than or equal to the third threshold), the process jumps to step S211.

[0068] An embodiment of the present application further provides a vehicle. Referring to FIG. 3, the vehicle may include a controller 310, a vision sensor 320, a map information processing module 330, and an antenna 340.

[0069] The controller 310 is mainly used for logical judgment and data processing. The vision sensor 320 (for example, a camera) is mainly used for acquiring image data. Image data processing is mainly performed in the controller 310. For example, the controller 310 may be used to receive image data (for example, image data of a speed limit sign) acquired by the vision sensor 320, and the controller 310 may be used to process the image data to obtain a speed limit value of the speed limit sign and distance information between the vehicle and the speed limit sign. The controller 310 may send an instruction to the vehicle to display current speed limit information of the vehicle. The instruction may be, for example, an instruction to update speed limit information of the vehicle to speed limit information of the speed limit sign. The antenna 340 is disposed on the map information processing module 330, and the antenna 340 may communicate with satellites for real-time positioning of the vehicle. The map information processing module 330 may be used to acquire driving map information of the vehicle according to current position of the vehicle. The map information processing module 330 may be, for example, a display screen or a center console screen, and the present application does not impose specific limitations in this regard.

[0070] The present application does not impose specific limitations on a communication mode between the map information processing module 330 and the controller 310. For example, the map information processing module 330 and the controller 310 may communicate via a serial port; for another example, the map information processing module 330 and the controller 310 may also communicate via a CAN bus. The controller 310 and a vehicle system may communicate via a CAN bus. In some implementations, the controller 310 may further include a microprocessor 311 for alleviating the processing pressure of the processor 310.

[0071] The method embodiments of the present application have been described in detail above with reference to FIGs. 1 to 3. The apparatus embodiments of the present application will be described in detail below with reference to FIGs. 4 to 5. It should be understood that the

description of the method embodiments corresponds to the description of the apparatus embodiments, and therefore, parts not described in detail may be referred to the foregoing method embodiments.

[0072] FIG. 4 is a schematic structural diagram of a speed limit control apparatus according to an embodiment of the present application. The speed limit control apparatus 400 may include a first acquiring module 410, a second acquiring module 420, a recognition module 430, and a selection module 440.

[0073] The first acquiring module 410, configured to acquire current map data of a vehicle, where the map data includes current position information of the vehicle and map-based speed limit information of the vehicle.

[0074] The second acquiring module 420, configured to acquire vision-based speed limit information, where the vision-based speed limit information is speed limit information acquired by recognizing, by a vision sensor of the vehicle, a road speed limit sign.

[0075] The recognition module 430, configured to recognize, based on first driving information of the vehicle, a ramp entry intention of the vehicle, where the first driving information includes one or more of the following information: the current position information of the vehicle, field of view information of the vehicle, steering angle information of the vehicle, turn signal information of the vehicle, and lane change information of the vehicle.

[0076] The selection module 440, configured to select, based on second driving information of the vehicle, the map-based speed limit information or the vision-based speed limit information as current speed limit information of the vehicle, where the second driving information includes one or more of the following information: the current position information of the vehicle, the ramp entry intention, a relative position between the road speed limit sign and the vehicle, and a distance between the road speed limit sign and the vehicle.

[0077] Optionally, the selection module 440, configured to select the vision-based speed limit information as the current speed limit information of the vehicle if the vehicle is approaching a ramp, the vehicle is on a main road, and the speed limit sign is located on a non-regulatory side of the vehicle or in front of and above the vehicle.

[0078] Optionally, the selection module 440, configured to select, based on the ramp entry intention and the distance between the road speed limit sign and the vehicle, the map-based speed limit information or the vision-based speed limit information as the current speed limit information of the vehicle, if the vehicle is approaching a ramp and the speed limit sign is located on a regulatory side of the vehicle or in front of and above the vehicle.

[0079] Optionally, the selection module 440, configured to select the vision-based speed limit information as the current speed limit information of the vehicle if the vehicle is approaching the ramp, the speed limit sign is located on the regulatory side of the vehicle or in front of

and above the vehicle, the ramp entry intention is not recognized, and the distance between the road speed limit sign and the vehicle is less than a first threshold; or select the vision-based speed limit information as the current speed limit information of the vehicle if the vehicle is approaching the ramp, the speed limit sign is located on the regulatory side of the vehicle or in front of and above the vehicle, the ramp entry intention is recognized, and the distance between the road speed limit sign and the vehicle is less than a second threshold; where the first threshold is less than the second threshold.

[0080] Optionally, the selection module 440, configured to select the vision-based speed limit information as the current speed limit information of the vehicle if the vehicle has already entered a ramp and the speed limit sign is located on a regulatory side of the vehicle or in front of and above the vehicle; or select the vision-based speed limit information as the current speed limit information of the vehicle if the vehicle has already entered a ramp, the speed limit sign is located on a non-regulatory side of the vehicle, and the distance between the road speed limit sign and the vehicle is less than a third threshold.

[0081] Optionally, the apparatus 400 also includes: a determining module, configured to, before the selecting the current speed limit information of the vehicle, determine a regulatory side of the vehicle and the non-regulatory side of the vehicle based on the current position information of the vehicle; the regulatory side of the vehicle is a right side or a left side of the vehicle, and the non-regulatory side of the vehicle is the left side or the right side of the vehicle.

[0082] Optionally, the apparatus 400 also includes: a second selection module, configured to select the map-based speed limit information as the current speed limit information of the vehicle if the speed limit sign is not recognized by the vision sensor of the vehicle.

[0083] Optionally, the map-based speed limit information includes one or more of the following information: speed camera speed limit information, and speed limit information of the vehicle at a current position queried through an offline map or an online map.

[0084] A vehicle 500 according to an embodiment of the present application is introduced below with reference to FIG. 5. The vehicle 500 may be used to implement the methods described in the foregoing method embodiments.

[0085] The vehicle 500 may include one or more processors 510. The processor 510 may support the vehicle 500 in implementing the methods described in the foregoing method embodiments.

[0086] The processor 510 may be a general-purpose processor or a special-purpose processor. For example, the processor may be a central processing unit (CPU). Alternatively, the processor may be another general-purpose processor, a digital signal processor (DSP), an application specific integrated circuit (ASIC), a field programmable gate array (FPGA) or another program-

mable logic device, a discrete gate or a transistor logic device, or a discrete hardware component, and so on. The general-purpose processor may be a microprocessor or the processor may be any conventional processor.

[0087] The vehicle 500 may further include one or more memories 520. A program is stored on the memory 520, and the program may be executed by the processor 510 to control the vehicle 500 to perform the methods described in the foregoing method embodiments. The memory 520 may be independent of the processor 510 or may be integrated in the processor 510.

[0088] The vehicle 500 may further include a transceiver 530. The processor 510 may communicate with other devices through the transceiver 530. For example, the processor 510 may transmit and receive data with other devices through the transceiver 530.

[0089] An embodiment of the present application further provides a chip, including a processor, where the processor may be used to invoke and execute a computer program from a memory, so that a vehicle installed with the chip performs the methods described in the foregoing method embodiments. It can be understood that the processor may be any type of processor mentioned above. It can be understood that the memory may be independent of the chip or may be integrated in the chip.

[0090] An embodiment of the present application further provides a machine-readable storage medium for storing a program, where the program causes a computer to perform the methods in the various embodiments of the present application.

[0091] An embodiment of the present application further provides a computer program product. The computer program product includes a program. The program causes a computer to perform the methods in the various embodiments of the present application.

[0092] In the above embodiments, implementation may be wholly or partially implemented by software, hardware, firmware, or any other combination thereof. When implemented by software, it may be implemented wholly or partially in the form of a computer program product. The computer program product includes one or more computer instructions. When the computer program instructions are loaded and executed on a computer, the processes or functions according to the embodiments of the present disclosure are generated in whole or in part. The computer may be a general-purpose computer, a special-purpose computer, a computer network, or other programmable devices. The computer instructions may be stored in a machine-readable storage medium, or transmitted from one machine-readable storage medium to another machine-readable storage medium, for example, the computer instructions may be transmitted from one website site, computer, server, or data center to another website site, computer, server, or data center by wire (for example, coaxial cable, optical fiber, Digital Subscriber Line (DSL)) or wirelessly (for example, infrared, wireless, microwave, and so on). The machine-

readable storage medium may be any available medium that may be accessed by a computer or a data storage device such as a server or data center integrated with one or more available media. The available medium may be a magnetic medium (for example, a floppy disk, a hard disk, a magnetic tape), an optical medium (for example, a Digital Video Disc (DVD)), or a semiconductor medium (for example, a Solid State Disk (SSD)), and so on.

[0093] A person of ordinary skill in the art may appreciate that the units and algorithm steps of the examples described in connection with the embodiments of the present disclosure may be implemented by electronic hardware, or a combination of computer software and electronic hardware. Whether these functions are performed by hardware or software depends on specific application and design constraints of the technical solution. A person skilled in the art may use different methods for each specific application to implement the described functions, but such implementation should not be considered as exceeding the scope of the present disclosure.

[0094] In the several embodiments provided in the present disclosure, it should be understood that the disclosed systems, apparatuses, and methods may be implemented in other manners. For example, the apparatus embodiments described above are merely illustrative. For example, the division of the units is only a logical function division. In actual implementation, there may be other division manners. For example, multiple units or components may be combined or integrated into another system, or some features may be ignored or not executed. In addition, the mutual coupling or direct coupling or communication connection shown or discussed may be indirect coupling or communication connection through some interfaces, devices or units, and may be electrical, mechanical or other forms.

[0095] The units described as separate components may or may not be physically separated. The components shown as units may or may not be physical units, that is, the units may be located in one place, or may be distributed over multiple network units. Some or all of the units may be selected according to actual needs to achieve the purpose of the solution of the embodiment.

[0096] In addition, the functional units in the various embodiments of the present disclosure may be integrated into one processing unit, or each unit may exist physically separately, or two or more units may be integrated into one unit.

[0097] The above description is only a specific implementation of the present disclosure, but the scope of protection of the present disclosure is not limited thereto. Any person skilled in the art may easily conceive of changes or substitutions within the technical scope disclosed in the present disclosure, and all such changes or substitutions shall fall within the scope of protection of the present disclosure. Therefore, the scope of protection of the present disclosure shall be subject to the scope of protection of the claims.

Claims

1. A speed limit control method, **characterized by**, comprising:

acquiring current map data of a vehicle, wherein the map data comprises current position information of the vehicle and map-based speed limit information of the vehicle;

acquiring vision-based speed limit information, wherein the vision-based speed limit information is speed limit information acquired by recognizing, by a vision sensor of the vehicle, a road speed limit sign;

recognizing, based on first driving information of the vehicle, a ramp entry intention of the vehicle, wherein the first driving information comprises one or more of the following information: the current position information of the vehicle, field of view information of the vehicle, steering angle information of the vehicle, turn signal information of the vehicle, and lane change information of the vehicle; and

selecting, based on second driving information of the vehicle, the map-based speed limit information or the vision-based speed limit information as current speed limit information of the vehicle, wherein the second driving information comprises one or more of the following information: the current position information of the vehicle, the ramp entry intention, a relative position between the road speed limit sign and the vehicle, and a distance between the road speed limit sign and the vehicle.

2. The method according to claim 1, wherein the selecting, based on the second driving information of the vehicle, the map-based speed limit information or the vision-based speed limit information as the current speed limit information of the vehicle comprises:

selecting the vision-based speed limit information as the current speed limit information of the vehicle if the vehicle is approaching a ramp, the vehicle is on a main road, and the speed limit sign is located on a non-regulatory side of the vehicle or in front of and above the vehicle.

3. The method according to claim 1, wherein the selecting, based on the second driving information of the vehicle, the map-based speed limit information or the vision-based speed limit information as the current speed limit information of the vehicle comprises: selecting, based on the ramp entry intention and the distance between the road speed limit sign and the vehicle, the map-based speed limit information or the vision-based speed limit information as the current speed limit information of the vehicle, if the vehicle is approaching a ramp and the speed limit sign is

located on a regulatory side of the vehicle or in front of and above the vehicle.

4. The method according to claim 3, wherein the selecting, based on the second driving information of the vehicle, the map-based speed limit information or the vision-based speed limit information as the current speed limit information of the vehicle comprises:

selecting the vision-based speed limit information as the current speed limit information of the vehicle if the vehicle is approaching the ramp, the speed limit sign is located on the regulatory side of the vehicle or in front of and above the vehicle, the ramp entry intention is not recognized, and the distance between the road speed limit sign and the vehicle is less than a first threshold; or

selecting the vision-based speed limit information as the current speed limit information of the vehicle if the vehicle is approaching the ramp, the speed limit sign is located on the regulatory side of the vehicle or in front of and above the vehicle, the ramp entry intention is recognized, and the distance between the road speed limit sign and the vehicle is less than a second threshold, wherein the first threshold is less than the second threshold.

5. The method according to claim 1, wherein the selecting, based on the second driving information of the vehicle, the map-based speed limit information or the vision-based speed limit information as the current speed limit information of the vehicle comprises:

selecting the vision-based speed limit information as the current speed limit information of the vehicle if the vehicle has already entered a ramp and the speed limit sign is located on a regulatory side of the vehicle or in front of and above the vehicle; or

selecting the vision-based speed limit information as the current speed limit information of the vehicle if the vehicle has already entered a ramp, the speed limit sign is located on a non-regulatory side of the vehicle, and the distance between the road speed limit sign and the vehicle is less than a third threshold.

6. The method according to claim 2, wherein before the selecting the current speed limit information of the vehicle, the method further comprises:

determining a regulatory side of the vehicle and the non-regulatory side of the vehicle based on the current position information of the vehicle, wherein the regulatory side of the vehicle is a

right side or a left side of the vehicle, and the non-regulatory side of the vehicle is the left side or the right side of the vehicle.

gram stored in the memory to control the vehicle to perform the method according to any one of claims 1 to 8.

7. The method according to any one of claims 1 to 6, wherein the method further comprises:
selecting the map-based speed limit information as the current speed limit information of the vehicle if the speed limit sign is not recognized by the vision sensor of the vehicle. 5 10
8. The method according to any one of claims 1 to 6, wherein the map-based speed limit information comprises one or more of the following information:
speed camera speed limit information, and speed limit information of the vehicle at a current position queried through an offline map or an online map. 15
9. A speed limit control apparatus, **characterized by**, comprising: 20

a first acquiring module, configured to acquire current map data of a vehicle, wherein the map data comprises current position information of the vehicle and map-based speed limit information of the vehicle; 25
a second acquiring module, configured to acquire vision-based speed limit information, wherein the vision-based speed limit information is speed limit information acquired by recognizing, by a vision sensor of the vehicle, a road speed limit sign; 30
a recognition module, configured to recognize, based on first driving information of the vehicle, a ramp entry intention of the vehicle, wherein the first driving information comprises one or more of the following information: the current position information of the vehicle, field of view information of the vehicle, steering angle information of the vehicle, turn signal information of the vehicle, and lane change information of the vehicle; 35 40
and
a selection module, configured to select, based on second driving information of the vehicle, the map-based speed limit information or the vision-based speed limit information as current speed limit information of the vehicle, wherein the second driving information comprises one or more of the following information: the current position information of the vehicle, the ramp entry intention, a relative position between the road speed limit sign and the vehicle, and a distance between the road speed limit sign and the vehicle. 45 50
10. A vehicle, **characterized by**, comprising: a processor and a memory, wherein the memory is configured to store a computer program, and the processor is configured to invoke and execute the computer pro- 55

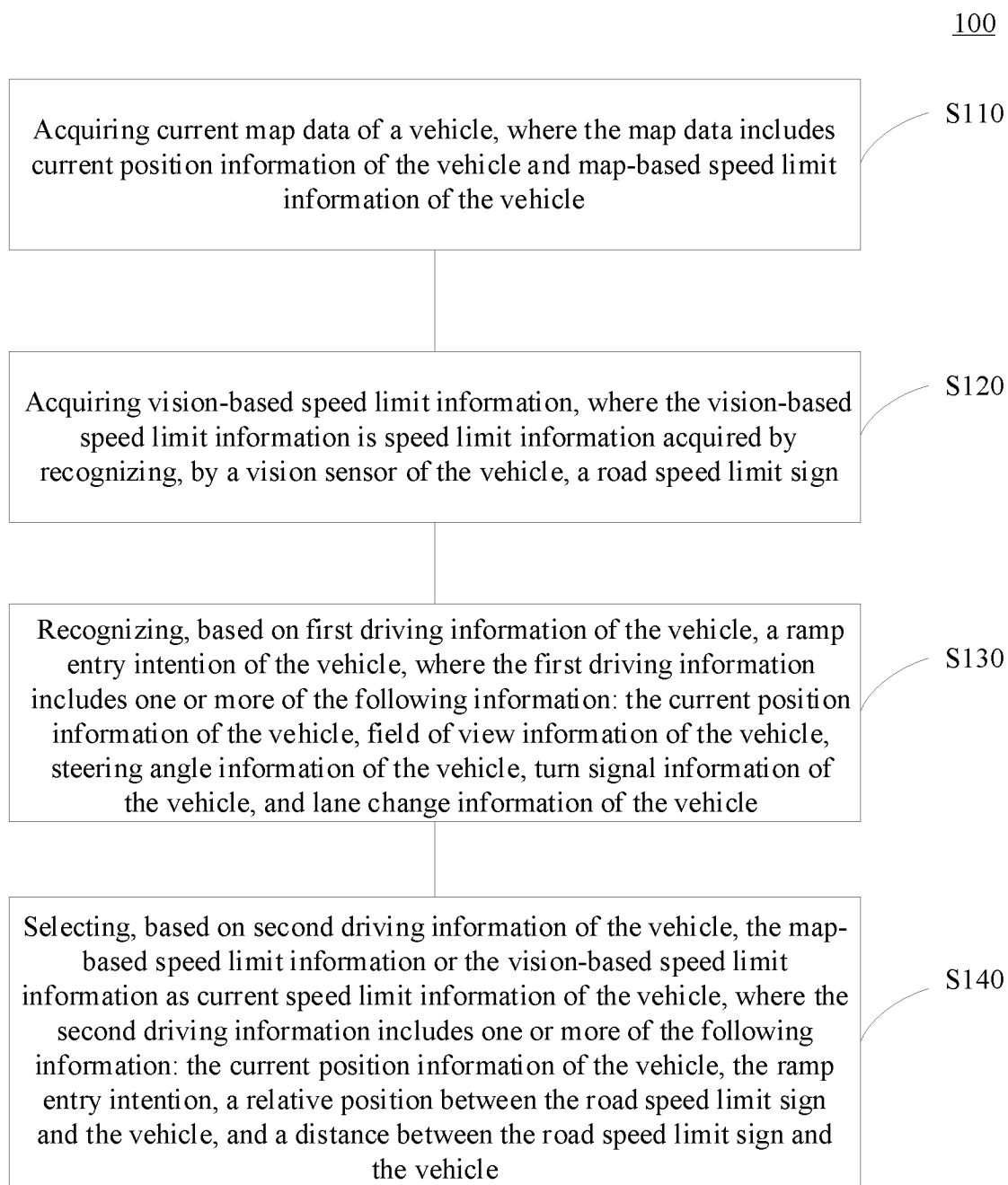


FIG. 1

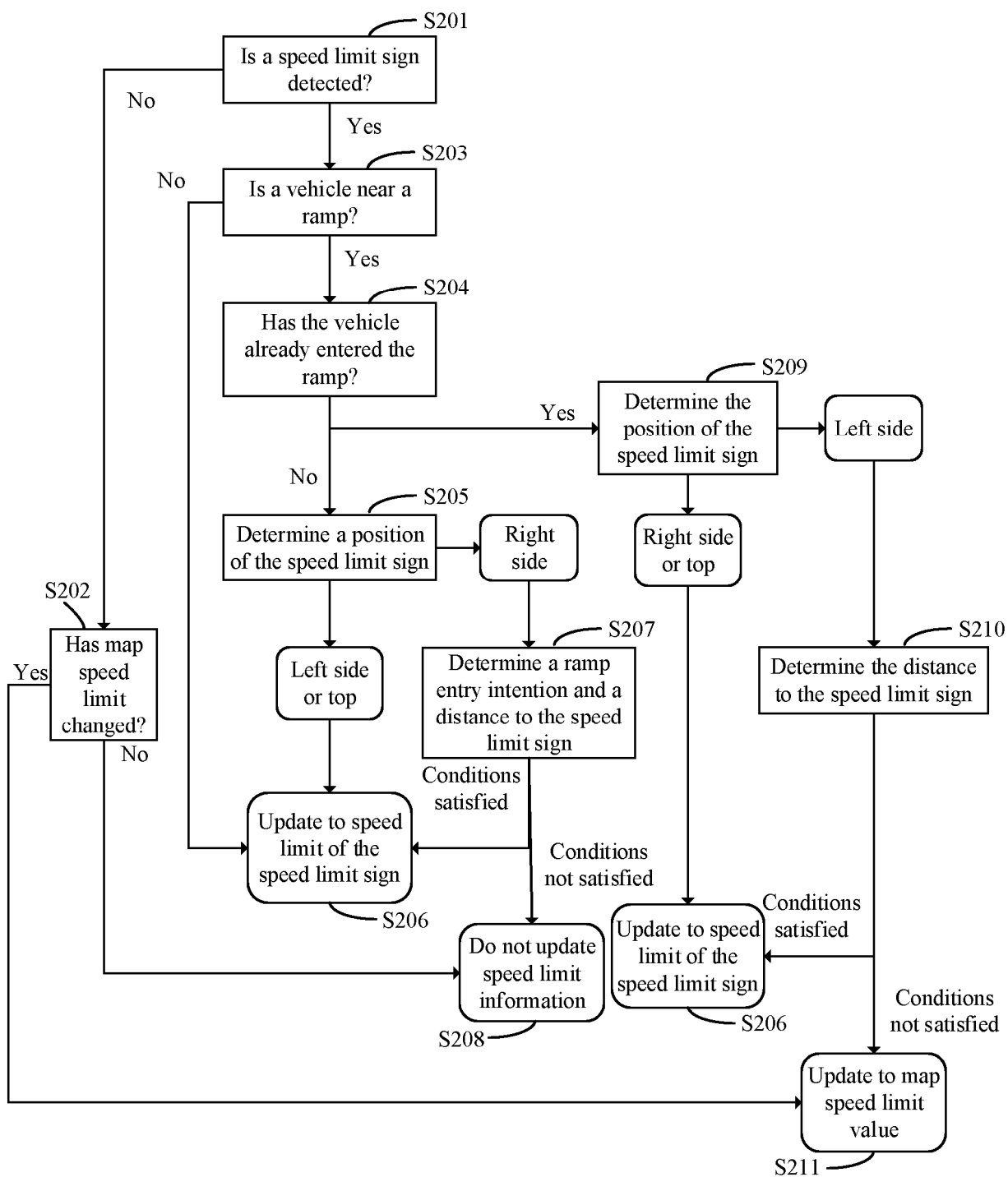


FIG. 2

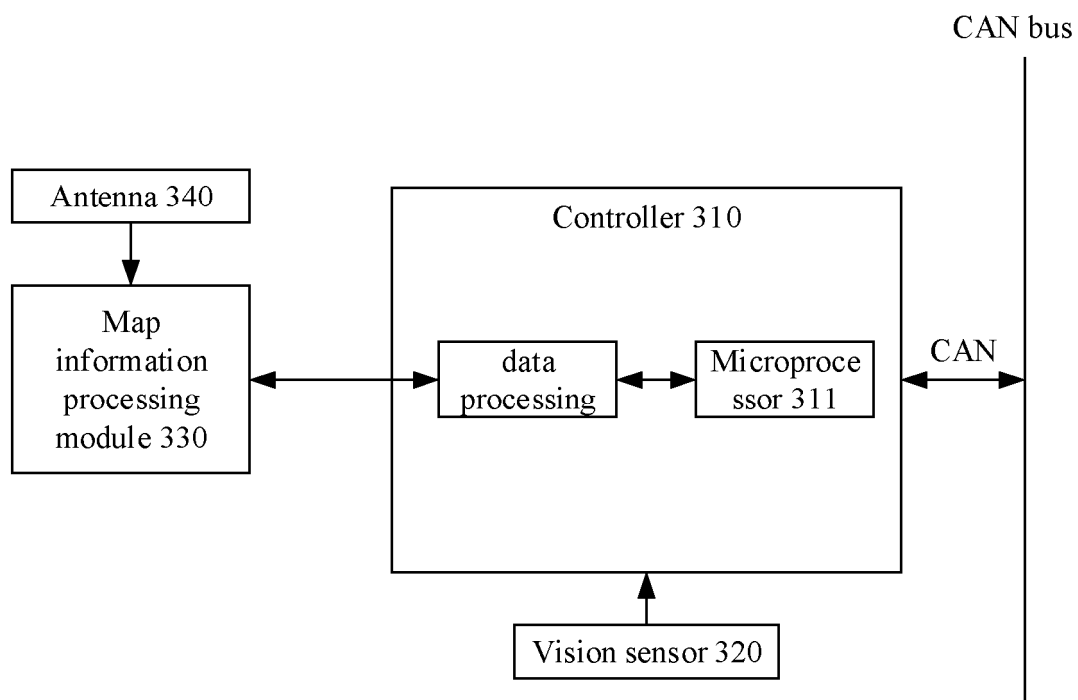


FIG. 3

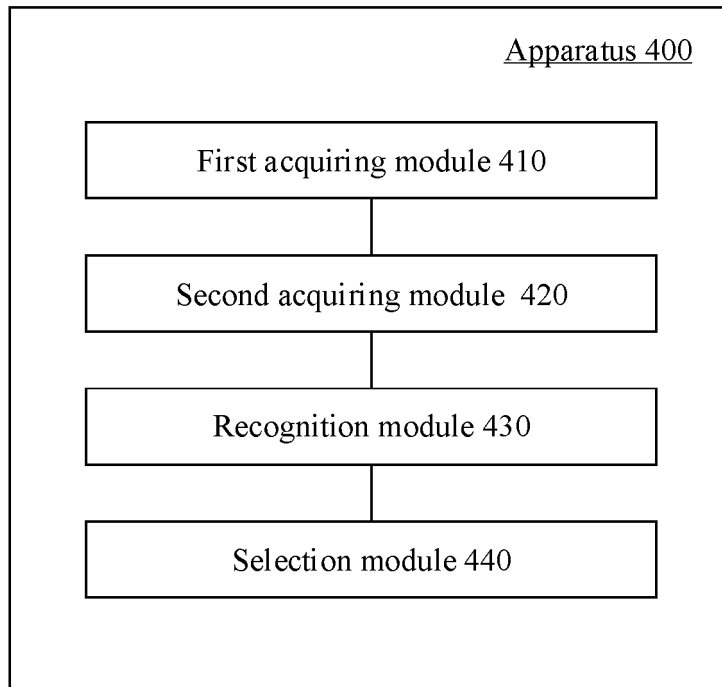


FIG. 4

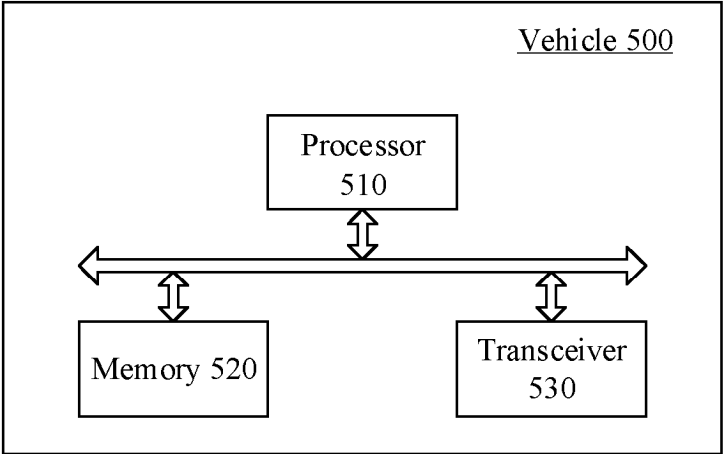


FIG. 5

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2025/097086

A. CLASSIFICATION OF SUBJECT MATTER

G08G1/0967(2006.01)i; G08G1/04(2006.01)n; G08G1/01(2006.01)n

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC:G08G1 B60W40

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNABS, CNTXT, CNKI: 限速, 速度限制, 地图, 视觉, 图像, 摄像头, 匝道, 视野, 转向角, 转向灯, 变道, 法则侧, 行驶侧, 标识, 相对位置, 距离, 间距, 动态, 选择, 仲裁, 多源融合; VEN, USTXT, WOTXT, EPTXT: speed limit, map, visual, image, camera, ramp, field of view, steering angle, turn signal, change, law side, rule side, driving side, side of travel, sign, relative location, relative position, distance, spacing, dynamic, select, arbitrate, multisource fusion

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 119169848 A (SANY SPECIAL PURPOSE VEHICLE CO., LTD.) 20 December 2024 (2024-12-20) claims 1-10	1-10
X	CN 117935197 A (XIAOMI AUTOMOBILE TECHNOLOGY CO., LTD.) 26 April 2024 (2024-04-26) description, paragraphs 59-164, and figures 1-8	1-10
X	CN 114446071 A (CHONGQING CHANG'AN AUTOMOBILE CO., LTD.) 06 May 2022 (2022-05-06) description, paragraphs 19-29, and figures 1-4	1-10
A	CN 108437795 A (GEELY AUTOMOBILE RESEARCH INSTITUTE (NINGBO) CO., LTD. et al.) 24 August 2018 (2018-08-24) entire document	1-10

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"D" document cited by the applicant in the international application	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"E" earlier application or patent but published on or after the international filing date	"&" document member of the same patent family
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

2025年8月15日

Date of mailing of the international search report

09 September 2025

Name and mailing address of the ISA/CN

China National Intellectual Property Administration (ISA/
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Beijing 100088

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2025/097086

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C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 116189467 A (ZHEJIANG ZEEKR INTELLIGENT TECHNOLOGY CO., LTD. et al.) 30 May 2023 (2023-05-30) entire document	1-10
A	US 2023186759 A1 (CONTINENTAL AUTOMOTIVE GMBH) 15 June 2023 (2023-06-15) entire document	1-10

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/CN2025/097086

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
CN	119169848	A	20 December 2024	None			
CN	117935197	A	26 April 2024	None			
CN	114446071	A	06 May 2022	None			
CN	108437795	A	24 August 2018	CN	108437795	B	21 April 2020
CN	116189467	A	30 May 2023	None			
US	2023186759	A1	15 June 2023	FR	3130231	A1	16 June 2023
				FR	3130231	B1	10 May 2024

REFERENCES CITED IN THE DESCRIPTION

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