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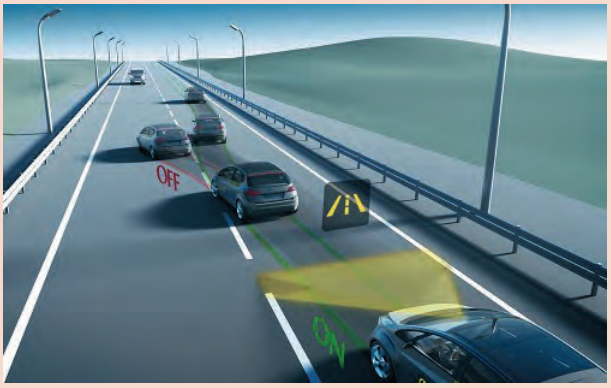
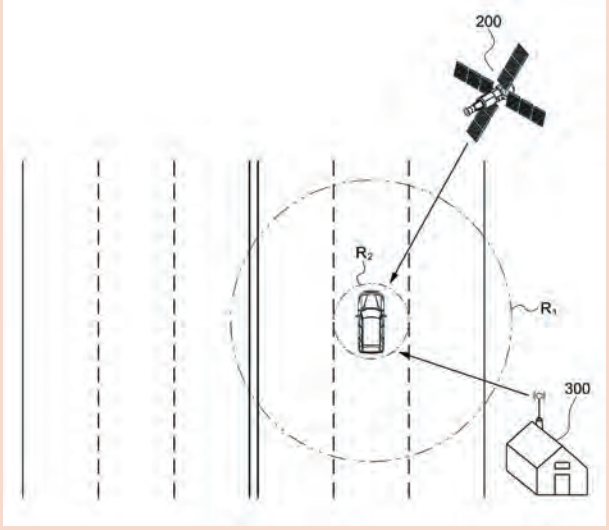
Method of determining driving lane

Outline of Technology

Using a vehicle dynamics model, a heading changing rate of a vehicle and a location changing rate are compared to match them to a driving lane of an actual vehicle.





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Title
- NAVIGATION DEVICE AND ROAD LANE RECOGNITION METHOD THEREOF
- METHOD OF DETERMINING DRIVE LANE USING STEERING WHEEL MODEL

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Technical features and advantages

Distinctiveness

- A driving lane is determined by determining whether a location is appropriate based on a comparison of steering angle information and a GPS azimuth of a vehicle. An accuracy of tolerance is 30 cm or less, which is very precise.
- In detecting an abnormality of a satellite navigation, a driving lane is determined by estimating an azimuth of a vehicle and then using the relationship between the estimated azimuth and the driving lane, which leads to high safety.

Technical effects

- A driving lane is distinguished by reflecting features of a driving lane, and safety and accuracy are improved.

Problem of competitive technique	Solution
■ A satellite navigation system in the field of land traffic is utilized to collect location information for individual driving lanes, levy driving taxes depending on driving distance, monitor driving lane compliance of a hazardous article transport car, and charge differential fees for each driving lane, however it is not distinguished by a lane on which a vehicle drives. ■ Currently, a technique of maintaining a lane through recognition of driving lanes has been developed.	■ A location on a road on which a vehicle is currently driving is analyzed using differential GPS information based on carrier waves and a precise digital map in which each lane is distinguished, rather than a typical digital map, and then a driving lane is determined.

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Technical features and advantages

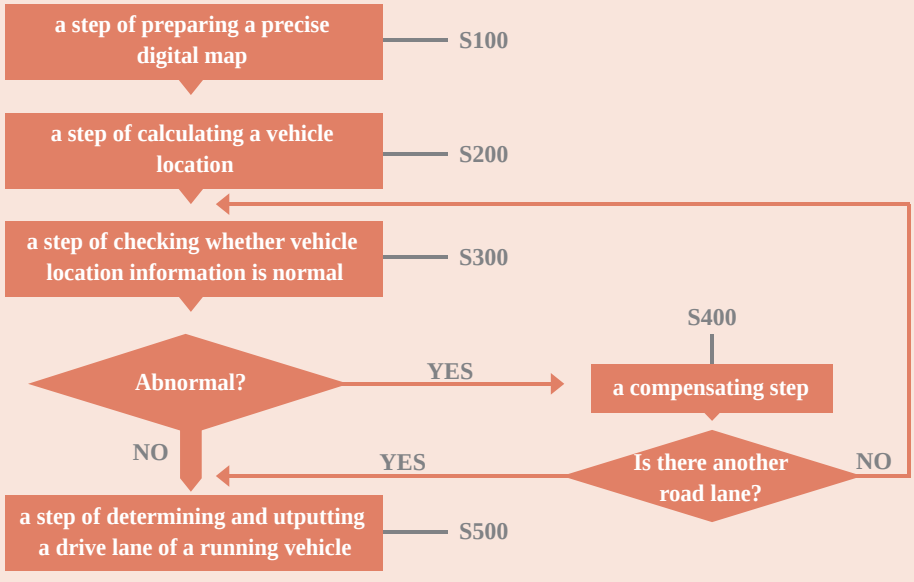
Problem of competitive technique	Solution
■ In the United States, research on determining a driving lane using a digital map capable of distinguishing location information and lanes has been conducted, however it does not distinguish a driving lane by reflecting features of the lane, but only determines a driving lane based on location information and a trajectory of a vehicle. ■ Therefore, a driver needs to recognize and determine circumstances around a vehicle and a lane in which he/she is currently driving by himself/herself in order to change a driving lane, which leads to lack of safety.	■ Provided is a method of determining a driving lane for largely improving driving lane recognition performance which is correctable when there is an abnormality found after an abnormality check based on GPS information using information related to a steering direction of a vehicle in determination of a driving lane.

Technical detail

Method of determining drive lane using steering wheel model

Preparation of precise digital map	Preparation of a precise digital map with precision capable of distinguishing lanes
Calculation of vehicle location	Calculation of differential GPS information based on carrier waves, which is a differential global navigation satellite system (DGNSS)
Detection of the presence of abnormality of vehicle location	Determination of whether vehicle location information is abnormal using a difference between a heading changing rate (GPS) and an azimuth changing rate (using a steering model) $\Delta\Psi_{k+1}^{GPS}=\Psi_{k+1}^{GPS}-\Psi_{k}^{GPS}$
Determination and output of a driving lane	Determination of a driving lane through correction and output of the result to a terminal

- According to a method of determining a driving lane using a steering model, when abrupt tolerance occurs and a driving lane is inappropriately recognized in matching o f lanes for distinguishing lanes, a heading changing rate and a location changing rate of a vehicle are compared using a vehicle dynamics model, and therefore a driving lane of an actual vehicle is matched.



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Method of determining driving lane

Technical detail

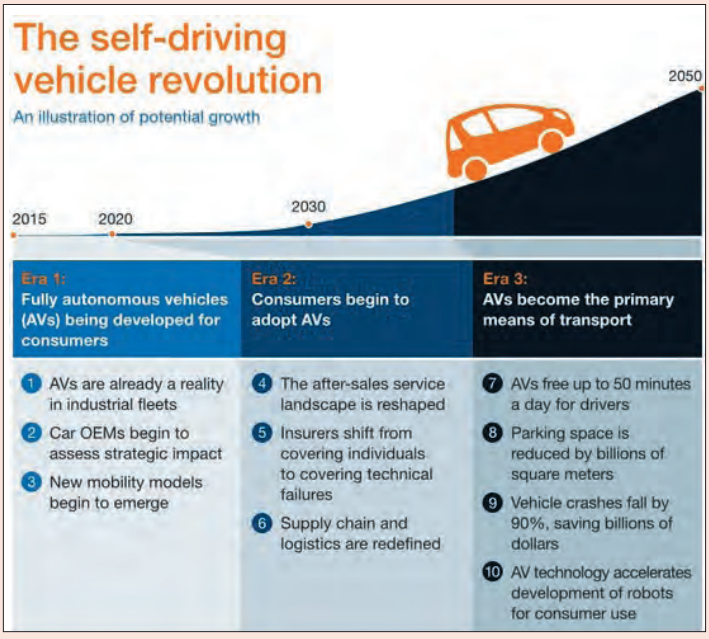
NAVIGATION DEVICE AND ROAD LANE RECOGNITION METHOD THEREOF

Calculation of location	A vehicle location is calculated using a satellite signal including carrier waves and correction information.
Range of distinguishing driving lane	A driving direction is determined using location and lane information.
Calculation of lateral istance	A lateral distance between a vehicle location and a central line of each lane in a driving direction is calculated.
Division of driving lane	A lane with a minimum lateral distance is classified as a driving lane of a vehicle.

- Technique for distinguishing a driving lane using correction information of GPS and driving lane information embedded in a digital map
- Signaling time can be flexibly controlled by traffic for each driving lane
- When using precise location information based on division of driving lanes, information related to driving circumstances and a signal system of each lane can be provided.

Market and future prospects

• A market of autonomous driving vehicles is expected to show an average annual growth rate of 25.7% from 2016 to 2024, and reach 20 billion dollars by 2024.



• Further, a supplying size of autonomous driving vehicles is expected to grow 95.4 million in 2035 from 8000 in 2020, which is an average annual growth rate of 85%. The circumstances of complete autonomous driving will be adapted all over the world.

Applications

• The technique can be utilized in various fields such as by developers of navigation devices, navigation manufacturers, vehicle manufacturers, etc.

• Applicable in the fields of traffic control systems, road maintenance, next generation navigation systems, self-driving vehicles, etc.