CLAIMS

1. A passage detection system detecting passage of a vehicle at a predetermined position, the passage detection system comprising:

a positioning device configured to measure an own position using radio navigation and autonomous navigation; and

a passage detection device configured to detect the passage of the vehicle at a predetermined position;

wherein the passage detection device includes:

a position specifying unit configured to specify a position of the vehicle by correcting a positioning result measured by the positioning device on the basis of systematic error information prepared in advance regarding a systematic error of the positioning result of the positioning device and on the basis of a travel state of the vehicle;

a map matching unit configured to perform map matching on the position specified by the position specifying unit;

an accidental error calculation unit configured to calculate an accidental error of the positioning result measured by the positioning device on the basis of a deviation amount between a first position specified by the position specifying unit and a second position indicated by a result obtained through the map matching by the map matching unit; and

a passage determination unit configured to determine whether the vehicle has passed the predetermined position on the basis of a temporal change in the position specified by the position specifying unit, and

wherein the passage determination unit determines that the vehicle has not passed the predetermined position when the predetermined position is within a range of the accidental error calculated by the accidental error calculation unit.

2. The passage detection system according to claim 1,

wherein the passage detection device further includes a travel state specifying unit configured to specify the travel state of the vehicle on the basis of the temporal change in the position specified by the position specifying unit up to a present time; and

wherein the position specifying unit specifies the position of the vehicle by correcting the positioning result measured by the positioning device on the basis of the systematic error information prepared in advance regarding the system error of the positioning result measured by the positioning device and on the basis of the travel state of the vehicle specified by the travel state specifying unit.

3. The passage detection system according to claim 1 or 2,

wherein the passage detection device further includes:

a charging process unit configured to perform a charging process when the vehicle has passed the predetermined position.

4. A passage detection system detecting passage of a vehicle at a predetermined position, the passage detection system comprising:

a positioning device configured to measure an own position using radio navigation and autonomous navigation; and

a passage detection device configured to detect the passage of the vehicle at a predetermined position;

wherein the passage detection device includes:

a map matching unit configured to perform map matching on the positioning result measured by the positioning device,

an accidental error calculation unit configured to calculate an accidental error of a positioning result measured by the positioning device on the basis of a deviation amount between a first position specified by the positioning device and a second position indicated by a result obtained through the map matching by the map matching unit, and

a passage determination unit configured to determine that the vehicle has not passed the predetermined position when the predetermined position is within a range of the accidental error calculated by the accidental error calculation unit.

5. A passage detection method of detecting passage of a vehicle at a predetermined position, the method comprising:

a position specifying step of specifying a position of the vehicle by correcting a positioning result measured by a positioning device which measures an own position using radio navigation and autonomous navigation on the basis of systematic error information prepared in advance regarding a systematic error of the positioning result measured by the positioning device and on the basis of a travel state of the vehicle;

a map matching step of performing map matching on the position specified in the position specifying step;

an accidental error calculation step of calculating an accidental error of the positioning result measured by the positioning device on the basis of a deviation amount

between a first position specified by the position specifying step and a second position indicated by a result obtained through the map matching by the map matching step; and

a passage determination step of determining whether the vehicle has passed the predetermined position on the basis of a temporal change in the position specified in the position specifying step, and

wherein the passage determination step determines that the vehicle has not passed the predetermined position when the predetermined position is within a range of the accidental error calculated by the accidental error calculation unit.

6. A passage detection method of detecting passage of a vehicle at a predetermined position, the method comprising:

a map matching step of performing map matching on a positioning result measured by a positioning device which measures an own position using radio navigation and autonomous navigation;

an accidental error calculation step of calculating an accidental error of the positioning result measured by the positioning device on the basis of a deviation amount between a first position of the positioning result measured by the positioning device and a second position indicated by a result obtained through the map matching in the map matching step; and

a passage determination step of determining that the vehicle has not passed the predetermined position when the predetermined position is within a range of the accidental error calculated in the accidental error calculation step.

7. A passage detection device detecting passage of a vehicle at a predetermined position, the passage detection device comprising:

a position specifying unit configured to specify a position of the vehicle by correcting a positioning result measured by a positioning device which measures an own position using radio navigation and autonomous navigation on the basis of systematic error information prepared in advance regarding a systematic error of the positioning result measured by the positioning device and on the basis of a travel state of the vehicle;

a map matching unit configured to perform map matching on the position specified by the position specifying unit;

an accidental error calculation unit configured to calculate an accidental error of the positioning result measured by the positioning device on the basis of a deviation amount

between a first position specified by the position specifying unit and a second position indicated by a result obtained through the map matching by the map matching unit; and

a passage determination unit configured to determine whether the vehicle has passed the predetermined position on the basis of a temporal change in the position specified in the position specifying unit, and

wherein the passage determination unit determines that the vehicle has not passed the predetermined position when the predetermined position is within a range of the accidental error calculated by the accidental error calculation unit.

8. A passage detection device detecting passage of a vehicle at a predetermined position, the passage detection device comprising:

a map matching unit configured to perform map matching on a positioning result measured by a positioning device which measures an own position using radio navigation and autonomous navigation;

an accidental error calculation unit configured to calculate an accidental error of the positioning result measured by the positioning device on the basis of a deviation amount between a first position of the positioning result measured by the positioning device and a second position indicated by a result obtained through the map matching in the map matching step; and

a passage determination unit configured to determine that the vehicle has not passed the predetermined position when the predetermined position is within a range of the accidental error calculated in the accidental error calculation step.

9. A program causing a computer to function as a passage detection device detecting passage of a vehicle at a predetermined position, the program causing the computer to function as:

a position specifying unit configured to specify a position of the vehicle by correcting a positioning result measured by a positioning device which measures an own position using radio navigation and autonomous navigation on the basis of systematic error information prepared in advance regarding a systematic error of the positioning result measured by the positioning device and on the basis of a travel state of the vehicle;

a map matching unit configured to perform map matching on the position specified by the position specifying unit;

an accidental error calculation unit configured to calculate an accidental error of the positioning result measured by the positioning device on the basis of a deviation amount between a first position specified by the position specifying unit and a second position indicated by a result obtained through the map matching by the map matching unit; and

a passage determination unit configured to determine whether the vehicle has passed the predetermined position on the basis of a temporal change in the position specified in the position specifying unit, and

wherein the passage determination unit determines that the vehicle has not passed the predetermined position when the predetermined position is within a range of the accidental error calculated by the accidental error calculation unit.

10. A program causing a computer to function as a passage detection device detecting passage of a vehicle at a predetermined position, the program causing the computer to function as:

a map matching unit configured to perform map matching on a positioning result measured by a positioning device which measures an own position using radio navigation and autonomous navigation;

an accidental error calculation unit configured to calculate an accidental error of the positioning result measured by the positioning device on the basis of a deviation amount between a first position of the positioning result measured by the positioning device and a second position indicated by a result obtained through the map matching in the map matching step; and

a passage determination unit configured to determine that the vehicle has not passed the predetermined position when the predetermined position is within a range of the accidental error calculated in the accidental error calculation unit.

11. A recording medium that records a program causing a computer to function as a passage detection device detecting passage of a vehicle at a predetermined position, the recording medium recording the program causing the computer to function as:

a position specifying unit configured to specify a position of the vehicle by correcting a positioning result measured by a positioning device which measures an own position using radio navigation and autonomous navigation on the basis of systematic error information prepared in advance regarding a systematic error of the positioning result measured by the positioning device and on the basis of a travel state of the vehicle;

a map matching unit configured to perform map matching on the position specified by the position specifying unit;

an accidental error calculation unit configured to calculate an accidental error of the positioning result measured by the positioning device on the basis of a deviation amount between a first position specified by the position specifying unit and a second position indicated by a result obtained through the map matching by the map matching unit; and

a passage determination unit configured to determine whether the vehicle has passed the predetermined position on the basis of a temporal change in the position specified in the position specifying unit, and

wherein the passage determination unit determines that the vehicle has not passed the predetermined position when the predetermined position is within a range of the accidental error calculated by the accidental error calculation unit.

12. A recording medium that records a program causing a computer to function as a passage detection device detecting passage of a vehicle at a predetermined position, the recording medium recording the program causing the computer to function as:

a map matching unit configured to perform map matching on a positioning result measured by a positioning device which measures an own position using radio navigation and autonomous navigation;

an accidental error calculation unit configured to calculate an accidental error of the positioning result measured by the positioning device on the basis of a deviation amount between a first position of the positioning result measured by the positioning device and a second position indicated by a result obtained through the map matching in the map matching step; and

a passage determination unit configured to determine that the vehicle has not passed the predetermined position when the predetermined position is within a range of the accidental error calculated in the accidental error calculation unit.