CLAIMS

[Claim 1]

A gradient information acquisition method, comprising:

a speed measurement value acquiring step of acquiring a measurement value of a speed of a railroad vehicle;

a speed calculating step of obtaining a calculation value of the speed of the railroad vehicle using an equation of motion including a function representing a gradient of a travel route of the railroad vehicle;

a parameter value acquiring step of obtaining a parameter value of the function representing the gradient, the parameter value minimizing a difference between the calculation value of the speed and the measurement value of the speed; and

a gradient information acquiring step of obtaining the gradient of the travel route based on the parameter value of the function representing the gradient acquired in the parameter value acquiring step.

[Claim 2]

The gradient information acquisition method according to claim 1,

wherein the speed measuring step further comprises

a speedometer measurement value acquiring step of acquiring the measurement value of the speed of the railroad vehicle by a speedometer;

a traveling time acquiring step of acquiring information of a time at which the railroad vehicle travels at a certain position; and

a speedometer measurement value correcting step of correcting the measurement value of the speedometer based on data acquired in the traveling time acquiring step and obtaining the measurement value of the speed of the railroad vehicle.

[Claim 3]

The gradient information acquisition method according to claim 1 or 2, further comprising,

a zone deciding step of deciding a zone in which a gradient is obtained by the gradient information acquisition method in a travel route of a gradient acquisition target.

[Claim 4]

The gradient information acquisition method according to claim 3,

wherein, in the zone deciding step, the zone in which the gradient is obtained by the gradient information acquisition method is decided in both directions of the travel route of the gradient acquisition target.

[Claim 5]

A storage medium storing information indicating a gradient obtained by executing the gradient information acquisition method according to any one of claims 1 to 4.

[Claim 6]

A gradient information acquisition device, comprising:

a speed measurement value acquiring unit configured to acquire a measurement value of a speed of a railroad vehicle;

a speed calculating unit configured to obtain a calculation value of the speed of the railroad vehicle using an equation of motion including a function representing a gradient of a travel route of the railroad vehicle;

a parameter value acquiring unit configured to obtain a parameter value of the function representing the gradient, the parameter value minimizing a difference between the calculation value of the speed and the measurement value of the speed; and

a gradient information acquiring unit configured to obtain the gradient of the travel route based on the parameter value of the function representing the gradient acquired by the parameter value acquiring unit.

[Claim 7]

A program causing a computer functioning as a gradient information acquisition device to execute:

a speed measuring step of acquiring a measurement value of a speed of a railroad vehicle;

a speed calculating step of obtaining a calculation value of the speed of the railroad vehicle using an equation of motion including a function representing a gradient of a travel route of the railroad vehicle;

a parameter value acquiring step of obtaining a parameter value of the function representing the gradient, the parameter value minimizing a difference between the calculation value of the speed and the measurement value of the speed; and

a gradient information acquiring step of obtaining the gradient of the travel route based on the parameter value of the function representing the gradient acquired in the parameter value acquiring step.

CLAIMS

[Claim 1]

A gradient information acquisition method, comprising:

a speed measurement value acquiring step of acquiring a measurement value of a speed of a railroad vehicle;

a speed calculating step of obtaining a calculation value of the speed of the railroad vehicle using an equation of motion including a function representing a gradient of a travel route of the railroad vehicle;

a parameter value acquiring step of obtaining a parameter value of the function representing the gradient, the parameter value minimizing a difference between the calculation value of the speed and the measurement value of the speed; and

a gradient information acquiring step of obtaining the gradient of the travel route based on the parameter value of the function representing the gradient acquired in the parameter value acquiring step.

[Claim 2]

The gradient information acquisition method according to claim 1,

wherein the speed measuring step further comprises

a speedometer measurement value acquiring step of acquiring the measurement value of the speed of the railroad vehicle by a speedometer;

a traveling time acquiring step of acquiring information of a time at which the railroad vehicle travels at a certain position; and

a speedometer measurement value correcting step of correcting the measurement value of the speedometer based on data acquired in the traveling time acquiring step and obtaining the measurement value of the speed of the railroad vehicle.

[Claim 3]

The gradient information acquisition method according to claim 1 or 2, further comprising,

a zone deciding step of deciding a zone in which a gradient is obtained by the gradient information acquisition method in a travel route of a gradient acquisition target.

[Claim 4]

The gradient information acquisition method according to claim 3,

wherein, in the zone deciding step, the zone in which the gradient is obtained by the gradient information acquisition method is decided in both directions of the travel route of the gradient acquisition target.

[Claim 5]

A method of generating a storage medium comprising steps of:

executing the gradient information acquisition method according to any one of claims 1 to 4; and

storing information indicating a gradient, which has been obtained, in the storage medium.

[Claim 6]

A gradient information acquisition device, comprising:

a speed measurement value acquiring unit configured to acquire a measurement value of a speed of a railroad vehicle;

a speed calculating unit configured to obtain a calculation value of the speed of the

railroad vehicle using an equation of motion including a function representing a gradient of a travel route of the railroad vehicle;

a parameter value acquiring unit configured to obtain a parameter value of the function representing the gradient, the parameter value minimizing a difference between the calculation value of the speed and the measurement value of the speed; and

a gradient information acquiring unit configured to obtain the gradient of the travel route based on the parameter value of the function representing the gradient acquired by the parameter value acquiring unit.

[Claim 7]

A program causing a computer functioning as a gradient information acquisition device to execute:

a speed measuring step of acquiring a measurement value of a speed of a railroad vehicle;

a speed calculating step of obtaining a calculation value of the speed of the railroad vehicle using an equation of motion including a function representing a gradient of a travel route of the railroad vehicle;

a parameter value acquiring step of obtaining a parameter value of the function representing the gradient, the parameter value minimizing a difference between the calculation value of the speed and the measurement value of the speed; and

a gradient information acquiring step of obtaining the gradient of the travel route based on the parameter value of the function representing the gradient acquired in the parameter value acquiring step.