

Method, Device, Medium and Apparatus for Controlling Running of Gantry

TECHNICAL FIELD

[001] The present invention relates to the technical field of industrial controlling, and especially to a method, a device, a medium and an apparatus for controlling running of a gantry.

BACKGROUND OF THE INVENTION

[002] During operation of a rubber-tyred gantry crane (RTG), it is generally necessary to move the gantry. However, it is necessary for the gantry during movement to run between two lane lines on the road, otherwise, it may collide containers arranged on storage yards on both sides. Currently, a general manner for controlling running of the gantry is observation by human eyes wherein the driver performs manual rectification according to the road standard lines and the rectification precision is low.

SUMMARY OF THE INVENTION

[003] In the embodiments of the present invention, a method, a device, a medium and an apparatus for controlling running of a gantry are provided, and the rectification precision during running of the gantry can be improved.

[004] In a first aspect, an embodiment of the present invention provides a method for controlling running of a gantry, comprising:

determining road information at the current moment;

controlling running of the gantry according to a predicted value of a state parameter at the current moment predicted at the previous moment and the road information at the current moment;

determining an actual value of the state parameter at the current moment;

calculating a difference value between the predicted value of the state parameter at the current moment predicted at the previous moment and the actual value of the state parameter at the current moment, and using the difference value as a feedback value corresponding to the current moment; and

determining a predicted value of the state parameter at the next moment,

according to the feedback value corresponding to the current moment and the actual value of the state parameter at the current moment, to control running of the gantry at the next moment according to the predicted value of the state parameter at the next moment.

[005] In a second aspect, an embodiment of the present invention provides a device for controlling running of a gantry, comprising:

- a first determination module, for determining road information at the current moment;

- a running controlling module, for controlling running of the gantry according to a predicted value of a state parameter at the current moment predicted at the previous moment and the road information at the current moment;

- a second determination module, for an actual value of the state parameter at the current moment;

- a first calculation module, for calculating a difference value between the predicted value of the state parameter at the current moment predicted at the previous moment and the actual value of the state parameter at the current moment, and using the difference value as a feedback value corresponding to the current moment; and

- a third determination module, for determining a predicted value of the state parameter at the next moment, according to the feedback value corresponding to the current moment and the actual value of the state parameter at the current moment, to control running of the gantry at the next moment according to the predicted value of the state parameter at the next moment.

[006] In a third aspect, an embodiment of the present invention provides a computer-readable storage medium. It is stored thereon with a computer program, and when the computer program is executed in a computer, the method as provided in the first aspect is implemented by the computer.

[007] In a fourth aspect, an embodiment of the present invention provides a calculation apparatus. It comprises a memory and a processor wherein the memory is stored therein with executable codes, and when the executable codes are executed by the processor, the method as provided in the first aspect is implemented.

[008] The method, device, medium and apparatus for controlling running of a gantry as provided in the embodiments of the present invention, individually or in combination, can have at least the following technical effects:

- (1) It is first to determine road information at the current moment, then to control

running of the gantry according to a predicted value of a state parameter at the current moment predicted at the previous moment and the road information at the current moment; then, after controlling, to determine an actual value of the state parameter at the current moment; then to calculate a difference value between the predicted value of the state parameter at the current moment predicted at the previous moment and the actual value of the state parameter at the current moment, and use the difference value as a feedback value corresponding to the current moment; and to determine a predicted value of the state parameter at the next moment, according to the feedback value corresponding to the current moment and the actual value of the state parameter at the current moment, and in turn control running of the gantry at the next moment according to the predicted value of the state parameter at the next moment. As can be seen, in the method(s) as provided in the embodiment(s) of the present invention, the state parameter is added. The running of the gantry can be controlled according to a predicted value of a state parameter at the current moment predicted at the previous moment and the road information at the current moment. Also, it can provide feedback according to a difference value between the predicted value and the actual value of the state parameter at the current moment, for prediction to the state parameter at the next moment. As can be seen, compared with the manner of rectification only by cameras, the method(s) as provided in the embodiment(s) of the present invention can significantly improve the rectification precision.

(2) In an embodiment, when the road standard line is covered, the road information at the current moment is determined according to a pre-generated electronic map wherein the electronic map is generated according to the road image obtained during running of the gantry when the road standard line is not covered, such that when the road standard line is covered due to snowing, the running of the gantry can be controlled, thus ensuring normal working.

(3) In an embodiment, when determining the predicted value of the state parameter at the next moment, it is necessary to determine a disturbance value, calculate a difference value between the disturbance value and the feedback value corresponding to the current moment and configure the difference value as the difference value corresponding to the current moment, and then determine the predicted value of the state parameter at the next moment according to the difference value corresponding to the current moment and the actual value of the state parameter at the current moment. The disturbance value reflects a degree of being disturbed of

data during transmission. That is, when determining the predicted value of the state parameter at the next moment, not only the feedback value corresponding to the current moment and the actual value of the state parameter at the current moment are considered, but also the degree of being disturbed of data during transmission is considered, such that the influence by disturbance on the predicted value of the state parameter at the next moment can be reduced to the least.

(4) In an embodiment, gain processing to the difference value between the disturbance value and the feedback value corresponding to the current moment is performed, and the gain value is a value reflecting a distribution weight between the actual value and the predicted value of the state parameter. Therefore, when determining the predicted value of the state parameter at the next moment, not only the feedback value corresponding to the current moment, the actual value of the state parameter at the current moment and the degree of being disturbed of data during transmission are considered, but also the expected influence degrees of the actual value and the predicted value of the state parameter are considered, such that the predicted value of the state parameter at the next moment can conform to the expected influence degrees as far as possible.

DESCRIPTION OF THE DRAWINGS

[009] In order to explain the technical solutions in the embodiments of the present invention or in the prior art more clearly, the figures necessary to be used for description in the embodiments or in the prior art will be briefly introduced as below. Apparently, the figures for the description below are for some embodiments in the present invention. Based on these figures, those skilled in the art can obtain other figures without any inventive work.

[0010] Figure 1 is a flowchart of a method for controlling running of a gantry in an embodiment of the present invention.

[0011] Figure 2 is a structural block diagram of a device for controlling running of a gantry in an embodiment of the present invention.

[0012] Reference numerals:

S110~S150	steps
200	device for controlling running of gantry

210	first determination module
220	running controlling module
230	second determination module
240	first calculation module
250	third determination module

DESCRIPTION OF EXEMPLARY EMBODIMENTS

[0013] In order to make the objective(s), technical solutions and advantages of embodiments of the present invention clearer, the technical solutions in the embodiments of the present invention will be described clearly and completely hereinafter in connection with the figures in the embodiments of the present invention. Apparently, the described embodiments are some embodiments in the present invention, rather than all embodiments. Any other embodiments obtained based on the embodiments in the present invention by those skilled in the art without any inventive work will fall within the protection scope of the present invention.

[0014] In an embodiment of the present invention, a method for controlling running of a gantry is provided. Referring to figure 1, the method comprises the following steps S110~S150:

[0015] S110: determining road information at the current moment.

[0016] In practical circumstances, it is possible to mount a camera on the gate leg of the gantry. For example, a high resolution camera is mounted on each of the four gate legs of the gantry to collect road images in real time. Then, an industrial computer is used to perform grey value calculation, profile feature extraction, or other image processing to the road images, to extract the road information from the road images, such as position information of the gantry on the road, whether the gantry is deviated from the road standard line, the deviation angle, etc.

[0017] In normal weather conditions, when the road standard line is not covered, it is possible to obtain the road information from the road images collected by the cameras. In non-normal weather conditions, when the road standard line is covered, it is impossible to obtain the road information from the road images collected by the cameras, and it is possible in this case to determine the road information by use of an electronic map.

[0018] That is, in an embodiment, S110 may specifically comprise:

[0019] determining the road information at the current moment according to a road

image collected at the current moment when a road standard line is not covered; and determining the road information at the current moment according to a pre-generated electronic map when the road standard line is covered wherein the electronic map is generated according to the road image obtained during running of the gantry when the road standard line is not covered wherein the road standard line is used to indicate a standard route for running of the gantry.

[0020] Herein, the electronic map is a digital map. The electronic map is generated according to the road images collected by the cameras in earlier times when the road standard line is not covered, and can be used when the road standard line is covered due to snowing weathers. When the road standard line is covered, it is possible to determine the road information at the current moment according to the electronic map.

[0021] S120: controlling running of the gantry according to a predicted value of a state parameter at the current moment predicted at the previous moment and the road information at the current moment.

[0022] It is understandable that the predicted value of a state parameter at the current moment predicted at the previous moment reflects the prediction at the previous moment to the state parameter at the current moment, and the road information at the current moment reflects the information at the current moment before controlling of running of the gantry, such as position of the gantry on the road, directional deviation angle, etc.

[0023] It is understandable that the state parameter at the current moment is predicted at the previous moment, to obtain a predicted value of the state parameter at the current moment predicted at the previous moment. According to the predicted value of the state parameter at the current moment predicted at the previous moment and the road information at the current moment, a signal for controlling running of the gantry is generated, by which the running of the gantry is controlled, such that the gantry is running along the road standard line as precisely as possible to prevent collision to containers arranged on storage yards on both sides.

[0024] In an embodiment, the state parameter may comprise at least one of a speed, an acceleration, a position, and a deviation angle between a running direction of the gantry and the road standard line.

[0025] S130: determining an actual value of the state parameter at the current moment.

[0026] It is understandable that after controlling running of the gantry according to the predicted value of the state parameter at the current moment predicted at the previous moment and the road information at the current moment, the state parameter will change. The actual value of the state parameter at the current moment refers to the actual value of the state parameter at the current moment after controlling of running of the gantry.

[0027] Herein, the actual value of the state parameter may be obtained by the following manner: In practical circumstances, an inertia measuring unit is mounted on the gantry in advance. The inertia measuring unit comprises an accelerometer and a gyroscope. The accelerometer can collect an actual acceleration of the gantry in its running direction in real time, and the gyroscope can collect an actual directional deviation angle of the gantry in real time. Herein, the accelerometer may use a uniaxial acceleration sensor, and the gyroscope may use a uniaxial gyroscope. The directional deviation angle is a deviation angle between the running direction of the gantry and the road standard line. The inertia measuring unit can send the collected acceleration and the directional deviation angle to an industrial computer which in turn calculates an actual value of speed according to the actual value of acceleration. It is also possible to mount a positioning unit on the gantry in advance. The positioning unit is used to collect actual position information which is then sent to the industrial computer. Thus, the industrial computer can obtain the actual values of the acceleration, the deviation angle between the running direction of the gantry and the road standard line, the speed, and the position.

[0028] S140: calculating a difference value between the predicted value of the state parameter at the current moment predicted at the previous moment and the actual value of the state parameter at the current moment, and using the difference value as a feedback value corresponding to the current moment.

[0029] That is, it is to calculate a difference value between the predicted value of the state parameter at the current moment predicted at the previous moment and the actual value of the state parameter at the current moment, such as a speed difference value, an acceleration difference value, a position difference value or a directional deviation angle difference value, and use the difference value as a feedback value at the current moment.

[0030] S150: determining a predicted value of the state parameter at the next moment, according to the feedback value corresponding to the current moment and the

actual value of the state parameter at the current moment, to control running of the gantry at the next moment according to the predicted value of the state parameter at the next moment.

[0031] It is understandable that according to the feedback value corresponding to the current moment, an accuracy of the predicted value at the current moment predicted at the previous moment can be obtained. According to the feedback value corresponding to the current moment, the prediction direction is adjusted. Further, based on the actual value of the state parameter at the current moment and according to the adjusted prediction direction, the state parameter at the next moment is predicted, to obtain a predicted value of the state parameter at the next moment predicted at the current moment. Thus and thus, it is possible to improve the prediction accuracy constantly.

[0032] In an embodiment, S150 may comprise the following steps S151~S153:

[0033] S151: determining a disturbance value which is used to reflect a degree of being disturbed of data during transmission.

[0034] Herein, when the accelerometer, the gyroscope, the positioning unit, the camera and the like are transmitting data to the industrial computer, the transmission process will be disturbed inevitably. If the degree of being disturbed is relatively high, the disturbance value is relatively high; and if the degree of being disturbed is relatively low, the disturbance value is relatively low. The degree of being disturbed may be determined according to degrees of packet loss, dislocation, and/or other problem(s) during data transmission.

[0035] It is understandable that if such factor of disturbance is not considered, the disturbance value may be configured as zero.

S152: calculating a difference value between the disturbance value and the feedback value corresponding to the current moment and configuring the difference value as the difference value corresponding to the current moment.

[0036] Specifically, it is possible to calculate a difference value between the disturbance value and each feedback value, such as a difference value between the disturbance value and a speed difference value, an acceleration difference value, a position difference value or a directional deviation angle difference value. The calculated difference value is used as the difference value corresponding to the current moment.

[0037] It is understandable that the difference value corresponding to the current

moment reflects both the degree of being disturbed of the data and the feedback value corresponding to the current moment.

[0038] S153: determining the predicted value of the state parameter at the next moment according to the difference value corresponding to the current moment and the actual value of the state parameter at the current moment.

[0039] That is, when determining the predicted value of the state parameter at the next moment, not only the feedback value corresponding to the current moment and the actual value of the state parameter at the current moment are considered, but also the degree of being disturbed of data during transmission is considered, such that the influence by disturbance on the predicted value of the state parameter at the next moment can be reduced to the least.

[0040] Further, S153 may specifically comprise S531~S532:

[0041] S531: performing gain processing to the difference value corresponding to the current moment, to obtain a gain difference value at the current moment.

[0042] Herein, the difference value corresponding to the current moment is the difference value between the disturbance value and the feedback value corresponding to the current moment.

[0043] That is performing gain processing to the difference value corresponding to the current moment. For example, the difference value corresponding to the current moment is multiplied by a gain value K, to obtain a gain difference value corresponding to the current moment.

[0044] Herein, the gain value K may depend on the weight distribution proportion between the predicted value and the actual value of the state parameter at the current moment when making prediction to the state parameter at the next moment. That is, by controlling the gain value, it is possible to control the influence degrees of the actual value and the predicted value of the state parameter at the current moment when determining the predicted value of the state parameter at the next moment. Therefore, the gain value K may be configured according to the expected influence degrees of the actual value and the predicted value of the state parameter.

[0045] Herein, the gain value K may be a constant value, or may be adjusted continuously with the development of prediction process. In an embodiment, S531 may specifically comprise: performing gain processing to the difference value corresponding to the current moment at the current moment by means of a gain value determined at the previous moment wherein the gain value is a value reflecting a

distribution weight between the actual value and the predicted value of the state parameter.

[0046] That is, the gain values at different moments may be different. For example, the gain value used during gain processing at the current moment is the gain value determined at the previous moment, and a gain value may be determined at the current moment to be used for gain processing at the next moment.

[0047] The process of determining a gain value corresponding to the next moment at the current moment may comprise: determining a gain value corresponding to the next moment according to the gain difference value at the current moment and the predicted value of the state parameter at the current moment predicted at the previous moment.

[0048] That is determining a gain value according to the gain difference value at the current moment and the predicted value of the state parameter at the current moment predicted at the previous moment, for the gain processing at the next moment. As can be seen, the method(s) as provided in the embodiment(s) of the present invention may further comprise: determining a gain value corresponding to the next moment according to the gain difference value at the current moment and the predicted value of the state parameter at the current moment predicted at the previous moment, for the gain processing at the next moment.

[0049] In an embodiment, the step of determining the gain value corresponding to the next moment according to the gain difference value at the current moment and the predicted value of the state parameter at the current moment predicted at the previous moment may specifically comprise: performing calculation to the gain difference value at the current moment and the predicted value of the state parameter at the current moment predicted at the previous moment by means of the Kalman Filter Algorithm, to obtain the gain value corresponding to the next moment.

[0050] That is, the gain difference value at the current moment and the predicted value of the state parameter at the current moment predicted at the previous moment are input into the Kalman Filter Algorithm, and the gain value corresponding to the next moment can be obtained.

[0051] Herein, the Kalman Filter Algorithm is the Kalman Filtering Algorithm. The gain difference value at the current moment and the predicted value of the state parameter at the current moment predicted at the previous moment are input into the Kalman Filter Algorithm, and a Kalman gain value can be obtained and is used as the

gain value corresponding to the next moment.

[0052] S532: determining the predicted value of the state parameter at the next moment according to the gain difference value at the current moment and the actual value of the state parameter at the current moment.

[0053] Herein, the gain difference value at the current moment reflects not only the degree of being disturbed of data and the feedback value corresponding to the current moment, but also the expected influence degrees of the actual value and the predicted value of the state parameter.

[0054] That is, when determining the predicted value of the state parameter at the next moment, not only the feedback value corresponding to the current moment, the actual value of the state parameter at the current moment and the degree of being disturbed of data during transmission are considered, but also the expected influence degrees of the actual value and the predicted value of the state parameter are considered, such that the predicted value of the state parameter at the next moment can conform to the expected influence degrees as far as possible.

[0055] Certainly, it is also possible to store the predicted value and the actual value of the state parameter at each moment into a database, for subsequent big data analysis work.

[0056] It is understandable that in the embodiment(s) of the present invention, at most one set of GPS system is needed to install, i.e. the positioning unit mentioned as above. If an automatic rectification system in the prior art is used for rectification, however, it is necessary to mount one set of GPS system onto the crane structure for receiving satellite positioning information, and it is also necessary to mount another set of GPS system onto a nearby stationary building for differential calculation. It is a high cost to use two sets of GPS systems. Moreover, if there is no large building nearby, there is no suitable position for mounting the GPS system.

[0057] Furthermore, in the method(s) as provided in the embodiment(s) of the present invention, it is not necessary to mount magnetic nails on the ground. If the ground magnetic nails in the prior art is used for rectification, however, it is necessary to mount a reading head onto the gantry, and the position of the gantry is read by the reading head during running of the gantry for position rectification. In this manner, the approval by the wharf user for infrastructure reconstruction is necessary, and the wharf user has to avoid the magnetic nails later during gantry running, high in implementation difficulty and high in maintenance cost in later period. In the method(s) as provided in

the embodiment(s) of the present invention, however, no approval by the wharf user for infrastructure reconstruction is needed, and it is not necessary for the wharf user to avoid the magnetic nails later during gantry running. It is only to mount some small data collection devices, such as an inertia measuring unit, a camera, etc. onto the gantry. As can be seen, the methods as provided in the embodiments of the present invention have such advantages as a low cost, a low difficulty, etc.

[0058] In addition, in the method(s) as provided in the embodiment(s) of the present invention, compared with the manner of rectification only by cameras in the prior art, a state parameter is added. According to the predicted value of the state parameter at the current moment predicted at the previous moment and the road information at the current moment, the running of the gantry is controlled, and further according to the difference value between the actual value of the state parameter at the current moment and the predicted value, a feedback is provided, for making prediction for the state parameter at the next moment. As can be seen, in the method(s) as provided in the embodiment(s) of the present invention, compared with the manner of rectification only by cameras in the prior art, the rectification precision can be significantly improved. Furthermore, even when the road standard line is covered by snow, the running of the gantry can be controlled to achieve normal working.

[0059] As can be seen, in the method(s) as provided in the embodiment(s) of the present invention, the hardware with a relatively low cost is used, solving the problem of failure in rectification due to failure in identifying the road standard line in extreme weather conditions, such as heavy rains or heavy snows, combining the image processing technology, and improving the rectification precision.

[0060] In a second aspect, an embodiment of the present invention provides a device for controlling running of a gantry. Referring to figure 2, the device 200 comprises:

- a first determination module 210, for determining road information at the current moment;

- a running controlling module 220, for controlling running of the gantry according to a predicted value of a state parameter at the current moment predicted at the previous moment and the road information at the current moment;

- a second determination module 230, for an actual value of the state parameter at the current moment;

- a first calculation module 240, for calculating a difference value between the

predicted value of the state parameter at the current moment predicted at the previous moment and the actual value of the state parameter at the current moment, and using the difference value as a feedback value corresponding to the current moment; and

a third determination module 250, for determining a predicted value of the state parameter at the next moment, according to the feedback value corresponding to the current moment and the actual value of the state parameter at the current moment, to control running of the gantry at the next moment according to the predicted value of the state parameter at the next moment.

[0061] In an embodiment, the first determination module 210 is specifically used for: determining the road information at the current moment according to a road image collected at the current moment when a road standard line is not covered; and determining the road information at the current moment according to a pre-generated electronic map when the road standard line is covered wherein the electronic map is generated according to the road image obtained during running of the gantry when the road standard line is not covered wherein the road standard line is used to indicate a standard route for running of the gantry.

[0062] In an embodiment, the third determination module 250 comprises:
a first determination unit, for determining a disturbance value which is used to reflect a degree of being disturbed of data during transmission;
a first calculation unit, for calculating a difference value between the disturbance value and the feedback value corresponding to the current moment and configuring the difference value as the difference value corresponding to the current moment; and
a second determination unit, for determining the predicted value of the state parameter at the next moment according to the difference value corresponding to the current moment and the actual value of the state parameter at the current moment.

[0063] In an embodiment, the second determination unit specifically comprises:
a first gain subunit, for performing gain processing to the difference value corresponding to the current moment, to obtain a gain difference value at the current moment; and
a first determination subunit, for determining the predicted value of the state parameter at the next moment according to the gain difference value at the current moment and the actual value of the state parameter at the current moment.

[0064] In an embodiment, the first gain subunit is specifically used for: performing gain processing to the difference value corresponding to the current moment at the

current moment by means of a gain value determined at the previous moment wherein the gain value is a value reflecting a distribution weight between the actual value and the predicted value of the state parameter; and accordingly, the device further comprises: a gain calculation module, for determining a gain value corresponding to the next moment according to the gain difference value at the current moment and the predicted value of the state parameter at the current moment predicted at the previous moment, for the gain processing at the next moment.

[0065] In an embodiment, the gain calculation module is specifically used for: performing calculation to the gain difference value at the current moment and the predicted value of the state parameter at the current moment predicted at the previous moment by means of the Kalman Filter Algorithm, to obtain the gain value corresponding to the next moment.

[0066] In an embodiment, the state parameter may comprise at least one of a speed, an acceleration, a position, and a deviation angle between a running direction of the gantry and the road standard line.

[0067] It is understandable that the related explanation, specific implementation manner(s), beneficial effect(s), example(s), and the like of the device(s) as provided in the embodiments of the present invention may refer to the respective portions in the method(s) as provided in the first aspect, and will not be described repeatedly herein.

[0068] According to a third aspect, an embodiment of the present invention provides a computer-readable storage medium. It is stored thereon with a computer program, and when the computer program is executed in a computer, the method in any embodiment of the present invention is implemented by the computer.

[0069] It is understandable that the related explanation, specific implementation manner(s), beneficial effect(s), example(s), and the like of the computer-readable storage medium as provided in the embodiments of the present invention may refer to the respective portions in the method(s) as provided in the first aspect, and will not be described repeatedly herein.

[0070] According to a fourth aspect, an embodiment of the present invention provides a calculation apparatus. It comprises a memory and a processor wherein the memory is stored therein with executable codes, and when the executable codes are executed by the processor, the method in any embodiment of the present invention is implemented.

[0071] It is understandable that the related explanation, specific implementation

manner(s), beneficial effect(s), example(s), and the like of the calculation apparatus as provided in the embodiments of the present invention may refer to the respective portions in the method(s) as provided in the first aspect, and will not be described repeatedly herein.

[0072] The embodiments in the present description are described in a gradually progressive manner. The same or similar portions between different embodiments can be referred to each other. Each embodiment emphasizes in explaining the difference(s) with respect to other embodiment(s). In particular, as the apparatus/device embodiments are substantially similar to the method embodiments, the description thereof is relatively simple, and the description of the method embodiments may be referred to for the related portions.

[0073] With the above-described specific embodiments, the purposes, technical solutions and beneficial effects of the present invention are further explained in detail. It should be understood that the above description is only for specific embodiments in the present invention, not for defining the protection scope of the present invention. Any variation, equivalent substitution or improvement made based on the technical solutions of the present invention will fall within the protection scope of the present invention.

CLAIMS

1. A method for controlling running of a gantry, characterized in that it comprises:
determining road information at the current moment;

controlling running of the gantry according to a predicted value of a state parameter at the current moment predicted at the previous moment and the road information at the current moment;

determining an actual value of the state parameter at the current moment;

calculating a difference value between the predicted value of the state parameter at the current moment predicted at the previous moment and the actual value of the state parameter at the current moment, and using the difference value as a feedback value corresponding to the current moment; and

determining a predicted value of the state parameter at the next moment, according to the feedback value corresponding to the current moment and the actual value of the state parameter at the current moment, to control running of the gantry at the next moment according to the predicted value of the state parameter at the next moment.

2. The method according to claim 1, characterized in that the step of determining road information at the current moment comprises:

determining the road information at the current moment according to a road image collected at the current moment when a road standard line is not covered; and

determining the road information at the current moment according to a pre-generated electronic map when the road standard line is covered, wherein the electronic map is generated according to the road image obtained during running of the gantry when the road standard line is not covered wherein the road standard line is used to indicate a standard route for running of the gantry.

3. The method according to claim 1, characterized in that the step of determining the predicted value of the state parameter at the next moment according to the

feedback value corresponding to the current moment and the actual value of the state parameter at the current moment comprises:

determining a disturbance value which is used to reflect a degree of being disturbed of data during transmission;

calculating a difference value between the disturbance value and the feedback value corresponding to the current moment and configuring the difference value as the difference value corresponding to the current moment; and

determining the predicted value of the state parameter at the next moment according to the difference value corresponding to the current moment and the actual value of the state parameter at the current moment.

4. The method according to claim 3, characterized in that the step of determining the predicted value of the state parameter at the next moment according to the difference value corresponding to the current moment and the actual value of the state parameter at the current moment comprises:

performing gain processing to the difference value corresponding to the current moment, to obtain a gain difference value at the current moment; and

determining the predicted value of the state parameter at the next moment according to the gain difference value at the current moment and the actual value of the state parameter at the current moment.

5. The method according to claim 4, characterized in that the step of performing gain processing to the difference value corresponding to the current moment comprises: performing gain processing to the difference value corresponding to the current moment at the current moment by means of a gain value determined at the previous moment wherein the gain value is a value reflecting a distribution weight between the actual value and the predicted value of the state parameter; and

accordingly, the method further comprises: determining a gain value corresponding to the next moment according to the gain difference value at the current moment and the predicted value of the state parameter at the current moment predicted at the previous moment, for the gain processing at the next moment.

6. The method according to claim 5, characterized in that the step of determining the gain value corresponding to the next moment according to the gain difference value at the current moment and the predicted value of the state parameter at the current moment predicted at the previous moment comprises:

performing calculation to the gain difference value at the current moment and the predicted value of the state parameter at the current moment predicted at the previous moment by means of the Kalman Filter Algorithm, to obtain the gain value corresponding to the next moment.

7. The method according to claim 1, characterized in that the state parameter comprises at least one of a speed, an acceleration, a position, and a deviation angle between a running direction of the gantry and the road standard line.

8. A device for controlling running of a gantry, characterized in that it comprises:

a first determination module, for determining road information at the current moment;

a running controlling module, for controlling running of the gantry according to a predicted value of a state parameter at the current moment predicted at the previous moment and the road information at the current moment;

a second determination module, for an actual value of the state parameter at the current moment;

a first calculation module, for calculating a difference value between the predicted value of the state parameter at the current moment predicted at the previous moment and the actual value of the state parameter at the current moment, and using the difference value as a feedback value corresponding to the current moment; and

a third determination module, for determining a predicted value of the state parameter at the next moment, according to the feedback value corresponding to the current moment and the actual value of the state parameter at the current moment, to control running of the gantry at the next moment according to the predicted value of the state parameter at the next moment.

9. A computer-readable storage medium, characterized in that it is stored thereon

with a computer program, and when the computer program is executed in a computer, the method according to any one of claims 1-7 is implemented by the computer.

10. A calculation apparatus, characterized in that it comprises a memory and a processor wherein the memory is stored therein with executable codes, and when the executable codes are executed by the processor, the method according to any one of claims 1-7 is implemented.