

ROBOT-BASED SCRAPE COATING OPERATION METHOD AND DEVICE

TECHNICAL FIELD

5 This application relates to the robot field, and specifically, to a robot-based scrape coating operation method and device.

BACKGROUND

With rapid progress of science and technology, robots have started to perform some work with relatively high labor intensity instead of manual workers, such as floor paint coating. In a process of
10 a floor paint operation, most of manual workers use a fixed-point scrape coating operation method, which is inefficient and labor-intensive. Long-term crouching can easily induce occupational diseases. Therefore, it is very important for a robot to implement a large-area, follow-up, and efficient operation.

Currently, there are following types for a machine to perform floor paint coating: 1. A base is fixed, and a robotic arm only travels a repeatedly fixed motion trajectory. This operating mode has a relatively limited application scenario. 2. A base moves with a chassis. After the chassis moves in
15 place, the chassis remains still. A robotic arm starts to move. When the robotic arm finishes moving, the chassis will move again. Specifically, as shown in FIG. 1, when the chassis moves to a specified operating point, the robotic arm discharges materials and operates based on a preset trajectory. After completing the operation, the robotic arm returns to a reset point, and the chassis moves to a next
20 operating point, which successively repeats until the last operating point is reached, that is, an end point. This operating mode in this manner can implement switching among a plurality of scenarios. However, because there are a plurality of information exchanges involved in a working process, efficiency is low; and because the chassis is in a waiting state when the robotic arm is in a working process, operation efficiency is relatively low.

25 For a problem in the prior art that efficiency is relatively low when a robot is used to perform a floor paint coating operation, no effective solution has been proposed.

SUMMARY

Embodiments of this application provide a robot-based scrape coating operation method and device, so as to at least resolve a technical problem in the prior art that efficiency is relatively low
30 when a robot is used to perform a floor paint coating operation.

According to an aspect in an embodiment of this application, a robot-based scrape coating operation method is provided. A robot includes a robotic arm and a chassis, and the method includes: obtaining first path planning data, the first path planning data being used for indicating the movement

of the robot in an area for scrape coating; controlling the chassis of the robot to move according to the first path planning data; and controlling the robotic arm to perform a scrape coating operation according to a preset motion trajectory while the chassis of the robot moves according to the first path planning data.

5 Further, before the chassis of the robot moves based on the first path planning data, the method further includes: controlling the chassis to move to a start point in the first path planning data to generate first in-place information; and controlling, based on the first in-place information, the robotic arm to discharge materials at a first discharging speed and perform the scrape coating operation.

10 Further, before the chassis of the robot moves based on the first path planning data, the method further includes: determining whether a quantity of scrape coating operations of the robotic arm reaches a preset quantity of times when the robotic arm discharges materials at the first discharging speed and performs the scrape coating operation; and entering a step of controlling the chassis of the robot to move according to the first path planning data if a determining result is yes.

15 Further, while the chassis of the robot moves according to the first path planning data, the controlling the robotic arm to perform a scrape coating operation according to a preset motion trajectory includes: When the chassis moves based on the first path planning data, the robotic arm discharges materials based on a second discharging speed and performs the scrape coating operation, where the second discharging speed is less than the first discharging speed.

20 Further, while the chassis of the robot moves according to the first path planning data, the controlling the robotic arm to perform a scrape coating operation according to a preset motion trajectory includes: detecting a distance between a current position of the chassis and an end point indicated by the first path planning data; and controlling the robotic arm to stop discharging materials and to continue the scrape coating operation if the distance reaches a preset material closing distance.

25 Further, after the chassis of the robot moves based on the first path planning data, the method further includes: generating second in-place information when the chassis moves to the end point indicated by the first path planning data; and controlling the robotic arm to stop the scrape coating operation according to the second in-place information.

30 Further, the controlling the robotic arm to stop the scrape coating operation according to the second in-place information includes: controlling the robotic arm to receive the second in-place information, and to stop the scrape coating operation after completing a cycle of a scrape coating trajectory.

35 Further, second path planning data is used to indicate a path of a robotic arm end relative to the chassis, a sum of a first speed at which the chassis moves and a second speed at which the robotic arm moves is an operation speed of the scrape coating operation, and a direction of the operation speed is perpendicular to a direction in which the chassis moves.

Further, working planes of two adjacent scrape coating operations have an overlapping area.

According to an aspect in an embodiment of this application, a robot-based scrape coating operation device is provided. A robot includes a robotic arm and a chassis, and a robot scrape coating operation device includes: an obtaining module, configured to obtain first path planning data, the first path planning data being used for indicating the movement of the robot in an area for scrape coating; and a moving operation module, configured to control the chassis of the robot to move according to the first path planning data, and control the robotic arm to perform a scrape coating operation according to a preset motion trajectory while the chassis of the robot moves according to the first path planning data.

According to an aspect in an embodiment of this application, a storage medium is provided, and the storage medium includes a stored program. When running, the program controls a device in which the storage medium is located to perform the foregoing robot-based scrape coating operation method.

According to an aspect in an embodiment of this application, a processor is provided, and the processor is configured to run a program. When running, the program performs the foregoing robot-based scrape coating operation method.

Details of one or more embodiments of this application are provided in the following accompanying drawings and descriptions. Other features, objectives, and advantages of this application will become apparent from the specification, the accompanying drawings, and the claims.

BRIEF DESCRIPTION OF DRAWINGS

The accompanying drawings described herein are used to provide further understanding of this application, which constitutes a part of this application. A schematic embodiment of this application and descriptions thereof are used to explain this application, and are not intended to constitute an improper limitation on this application. In the accompanying drawings:

FIG. 1 is a flowchart of a scrape coating operation performed by a robot according to the prior art;

FIG. 2 is a flowchart of a robot-based scrape coating operation method according to an embodiment of this application;

FIG. 3 is a schematic diagram of a robot-based scrape coating operation device according to an embodiment of this application;

FIG. 4 is a schematic diagram of a first preset motion trajectory according to an embodiment of this application;

FIG. 5 is a schematic diagram of a motion trajectory of a scrape coating operation performed by an end tool according to an embodiment of this application;

FIG. 6a is a schematic diagram of robotic arm movement in linear motion according to an embodiment of this application;

FIG. 6b is a schematic diagram of robotic arm movement in turning motion according to an embodiment of this application;

FIG. 7 is a schematic diagram of a scrape coating area according to an embodiment of this application;

5 FIG. 8 is a flowchart of an optional robot-based scrape coating operation method according to an embodiment of this application; and

FIG. 9 is a schematic diagram of a robot-based scrape coating operation device according to an embodiment of this application.

DESCRIPTION OF EMBODIMENTS

10 In order to make a person skilled in the art understand solutions in this application better, the following describes technical solutions in the embodiments of this application clearly and fully with reference to the accompanying drawings in the embodiments of this application. Apparently, the described embodiments are only some, but not all, embodiments of this application. Based on the embodiments of this application, all other embodiments obtained by a person of ordinary skill in the
15 art without creative efforts shall fall within the protection scope of this application.

It should be noted that the terms "first", "second", and the like in the specification, the claims, and the foregoing accompanying drawings of this application are used to distinguish between similar objects, and do not need to be used to describe a specific order or sequence. It should be understood that terms used in this way may be interchangeable in appropriate circumstances, so that the
20 embodiments of this application described herein can be implemented in a sequence other than those shown or described herein. In addition, the terms "include" and "have" and any variants of them are intended to cover non-exclusive inclusion, for example, processes, methods, systems, products or devices that contain a series of steps or units are not necessarily limited to those steps or units that are clearly listed, but may include other steps or units that are not clearly listed or are inherent to these
25 processes, methods, products or devices.

Embodiment 1

According to an embodiment of this application, an embodiment of a robot-based scrape coating operation method is provided. It should be noted that steps shown in a flowchart of the accompanying drawings may be performed in a computer system such as a set of computer executable instructions,
30 and although a logical sequence is shown in the flowchart, steps shown or described may be performed in a different sequence in some cases.

FIG. 2 is a flowchart of a robot-based scrape coating operation method according to an embodiment of this application. A robot includes a robotic arm and a chassis. As shown in FIG. 2, the method includes the following steps:

35 Step S202: Obtain first path planning data, the first path planning data being used for indicating

the movement of the robot in an area for scrape coating.

Specifically, the first path planning data is used to perform path planning on movement of the chassis of the robot. The first path planning data includes information such as a direction and a speed of the movement of the chassis.

5 In an optional embodiment, the robot is provided with a radar ranging apparatus. After obtaining surrounding environment information by using the radar ranging apparatus, the robot automatically generates the first path planning data based on a start point and an end point that are entered by a user.

Step S204: Control the chassis of the robot to move according to the first path planning data, wherein when the chassis of the robot moves according to the first path planning data, the robotic arm
10 is controlled to perform a scrape coating operation according to a preset motion trajectory.

Specifically, the robotic arm performs the scrape coating operation according to the preset motion trajectory, which may be that a robotic arm end moves based on the preset motion trajectory, and a scraper carried by the robotic arm end may perform the scrape coating operation according to movement of the robotic arm end.

15 The preset motion trajectory may be a movement path of the robotic arm end relative to the chassis, that is, movement of the robotic arm in a robot coordinate system, or may be a movement path of the robotic arm relative to a surrounding environment, that is, movement of the robotic arm in a world coordinate system. To facilitate control of the robot on the robotic arm, in this embodiment of this application, a preset motion trajectory is used as an example to indicate the movement of the
20 robotic arm end in the robot coordinate system.

In the foregoing solution, the robotic arm performs the scrape coating operation in a process when the chassis of the robot moves, that is, the chassis moves based on the first path planning data and simultaneously the robotic arm moves based on the preset motion trajectory. Therefore, in this process, to implement a follow-up operation of the robot involves a collaborative operation between
25 the chassis and the robotic arm, which needs cooperation among the chassis, the robotic arm, and a pumping material system.

In the prior art, when a robotic arm of a robot performs a scrape coating operation, a chassis remains still, and when the chassis moves, the robotic arm is at a reset point and also remains still. That is, in the prior art, floor paint coating is divided into a plurality of sections. The chassis moves
30 to a corresponding operating point of each section, and the robotic arm completes a scrape coating operation of the section. When the scrape coating operation of each section begins, the robotic arm needs to start scrape coating from a reset point, and when the scrape coating operation of each section ends, the robotic arm needs to return to the reset point, which makes operation efficiency relatively low. In the foregoing solution of this embodiment, the chassis of the robot moves based on the first
35 path planning data. While the chassis of the robot moves according to the first path planning data, the

robotic arm performs the scrape coating operation according to the preset motion trajectory, so that the movement of the chassis of the robot and the scrape coating operation of the robotic arm can be performed simultaneously. The robotic arm does not need to repeatedly return to the reset point, thereby greatly improving robot operation efficiency, and resolving a technical problem in the prior art that efficiency is relatively low when a robot is used to perform a floor paint coating operation.

In an optional embodiment, before the chassis of the robot moves based on the first path planning data, the method further includes: controlling the chassis to move to a start point in the first path planning data to generate first in-place information; and controlling, based on the first in-place information, the robotic arm to discharge materials at a first discharging speed and perform the scrape coating operation.

Specifically, the start point is used to indicate a point at which the robotic arm starts to operate. For example, a start point in the first path planning data may be determined based on an area in which floor paint coating needs to be performed on a site. After obtaining the first path planning data, the robot detects a current position at which the robot is located. If the current position of the robot is not at the start point, the robot needs to move to the start point to start a floor paint coating operation. In the process of moving the chassis of the robot to the start point, the robotic arm is at a reset point.

After the chassis of the robot arrives at the start point, the first in-place information is generated, and it may be confirmed, based on the first in-place information, that the chassis has reached the start point. Therefore, a sequence of actions start, including: controlling a pumping material system to start discharging materials, and starting the scrape coating operation by using a scraper at the end.

In an optional embodiment, before the chassis of the robot moves based on the first path planning data, the method further includes: determining whether a quantity of scrape coating operations of the robotic arm reaches a preset quantity of times when the robotic arm discharges materials at the first discharging speed and performs the scrape coating operation; and entering a step of controlling the chassis of the robot to move according to the first path planning data if a determining result is yes.

In the foregoing solution, if the quantity of scrape coating operations of the robotic arm does not reach the preset quantity of times, the chassis remains still at the start point, and continues to wait for the scrape coating operation of the robotic arm.

In an optional embodiment, after the chassis of the robot reaches the start point, the robotic arm starts to discharge materials and performs the scrape coating operation. After a preset time (that is, a time of the robotic arm performing scrape coating for the preset quantity of times, which may be a time of the robotic arm performing scrape coating for four to six times), the chassis starts to move again based on the first path planning data.

It can be learned that, in the foregoing solution, the chassis of the robot does not start moving immediately when reaching a start point, but remains still for a period of time after reaching the start

point. In this period of time, the robotic arm performs a preset quantity of scrape coating operations, and the chassis of the robot starts moving again based on the first path planning data after the robotic arm completes the preset quantity of scrape coating operations. By using the foregoing manner of delivering and spreading materials at a fixed point, a sufficient quantity of materials can be ensured, so as to avoid missing coating caused by an insufficient quantity of materials.

In an optional embodiment, that the robotic arm performs the scrape coating operation according to the preset motion trajectory while the chassis of the robot moves according to the first path planning data includes: controlling the robotic arm to discharge materials based on a second discharging speed and perform the scrape coating operation when the chassis moves based on the first path planning data, where the second discharging speed is less than the first discharging speed.

In a process of a robotic arm follow-up operation, the pumping material system needs to discharge materials based on a preset second discharging speed, but the second discharging speed is less than the first discharging speed in a process of the follow-up operation. When the chassis of the robot just arrives at the start point, rapid material discharging is required to ensure the sufficient quantity of materials, so that the first discharging speed is relatively fast. In a process of performing the follow-up operation, smooth material discharging is required; and to ensure smooth scrape coating, the second discharging speed needs to cooperate with movement speeds of the chassis and the robotic arm, so that the second discharging speed is relatively low.

Different scrapers have different requirements for a quantity of materials in a process of the scrape coating operation. Therefore, in a process of spreading materials, to spread materials fast, materials are spread in advance at a start point, that is, materials are discharged at a relatively high discharging speed. The speed is set as a relatively high speed greater than a discharging speed when the follow-up operation is performed, so that a function of spreading materials in advance can be implemented in a short time.

In an optional embodiment, while the chassis of the robot moves according to the first path planning data, the controlling the robotic arm to perform a scrape coating operation according to a preset motion trajectory includes: detecting a distance between a current position of the chassis and an end point indicated by the first path planning data; and controlling the robotic arm to stop discharging materials and to continue the scrape coating operation if the distance reaches a preset material closing distance. Simultaneously, the chassis continues moving.

Specifically, the chassis may perceive a current position by using a radar sensor disposed on the robot, and compare the current position with a key point, so as to determine a distance between the current position and the key point. When the chassis of the robot moves from the start point to the end point, the distance between the chassis and the key point is becoming smaller. Therefore, when the distance decreases to a material closing distance, the pumping material system is controlled to

stop, and the robotic arm stops discharging materials. In this case, the robotic arm does not stop, and continues performing the scrape coating operation with remaining materials.

In the foregoing solution, to prevent a condition that there are remaining materials at the end point, the material closing distance is set, so that material closing can be performed in advance as required.

In an optional embodiment, after the chassis of the robot moves based on the first path planning data, the method further includes: generating second in-place information when the chassis moves to the end point indicated by the first path planning data; and controlling the robotic arm to stop the scrape coating operation according to the second in-place information.

The second in-place information is used to indicate that the chassis of the robot has reached the end point. When the chassis of the robot moves to the end point, the scrape coating operation is completed, and the chassis generates second in-place information. A controller receives the second in-place information, and controls the robotic arm to stop the scrape coating operation.

In an optional embodiment, the controlling the robotic arm to stop the scrape coating operation according to the second in-place information includes: controlling the robotic arm to stop the scrape coating operation after completing a cycle of a scrape coating trajectory.

Specifically, the scrape coating trajectory of the robotic arm indicated by the preset motion trajectory may repeat a scrape coating trajectory, and a cycle of completing this scrape coating trajectory is used to indicate that repetition of a unit scrape coating trajectory is completed.

In a follow-up operation mode, a motion trajectory of the robotic arm may be diverse, for example, left and right reciprocating ends do not need to rotate, or left and right reciprocating ends need to rotate.

Referring to FIG. 3 to FIG. 5, the following describes a robot-based scrape coating operation according to an embodiment of this application. FIG. 3 is a schematic diagram of a robot-based scrape coating operation device according to an embodiment of this application. As shown in FIG. 3, in an optional embodiment, a scrape coating operation device 300 may be an AGV (Automated Guided Vehicle) car. The AGV may be equipped with an automatic navigation apparatus such as an electromagnetic or optical device, can travel along a specified navigation path, and has functions such as safety protection and various transfer functions. However, the present invention is not limited thereto. As shown in FIG. 3, the scrape coating operation device 300 is equipped with a robot 310 to complete a scrape coating operation. The robot 310 includes: a chassis 311, which is disposed on the scrape coating operation device 300, and can move together with the scrape coating operation device 300; a plurality of robotic arms 312, where every two of the robotic arms 312 are pivotally connected by using a corresponding joint, and at least one of the robotic arms 312 is connected to the chassis 311; and an end tool 313, which is disposed on one of the plurality of robotic arms 312 and configured

to rotate relative to the robotic arm 312. The end tool 313 may be, for example, a scraper. Therefore, the scrape coating operation device 300 is loaded with the robotic arm 312, and the end tool 313 loaded at an end of the robotic arm 312 can perform a construction operation.

It should be recognized that the foregoing structure is merely an example, and in other embodiments, the robot 310 may include more components or fewer components, such as additional robotic arms and end tools. Some components (for example, two or more robotic arms) may be combined, and components of an additional type or a different type from those depicted may be used.

FIG. 4 is a schematic diagram of a first preset motion trajectory according to an embodiment of this application. The preset motion trajectory is used to indicate a scrape coating trajectory of a robotic arm end in a robot coordinate system. FIG. 5 is a schematic diagram of a motion trajectory of a scrape coating operation performed by an end tool according to an embodiment of this application. With reference to FIG. 3 to FIG. 5, during the scrape coating operation, the robot 310 moves together with the scrape coating operation device 300 along a first direction (for example, the -X direction shown in FIG. 3), so that the chassis 311 can move along the first direction at a specified speed, and the robotic arm 312 can perform a trajectory action at a specified speed. A motion trajectory of the robotic arm 312 may include two parts, one part is a robotic arm end 321 (shown in FIG. 3) and the other part is a motion trajectory of the end tool 313 of the robotic arm. The motion trajectory of the robotic arm end 321 is shown in FIG. 4 (for example, shown in a top view on an X-Y plane). When on the left, the robotic arm end 321 moves linearly toward the right front, and when on the right, the robotic arm end 321 moves linearly toward the left front. The motion trajectory of the end tool 313 of the robotic arm is shown, for example, in FIG. 5, may be clockwise rotation or counterclockwise rotation. When the robotic arm end 321 is on the left, the end tool 313 of the robotic arm rotates counterclockwise, and when the robotic arm end 321 is on the right, the end tool 313 of the robotic arm rotates clockwise. In this case, if the robotic arm end 321 is on the left, a cycle of the foregoing scrape coating trajectory is that the robotic arm end 321 moves linearly toward the right front, the end tool 313 rotates clockwise, the robotic arm end 321 moves linearly toward the left front, and the end tool 313 rotates counterclockwise. If the robotic arm end 321 is on the right, a cycle of the foregoing scrape coating trajectory is that the robotic arm end 321 moves linearly toward the left front, the end tool 313 rotates counterclockwise, the robotic arm end 321 moves linearly toward the right front, and the end tool 313 rotates clockwise.

In the foregoing solution, after the chassis 311 reaches an end point, second in-place information is generated. However, the robotic arm 312 does not immediately stop the scrape coating operation, does not stop until completes a cycle of a current trajectory, and finally moves to a reset point. Therefore, a problem of destroying a working plane caused by sudden stop of the robotic arm in an operation process is prevented.

It should be noted that, in a process of a follow-up operation, to meet a process requirement, a motion trajectory of a robotic arm should be continuous and uninterrupted reciprocating motion. Therefore, a fusion radius function of the robotic arm can be fully applied, and a fusion radius may be introduced when the motion trajectory of the robotic arm is set. Details are shown in FIG. 6a and FIG. 6b. In FIG. 6a, if there is linear motion, in a case in which there is a fusion radius, the motion trajectory does not directly from a start point to an end point. Distances which are the same as the fusion radius are reserved at the start point and the end point. In FIG. 6b, if there is turning motion, in a case in which there is a fusion radius, right angle turning is not directly performed from a middle point, but specified-radian turning is performed. It can be learnt that in a case in which the fusion radius is not introduced, the robotic arm reaches each point accurately, but a temporary pause occurs at each point. After the fusion radius is introduced, the robotic arm does not accurately reach a target point. Instead, the robotic arm transitions to another point in a circular arc mode without a pause. Therefore, to smooth a working plane that is scraped and coated by the robotic arm, the fusion radius may be introduced into path planning of the robotic arm, so that the robotic arm can move without a pause.

In an optional embodiment, second path planning data is used to indicate a path of a robotic arm end relative to a chassis, a sum of a first speed at which the chassis moves and a second speed at which the robotic arm moves is an operation speed of a scrape coating operation, and a direction of the operation speed is perpendicular to a direction in which the chassis moves.

In the foregoing solution, the direction of the operation speed is a direction of the scrape coating operation in a world coordinate system, and the direction is perpendicular to the direction in which the chassis moves. For example, if the chassis of the robot moves backward, the operation speed is in a horizontal direction.

FIG. 7 is a schematic diagram of a scrape coating area according to an embodiment of this application. With reference to FIG. 7, the robotic arm moves based on the motion trajectory shown in FIG. 4. Because the chassis of the robot moves backward, the robotic arm moves linearly toward the left front or right front, and the robotic arm can be combined with movement of the chassis, so that the working plane of the scrape coating operation is in the horizontal direction shown in FIG. 6.

In an optional embodiment, working planes of two adjacent scrape coating operations have an overlapping area.

To ensure that the working plane that is scraped and coated is complete without missing scraping in a process of a follow-up scrape coating operation, that the working planes have an overlapping area needs to be ensured. Therefore, a width and a length of one operation performed by an end mechanism, a motion speed of the robotic arm, and a motion speed of the chassis need to be comprehensively matched to ensure an overlapping area. A specific formula is as follows:

$$M = V_{\text{chassis}} * (L_{\text{robotic arm}} / V_{\text{robotic arm}} + T_{\text{rotation}}) / W_{\text{scraper}},$$

M represents a repetition degree, which is a proportion of an overlapping area in one scrape coating operation plane, a width of one left and right operation of the robotic arm is $L_{\text{robotic arm}}$, a motion speed of the robotic arm is $V_{\text{robotic arm}}$, a width of one left-right operation is W_{scraper} , a motion speed of the chassis is V_{chassis} , and a rotation time of the end tool of the robotic arm is T_{rotation} . Some trajectories do not need to be rotated based on different trajectories. Therefore, the rotation time T_{rotation} of the end tool of the robotic arm may be zero.

FIG. 8 is a flowchart of an optional robot-based scrape coating operation method according to an embodiment of this application. In an optional embodiment, floor paint coating is used as an example for description.

Parameters are initialized first, which include a preset quantity of times, a first discharging speed, a second discharging speed, and a material closing distance. The first discharging speed is used to indicate a discharging speed of the robotic arm when the chassis is at a start point, and the second discharging speed is used to indicate a discharging speed when the robotic arm moves and operates together with the chassis. The chassis first moves to the start point to generate first in-place information, and the robotic arm moves, based on the first in-place information, from a reset point to an operation start point and starts to discharge materials at the first discharging speed and operate. The robotic arm moves back and forth. It is determined whether a quantity of times of reciprocating motion of the robotic arm reaches a preset quantity of times. If the quantity of times of reciprocating motion of the robotic arm does not reach the preset quantity of times, the reciprocating motion of the robotic arm continues. If the quantity of times of reciprocating motion of the robotic arm reaches the preset quantity of times, the discharging speed is set to the second discharging speed, and the chassis starts to move and starts a follow-up operation.

During the follow-up operation, it is determined whether a distance between a current position of the chassis and the end point is the material closing distance. If a determining result is no, the follow-up operation continues; otherwise, material discharging is stopped, and the robotic arm and the chassis continue moving. Then, it is further determined whether the chassis reaches the end point. When the end point is reached, the entire scrape coating operation is completed, and the chassis moves to a next operating point.

Embodiment 2

According to this embodiment of this application, an embodiment of a robot-based scrape coating operation method is provided. FIG. 9 is a schematic diagram of a robot-based scrape coating operation device according to an embodiment of this application. A robot includes a robotic arm and a chassis. As shown in FIG. 9, the apparatus includes:

an obtaining module 70, configured to obtain first path planning data, the first path planning data

being used for indicating the movement of the robot in an area for scrape coating; and

a moving operation module 72, configured to control the chassis of the robot to move according to the first path planning data, and control the robotic arm to perform a scrape coating operation according to a preset motion trajectory while the chassis of the robot moves according to the first path planning data.

In an optional embodiment, before the chassis of the robot moves based on the first path planning data, the apparatus further includes: a first sending module, configured to control the chassis to move to a start point in the first path planning data to generate first in-place information; and a scrape coating module, configured to control, based on the first in-place information, the robotic arm to discharge materials at a first discharging speed and perform the scrape coating operation.

In an optional embodiment, before the chassis of the robot moves based on the first path planning data, the apparatus further includes: a determining module, configured to determine whether a quantity of scrape coating operations of the robotic arm reaches a preset quantity of times when the robotic arm discharges materials at the first discharging speed and performs the scrape coating operation; and an execution module, configured to enter a step of controlling the chassis of the robot to move according to the first path planning data if a determining result is yes.

In an optional embodiment, the moving operation module includes a scrape coating sub-module, configured to control the robotic arm to discharge materials based on a second discharging speed and perform the scrape coating operation, where the second discharging speed is less than the first discharging speed.

In an optional embodiment, the moving operation module includes: a detection sub-module, configured to detect a distance between a current position of the chassis and an end point indicated by the first path planning data; and a stop sub-module, configured to control the robotic arm to stop discharging materials and continue performing the scrape coating operation if a distance reaches a preset material closing distance.

In an optional embodiment, after the chassis of the robot moves based on the first path planning data, the apparatus further includes: a second sending module, configured to generate second in-place information when the chassis moves to the end point indicated by the first path planning data; and a stop module, configured to control the robotic arm to stop the scrape coating operation according to the second in-place information.

In an optional embodiment, the stop sub-module includes: a stop unit, configured to control the robotic arm to receive the second in-place information, and stop the scrape coating operation after completing a cycle of a scrape coating trajectory.

In an optional embodiment, second path planning data is used to indicate a path of a robotic arm end relative to a chassis, a sum of a first speed at which the chassis moves and a second speed at

which the robotic arm moves is an operation speed of a scrape coating operation, and a direction of the operation speed is perpendicular to a direction in which the chassis moves.

In an optional embodiment, working planes of two adjacent scrape coating operations have an overlapping area.

5 Embodiment 3

According to an embodiment of this application, a storage medium is provided, and the storage medium includes a stored program. When running, the program controls a device in which the storage medium is located to perform the robot-based scrape coating operation method in Embodiment 1.

Embodiment 4

10 According to an embodiment of this application, a processor is provided, and the processor is configured to run a program. When running, the program performs the robot-based scrape coating operation method in Embodiment 1.

The sequence numbers of the foregoing embodiments of this application are only used for description and do not represent advantages or disadvantages of the embodiments.

15 In the foregoing embodiments of this application, each embodiment is described with emphasis. For a part that is not described in detail in an embodiment, refer to related descriptions in another embodiment.

In several embodiments provided in this application, it should be understood that the disclosed technical content may be implemented in another manner. The described apparatus embodiment is merely an example. For example, the unit division may be logical function division. In an actual implementation, there may be another division manner. For example, a plurality of units or components may be combined or integrated into another system, or some features may be ignored or not performed. In addition, the shown or discussed mutual coupling or direct coupling or communication connection may be indirect coupling or communication connection through some interfaces, units, or modules or may be in an electrical or another form.

20 The units described as detached components may be or may not be physically separate, and components displayed as units may be or may not be physical units, that is, may be located in one place, or may be distributed on a plurality of units. Objectives of the solutions in the embodiments may be implemented by selecting some or all units based on an actual requirement.

30 In addition, function units in the embodiments of this application may be integrated into one processing unit, or each unit may separately physically exist, or two or more units may be integrated into one unit. The integrated unit may be implemented in a form of hardware, or may be implemented in a form of a software function unit.

If the integrated unit is implemented in the form of a software function unit and sold or used as an independent product, the integrated unit may be stored in a computer readable storage medium.

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Based on such an understanding, the technical solutions of this application essentially, or a part contributing to the prior art, or all or a part of the technical solutions may be implemented in a form of a software product. The computer software product is stored in a storage medium and includes several instructions for instructing a computer device (which may be a personal computer, a server, or a network device) to perform all or a part of the steps of the methods described in the embodiments of this application. The storage medium includes any medium that can store program codes, such as a USB flash disk, a read-only memory (ROM, Read-Only Memory), a random access memory (RAM, Random Access Memory), a mobile hard disk, a magnetic disk, or an optical disk.

The foregoing descriptions are merely preferred implementations of this application. It should be noted that a person of ordinary skill in the art may make some improvements and ornaments without departing from the principles of this application. These improvements and ornaments shall also be considered as within the protection scope of this application.

CLAIMS

1. A robot-based scrape coating operation method, wherein the robot comprises a robotic arm and a chassis, and the scrape coating operation method comprises:

5 obtaining first path planning data, the first path planning data being used for indicating the movement of the robot in an area for scrape coating;

controlling the chassis of the robot to move based on the first path planning data; and

controlling the robotic arm to perform a scrape coating operation according to a preset motion trajectory while the chassis of the robot moves according to the first path planning data.

10 2. The method according to claim 1, wherein before the chassis of the robot moves based on the first path planning data, the method further comprises:

controlling the chassis to move to a start point in the first path planning data to generate first in-place information; and

controlling, based on the first in-place information, the robotic arm to discharge materials at a first discharging speed and perform the scrape coating operation.

15 3. The method according to claim 2, wherein before the chassis of the robot moves based on the first path planning data, the method further comprises:

determining whether a quantity of scrape coating operations of the robotic arm reaches a preset quantity of times when the robotic arm discharges materials at the first discharging speed and performs the scrape coating operation; and

20 entering a step of controlling the chassis of the robot to move according to the first path planning data if a determining result is yes.

4. The method according to claim 2, wherein the controlling the robotic arm to perform a scrape coating operation according to a preset motion trajectory while the chassis of the robot moves according to the first path planning data comprises:

25 controlling the robotic arm to discharge materials based on a second discharging speed and perform the scrape coating operation when the chassis moves based on the first path planning data, wherein the second discharging speed is less than the first discharging speed.

5. The method according to any one of claims 1 to 4, wherein controlling the robotic arm to perform a scrape coating operation according to a preset motion trajectory while the chassis of the robot moves according to the first path planning data comprises:

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detecting a distance between a current position of the chassis and an end point indicated by the first path planning data; and

controlling the robotic arm to stop discharging materials and continue performing the scrape coating operation if the distance reaches a preset material closing distance.

5 6. The method according to claim 1, wherein after the chassis of the robot moves based on the first path planning data, the method further comprises:

generating second in-place information when the chassis moves to an end point indicated by the first path planning data; and

10 controlling the robotic arm to stop the scrape coating operation according to the second in-place information.

7. The method according to claim 6, wherein the controlling the robotic arm to stop the scrape coating operation according to the second in-place information comprises:

controlling the robotic arm to stop the scrape coating operation after completing a cycle of a scrape coating trajectory.

15 8. The method according to claim 1, wherein second path planning data is used to indicate a path of a robotic arm end relative to the chassis, a sum of a first speed at which the chassis moves and a second speed at which the robotic arm moves is an operation speed of the scrape coating operation, and a direction of the operation speed is perpendicular to a direction in which the chassis moves.

20 9. The method according to claim 8, wherein working planes of two adjacent scrape coating operations have an overlapping area.

10. A robot-based scrape coating operation device, wherein the robot comprises a robotic arm and a chassis, and the robot-based scrape coating operation device comprises:

an obtaining module, configured to obtain first path planning data, the first path planning data being used for indicating the movement of the robot in an area for scrape coating; and

25 a moving operation module, configured to control the chassis of the robot to move according to the first path planning data, and control the robotic arm to perform a scrape coating operation according to a preset motion trajectory while the chassis of the robot moves according to the first path planning data.

11. A storage medium, wherein the storage medium comprises a stored program, and when
30 running, the program controls a device in which the storage medium is located to perform the robot-based scrape coating operation method according to any one of claims 1 to 9.

12. A processor, wherein the processor is configured to run a program, and when running, the program performs the robot-based scrape coating operation method according to any one of claims 1 to 9.