IDENTIFICATION CODE RECOGNITION METHOD, RECOGNITION DEVICE, AND WAREHOUSING SYSTEM

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present disclosure claims priority to Chinese patent application No. 202410302786.6 filed March 15, 2024, the entire contents of which are incorporated herein by reference.

FIELD

[0002] The present disclosure relates to the technical field of warehousing and logistics, and in particular to a method for identifying an identification code, an identification device, and a warehousing system.

BACKGROUND

[0003] Usually, after a map of a warehouse is created, two-dimensional codes (also called quick response (QR) codes) required for the warehouse may be generated according to positions of cells in a warehousing map. After generated, the QR codes need to be attached by an implementer strictly according to their respective positions in the warehouse, which increases the implementation time and costs for deploying the QR codes. In addition, each QR code is unique, so if a QR code attached in the warehouse is contaminated, damaged or otherwise defective, it needs to be re-customized, which makes the maintenance of the QR code more complicated. Therefore, the implementation process of the QR codes in the related art suffers from problems of long implementation time, high implementation costs and high maintenance costs.

SUMMARY

[0004] Embodiments of the present disclosure provide a method for identifying an identification code, an identification device, and a warehousing system.

[0005] According to a first aspect of embodiments of the present disclosure, there is provided a method for identifying an identification code, the method is applied to a control device in a warehousing system, and includes: first, obtaining a warehousing map corresponding to a warehousing region, the warehousing map includes a plurality of cells, a plurality of identification codes are set in the warehousing region, and the plurality of identification codes correspond to the plurality of cells. Next, initial identification information of each of the plurality of cells is determined based on position information of each of the plurality of cells. Then, in a case where random setting of at least one identification code in the warehousing region is completed, a scanning robot in the warehousing system is controlled to scan an identification code corresponding to each cell according to position information

of the cell to obtain a scanning result of the identification code corresponding to the cell, and the scanning result of the identification code includes identification information of the identification code. Finally, in a case where identification information of a target identification code corresponding to a target cell is different from initial identification information of the target cell, the initial identification information of the target cell is updated based on the identification information of the target identification code to obtain target identification information of the target cell, and the target cell is any of the plurality of cells.

[0006] According to a second aspect of embodiments of the present disclosure, there is provided a warehousing system, which includes a scanning robot and a control device. The scanning robot is configured to scan a plurality of identification codes set in a warehousing region. The control device is configured to obtain a warehousing map corresponding to the warehousing region, the warehousing map includes a plurality of cells, the plurality of identification codes are set in the warehousing region, and the plurality of identification codes correspond to the plurality of cells. Initial identification information of each of the plurality of cells is determined based on position information of each of the plurality of cells. In a case where random setting of at least one identification code in the warehousing region is completed, a scanning robot in the warehousing system is controlled to scan an identification code corresponding to each cell according to position information of the cell to obtain a scanning result of the identification code corresponding to the cell, and the scanning result of the identification code includes identification information of the identification code. In a case where identification information of a target identification code corresponding to a target cell is different from initial identification information of the target cell, the initial identification information of the target cell is updated based on the identification information of the target identification code to obtain target identification information of the target cell, and the target cell is any of the plurality of cells.

[0007] According to a third aspect of embodiments of the present disclosure, there is provided an identification device, which including: an obtaining module, a determining module, a controlling module and an updating module. The obtaining module is configured to obtain a warehousing map corresponding to a warehousing region, the warehousing map includes a plurality of cells, a plurality of identification codes are set in the warehousing region, and the plurality of identification codes correspond to the plurality of cells. The determining module is configured to determine initial identification information of each of the plurality of cells based on position information of each of the plurality of cells. The controlling module is configured to: in a case where random setting of at least one identification code in the warehousing region is completed, control a scanning robot in the warehousing system to scan an identification code corresponding to each cell according to position information of the cell to obtain a scanning result of the identification code corresponding to the cell, and the scanning result of the identification code includes identification information of the identification code. The updating module is configured to: in a case where identification information

of a target identification code corresponding to a target cell is different from initial identification information of the target cell, update the initial identification information of the target cell based on the identification information of the target identification code to obtain target identification information of the target cell, and the target cell is any of the plurality of cells.

[0008] According to a fourth aspect of embodiments of the present disclosure, there is provided an electronic device, which includes: a processor and a memory; the memory is configured to store a computer-executable instruction; and the processor is configured to read the instruction from the memory and execute the instruction to implement the method for identifying an identification code as described in the first aspect above.

[0009] According to a fifth aspect of embodiments of the present disclosure, there is provided a computer-readable storage medium, having stored therein a computer program instruction that, when read by a computer, causes the computer to implement the method for identifying an identification code as described in the first aspect above.

[0010] According to a sixth aspect of embodiments of the present disclosure, there is provided a computer program product, which includes a computer program stored on a non-transitory computer-readable storage medium, and the computer program includes program instruction that, when executed by a computer, causes the computer to implement the method for identifying an identification code as described in the first aspect above.

[0011] According to a seventh aspect of embodiments of the present disclosure, there is provided a computer program that, when executed by a processor, causes the method for identifying an identification code as described in the first aspect above to be implemented.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] In order to more clearly illustrate technical solutions of embodiments of the present disclosure, drawings required for describing some embodiments of the present disclosure will be briefly introduced below. Apparently, the drawings described below are only some embodiments of the present disclosure. For ordinary technicians in the related art, other drawings are obtainable based on these drawings without paying creative work.

[0013] FIG. 1 is a schematic flowchart of a method for identifying an identification code according to some embodiments of the present disclosure;

[0014] FIG. 2 is a schematic flowchart of another method for identifying an identification code according to some embodiments of the present disclosure;

[0015] FIG. 3 is a schematic flowchart of another method for identifying an identification code according to some embodiments of the present disclosure;

[0016] FIG. 4 is a schematic flowchart of another method for identifying an identification code according to some embodiments of the present disclosure;

[0017] FIG. 5 is a schematic flowchart of another method for identifying an identification code according to some embodiments of the present disclosure;

[0018] FIG. 6 is a schematic diagram of a warehousing system according to some embodiments of the present disclosure;

[0019] FIG. 7 is a schematic diagram of an identification device according to some embodiments of the present disclosure; and

[0020] FIG. 8 is a schematic diagram of an electronic device according to some embodiments of the present disclosure.

DETAILED DESCRIPTION

[0021] To enable those skilled in the art to better understand technical solutions in embodiments of the present disclosure and to make the above purposes, features and advantages of embodiments of the present disclosure clear and easy to understand, technical solutions in embodiments of the present disclosure are further described in detail below with reference to the accompanying drawings.

[0022] For attaching QR codes in a warehouse, it is usually to generate a map corresponding to the warehouse first, and then generate a QR code corresponding to each of cells in the map according to position information of each of cells in the map. Code values of the QR codes generated have a one-to-one correspondence with attachment positions of the QR codes in the warehouse. After the QR codes are generated, an implementer needs to attach these QR codes strictly according to their respective positions in the warehouse, in other words, the implementer needs to attach these QR codes to respective attachment positions. For example, the on-site implementer needs to select the respective QR code to attach based on the position information of each cell in the map. In this case, the labor cost required for the implementation of a QR code project corresponding to a warehouse is about 15-20 man-days. In addition, if errors like mismatching occur during the process, rework may be required, resulting in low implementation efficiency and high labor costs.

[0023] Secondly, it needs to notify a supply chain to produce the QR codes after the map is generated. Since conditions vary from warehouse to warehouse, the number of QR codes required to be printed also varies. This meant that it needs to customize QR codes for each warehouse, which prolongs the implementation time of the QR code project and increases project costs. Further, since a supplier can only be notified to produce the QR codes after the map is generated, it is impossible to make bulk purchases in advance, which further increase the project implementation time.

[0024] In addition, since each QR code is unique, if any QR code attached in the warehouse is stained or damaged, an identical one is required to replace it. Therefore, it needs to notify the supply chain to reprint such QR code, which results in a longer maintenance cycle and higher maintenance costs.

[0025] Therefore, the QR code implementation schemes in the related art have the problems of long implementation time and high maintenance costs. In order to solve the above problems, embodiments of the present disclosure provide a method for identifying an identification code, an identification device and a warehousing system. By adopting a random QR code scheme, the implementation efficiency of the QR code implementation process is improved, and the implementation costs and maintenance costs are reduced. According to embodiments of the present disclosure, before a warehousing map corresponding to a warehousing region is generated, the number of identification codes required for the warehousing region is determined, and the identification codes are randomly generated. After the required identification codes are generated, each identification code is randomly set in the warehousing region, and after an attaching process of the identification codes is completed, each identification code is scanned by a scanning robot, and initial identification information of each cell is updated according to identification information of the respective identification code in a scanning result, so as to achieve a one-to-one correspondence between cells and identification codes. In embodiments of the present disclosure, since the identification information of each identification code is randomly generated, and the identification codes are attached randomly, which improve the efficiency of the implementation process of the identification codes, as compared with the existing technique where the identification codes are attached according to their position information.

[0026] The method for identifying an identification code according to embodiments of the present disclosure will be described in detail below with reference to FIG. 1 to FIG. 5. It should be noted that the method for identifying an identification code according to embodiments of the present disclosure may be implemented by a control device in a warehousing system.

[0027] In some examples, the control device may be a server or a terminal device, or a device deployed with a Robot Management System (RMS). The terminal device may include at least one of: a personal computer, a laptop computer, a smartphone, a tablet computer, or a portable wearable device; the server may include an independent server or a server cluster including multiple servers, which is not limited in embodiments of the present disclosure. For example, the control device in embodiments of the present disclosure may be a device deployed with an RMS, and the following embodiments are illustrated with reference to an example where the control device is a device deployed with an RMS.

[0028] FIG. 1 is a schematic flowchart of a method for identifying an identification code according to some embodiments of the present disclosure. As shown in FIG. 1, the method includes steps 110 to 140 as described below.

[0029] In step 110, a warehousing map corresponding to a warehousing region is obtained.

[0030] For example, a warehousing region may be the entire region or a partial region of a warehouse. The warehousing region may correspond to a warehousing map.

[0031] For example, the warehousing map may include a plurality of cells, that is, the

warehousing map is composed of a plurality of cells, and for each cell, there exists a corresponding region in the warehousing region. A plurality of identification codes may be set in the warehousing region, and the plurality of identification codes correspond to the plurality of cells.

[0032] In some examples, the warehousing region may be divided into a plurality of grids, and their sizes may be the same or different from each other. For example, a grid may be a region in the warehousing region that corresponds to a cell in the warehousing map, and there is a correspondence between grids and cells. For example, each grid may correspond to one cell in the warehousing map.

[0033] For example, a region (i.e., one grid) in the warehousing region that corresponds to one cell may be set with one identification code, that is, there is a one-to-one correspondence between identification codes and cells. Alternatively, a region (i.e., multiple grids) corresponding to multiple cells may be set with one identification code, or a region (i.e., one grid) corresponding to one cell may be set with multiple identification codes, that is, there is a multiple-to-one correspondence between identification codes and cells. It should be noted that embodiments of the present disclosure do not limit the correspondence between identification codes and cells. The following embodiments are illustrated with reference to an example where there is a one-to-one correspondence between identification codes and cells. In other words, there is a one-to-one correspondence between setting positions of identification codes and grids in the warehousing region, i.e., one identification code may be attached in each grid in the warehousing region.

[0034] In some examples, before the warehousing map is generated, identification codes required for grids in the warehousing region may be pre-generated. The identification codes may include QR codes, or the identification codes may be other types of identifiers. Embodiments of the present disclosure do not limit the type of the identification code. Embodiments of the present disclosure are illustrated with reference to an example where the identification code is the QR code.

[0035] In some embodiments, a first number of identification codes required for the warehousing region may be determined based on size information of the warehousing region and size information corresponding to each cell in the warehousing region; and based on the first number, a second number of identification codes are generated; the second number is greater than or equal to the first number, and each identification code has identification information.

[0036] In some examples, the size information corresponding to each cell in the warehousing region is a size of each grid in the warehousing region. Since each grid needs to be attached with one QR code, the size of the grid may be greater than or equal to a size of the QR code.

[0037] For example, the first number of identification codes required for the warehousing region may be determined based on the size of the warehousing region and the size of each grid.

[0038] For example, if the warehousing region has a length of 150 m and a width of 150 m, a region of the warehousing region is 150m*150m=22,500 square meters. If the size of each grid in the warehousing region is 1.5m*1.5m=2.25 square meters, it may be determined that the number of

identification codes (such as QR codes) required for the warehousing region is at least 22500/2.25=10,000.

[0039] In some examples, after determining the first number of identification codes required for the warehousing region (e.g., 10,000), a second number of identification codes may be generated, and the identification information of each generated identification code is randomly generated, or may be set according to a preset rule. In embodiments of the present disclosure, since each identification code is randomly allocated and attached to a grid in the warehousing region, that is, there is no association relationship between identification information of QR codes and positions of cells in the warehousing map, so in embodiments of the present disclosure, the identification codes may be generated without need to consider attachment positions of the identification codes, and a larger number (e.g., a second number) of identification codes may be generated at one time in embodiments of the present disclosure, where the second number is greater than the first number, to reserve some backup identification codes for subsequent maintenance.

[0040] For example, 100 million identification codes may be generated and produced at one time, which are sufficient to support 10,000 warehouses each with a region of approximately 20,000 square meters. In this way, there is no need to separately notify the supply chain to produce required QR codes when a QR code project is implemented for other warehouses, which shortens the implementation time of the QR code project. Identification information of an identification code may be a serial number corresponding to the identification code, for example, the identification information of identification codes may range from 000000001 to 99999999.

[0041] In some examples, QR codes with different number segments may be created in advance for different regions, with each region associated with its respective number segment. By way of example, the number segment for Asia Pacific is from 000000001 to 09999999.

[0042] With the method for identifying an identification code according to embodiments of the present disclosure, after QR codes for the warehousing region are generated, the QR codes may be attached in the warehousing region. Since there is no association relationship between the QR codes and the cells in the warehousing map, the QR codes may be randomly attached in the warehousing region, that is, a sequence for attaching the QR codes does not need to rely on positions of cells, thereby improving the implementation efficiency of the QR codes. In addition, it also prevents a QR code from being attached to a wrong position, thereby avoiding repeated rework, and further improving the implementation efficiency and reducing labor costs.

[0043] In some embodiments, the warehousing region may be divided into a plurality of scanning regions which may have the same or different sizes from each other. Each scanning region may include a plurality of grids, and the number of grids included in different scanning regions may be the same or different.

[0044] For example, after generating the QR codes corresponding to the warehousing region,

implementers may simultaneously implement attaching works of QR codes in a plurality of scanning regions. One QR code may be attached to each grid in the scanning region, and the QR code attached to each grid may be any of the plurality of QR codes generated (i.e., the second number of identification codes), thereby further improving the implementation efficiency of the QR codes.

[0045] With the method for identifying an identification code according to embodiments of the present disclosure, the number of identification codes required for the warehousing region is estimated in advance before the warehousing map is generated, and there is no association relationship between identification information of the identification codes and setting positions of the identification codes. That is, each identification code is random, and the setting process of each identification code is also random. Therefore, embodiments of the present disclosures are able to improve the implementation efficiency of the identification codes. Furthermore, because the identification codes are random, the scanning regions in the warehousing region may also be set synchronously, thereby further improving the implementation efficiency.

[0046] In step 120, initial identification information of each of the plurality of cells is determined based on position information of each of the plurality of cells.

[0047] For example, after generating the warehousing map, the position information of each cell in the warehousing map may be obtained. For example, the position information of each cell may be a coordinate value of each cell in the warehousing map.

[0048] In some examples, initial identification information may be generated for each cell in the warehousing map. For example, the initial identification information of each cell may be randomly generated, and the initial identification information of each cell is different from one another. For example, the initial identification information of each cell may be a serial number of each cell. For example, if the warehousing region includes 10,000 cells, their initial identification information may range from 00001 to 10000, or may be represented in an indexing manner with index No. ranging from A_1 to A_{10000}, or may be represented in other different ways, which will not be limited in embodiments of the present disclosure.

[0049] For example, after determining the initial identification information of each cell, the initial information of each cell may be associated with its position information. The initial information and position information of each cell can uniquely identify the cell, and each cell can be identified and located based on its position information and initial identification information.

[0050] In some examples, associating the initial identification information of each cell with its position information may include: establishing a mapping relationship (may be referred to as a first mapping relationship) between initial identification information of a plurality of cells and their position information. For example, after the first mapping relationship is established, the initial identification information of each cell may be queried based on its position information and the first mapping relationship.

[0051] In step 130, in a case where random setting of at least one identification code in the warehousing region is completed, a scanning robot in the warehousing system is controlled to scan an identification code corresponding to each cell according to position information of the cell to obtain a scanning result of the identification code corresponding to the cell.

[0052] In some examples, completing the random setting of at least one identification code in the warehousing region may include: completing the setting of one or more identification codes in the entire warehousing region, or completing the setting of one or more identification codes for at least one scanning region in the warehousing region. According to above embodiments, since the setting process of each identification code in the warehousing region is random, in the case where the random setting of at least one identification code is completed, an identification code scanning task may be performed.

[0053] In some examples, the identification code scanning task may be performed by a scanning robot in the warehousing system. For example, the warehousing system may include a plurality of scanning robots. The scanning robot may be any type of autonomous mobile device, such as an automated guided vehicle (AGV).

[0054] For example, the scanning robot is provided with a scanning device, the scanning device may include an image acquisition device, such as a camera, disposed at a bottom of the scanning robot. The camera is used to capture an identification code attached to the floor of the warehousing region and transmit the captured image information of the identification code to the scanning robot for identification. For example, the scanning device may be a video camera, a fisheye camera, a panoramic camera, or other image acquisition devices, which are not limited in embodiments of the present disclosure.

[0055] In some examples, the control device (e.g., an RMS) may send a scanning instruction to the scanning robot, and the scanning instruction may include the position information of each cell. The scanning robot moves towards a position of a corresponding cell according to the scanning instruction, and after arriving the position of the cell, the scanning robot uses the scanning device to capture the identification code corresponding to the cell to obtain a scanning result, and reports the scanning result to the control device for processing. The identification code corresponding to the cell is the identification code set on such a grid of the warehousing region that corresponds to the cell.

[0056] FIG. 2 is a schematic flowchart of another method for identifying an identification code according to some embodiments of the present disclosure. As shown in FIG. 2, the above step 130 includes steps 210 to 230 as described below.

[0057] In step 210, at least one target scanning robot is determined from a plurality of scanning robots in the warehousing system, and a respective target scanning region is determined for each of the at least one target scanning robot.

[0058] In some examples, the warehousing region is divided into a plurality of scanning

regions. If the attachment of the identification code(s) is completed in at least one target scanning region among the plurality of scanning regions, at least one target scanning robot may perform a scanning task on their respective target scanning regions simultaneously. For example, if two or more scanning regions among the plurality of scanning regions have completed the attachment of the identification codes, the scanning robots corresponding to these scanning regions may simultaneously perform the scanning task on these regions, thereby further improving the implementation efficiency.

[0059] For example, the at least one target scanning robot may be all or a part of the plurality of scanning robots. The target scanning region(s) may be all or a part of the plurality of scanning regions. The number of target robots is related to the number of target scanning regions. For example, the number of target scanning robots may be the same as the number of target scanning regions. In this case, one target scanning robot may perform a corresponding scanning task on one target scanning region.

[0060] In some examples, in a case where the number of scanning robots in the warehousing system is greater than or equal to the number of scanning regions, each scanning region may be assigned with one scanning robot, and each scanning robot performs a scanning task on the respective scanning region. In a case the number of scanning robots is less than the number of scanning regions, a same one scanning robot may be assigned with multiple scanning regions, and the scanning robot may sequentially perform the scanning task on each of the corresponding multiple scanning regions.

[0061] It should be noted that in the case where the number of scanning robots is less than the number of scanning regions, each scanning robot may be assigned with a corresponding scanning region first. When there exists an idle scanning robot in the warehousing system, the remaining scanning regions may be assigned to the idle scanning robot to perform the scanning task.

[0062] For example, for each of target scanning regions, a respective target scanning robot may be determined based on the target scanning regions; or for each of target scanning robots, a respective target scanning region may be determined based on the target scanning robots.

[0063] For example, after determining at least one target scanning region, each of the at least one target scanning region may be randomly assigned with a scanning robot (i.e., target scanning robot). Alternatively, for each target scanning region, a scanning robot closest to the target scanning region may be determined as a target scanning robot corresponding to the target scanning region based on distances between scanning robots and the target scanning region. For another example, after determining at least one target scanning robot, for each target scanning robot, a scanning region closest to the target scanning robot may be determined as a target scanning region corresponding to the target scanning robot based on distances between scanning regions and the target scanning robot. Embodiments of the present disclosure do not make limitations in this aspect.

[0064] In step 220, a starting scanning point of each target scanning robot in the respective target scanning region is determined according to a position of each target scanning robot.

[0065] For example, after determining the target scanning robot and the target scanning region corresponding to the target scanning robot, a starting scanning point may be determined in the target scanning region. The starting scanning point is an initial position of the scanning task when the target scanning robot performs the scanning task on the target scanning region.

[0066] In some examples, the target scanning region may include multiple grids corresponding to multiple cells, and the starting scanning point of the scanning task may be determined based on the position of the target scanning robot and positions of multiple grids in the target scanning region. The starting scanning point may be one of the multiple grids. For example, a distance between the target robot and each grid in the target scanning region may be determined based on the position of the target robot and the position of each grid in the target scanning region, and the starting scanning point of the scanning task may be determined based on the distance between the target robot and each grid in the target scanning region.

[0067] In some embodiments, in each target scanning region, a cell closest to the position of the target scanning robot may be determined as the starting scanning point.

[0068] For example, in a case where the target scanning region is rectangular, the target scanning region may include four vertex grids, of which such a vertex grid in the target scanning region that is closest to the target scanning robot may be used as the starting scanning point in the target scanning region. That is, the starting scanning point of the target scanning robot may be the vertex grid in the target scanning region that is closest to the target robot.

[0069] For example, for each target scanning robot, after the starting scanning point is determined, a scanning path of the target scanning robot in the target scanning region may also be determined based on the starting scanning point. The scanning path is a path along which the target scanning robot performs the scanning task in the target scanning region. For example, when the target scanning robot performs the scanning task in the target scanning region according to the scanning path, it may complete the scanning of each identification code in the target scanning region.

[0070] In some examples, when determining the scanning path of the target scanning robot, operation rules corresponding to various cells in the scanning path may not be considered. The operation rules are such rules that need to be followed by a robot when the robot operates in the warehousing region. For example, the operation rules corresponding to various cells may include allowing/prohibiting one-way traffic, allowing/prohibiting two-way traffic, allowing/prohibiting unloaded traffic, allowing/prohibiting loaded traffic, etc., which are not limited in embodiments of the present disclosure.

[0071] For example, in a case where an operation rule corresponding to a cell is only allowing one-way traffic, such as only allowing rightward traffic, when determining the scanning path, if it is determined that a scanning robot needs to move left in this cell, the RMS may change the operation rule corresponding to this cell to allow leftward traffic. For another example, in a case where an

operation rule corresponding to a cell is only allowing a loaded robot to pass, if a scanning path of an unloaded scanning robot passes through this cell, the RMS may also adjust the operation rule corresponding to this cell to allow the unloaded robot to pass.

[0072] That is, since the scanning robot performs the scanning task rather than a handling task, when determining the scanning path of the target scanning robot, if an operation rule corresponding to a cell conflicts with the scanning path, the RMS may modify the operation rule corresponding to this cell, so as to ensure that the determined scanning path can cover the identification codes corresponding to all cells in the target scanning region as much as possible. In this case, the target scanning robot is able to scan as many identification codes as possible in the target scanning region when performing the scanning task according to the scanning path.

[0073] In some examples, in a case where non-rotatable or other special functional cells exist in the target scanning region, the RMS may ignore these functional cells during path planning. That is, the scanning path determined by the RMS may not include a functional cell. A functional cell may be a cell that the target scanning robot cannot reach.

[0074] For example, when a function cell exists in the target scanning region, the RMS may set a status of the function cell to be disabled or locked, so that the functional cell may be filtered during path planning. In a case where the disabled or locked status of the function cell is subsequently relieved, i.e., the function cell is updated to a normal cell, the identification code corresponding to this cell may continue to be scanned.

[0075] In step 230, each target scanning robot is controlled to scan the identification code corresponding to each cell in the respective target scanning region starting from the starting scanning point in the respective target scanning region according to the respective scanning path.

[0076] For example, after determining the starting scanning point and the scanning path, the RMS can send a scanning instruction to the target scanning robot. The target scanning robot moves to the starting scanning point of the respective target scanning region according to the scanning instruction, scans the identification code corresponding to each cell on the scanning path starting from the starting scanning point along the scanning path to obtain a scanning result, and reports the scanning result to the RMS.

[0077] In some embodiments, during the scanning process of the target scanning robot on the identification code corresponding to each cell in the target scanning region, if the target scanning robot encounters an abnormality, a current scanning cell of the target scanning robot is determined; and a candidate scanning robot in the plurality of scanning robots is controlled to move to the current scanning cell and continue to scan the identification codes corresponding to an unscanned cell in the target scanning region according to the scanning path.

[0078] In some examples, during the process in which the target scanning robot performs a scanning task corresponding to the target scanning region, if the target scanning robot experiences an

operational abnormality, such as low battery that prevents it from continuing to move or hardware failure that prevents it from continuing the scanning task, the RMS may determine a candidate robot from idle scanning robots in the warehousing system, control the candidate robot to move to a current position of the target scanning robot (i.e., a position corresponding to the current scanning cell), and continue to perform the scanning task, i.e., continue to scan identification codes corresponding to remaining cells according to the scanning path. A remaining cell refers to a cell corresponding to an identification code among multiple identification codes in the target scanning region except for those identification codes that have been scanned by the target scanning robot.

[0079] For example, before determining the candidate robot and controlling the candidate robot to move to the current position of the target scanning robot (i.e., a grid where the target scanning robot is currently located), the target scanning robot at the current position may be removed and its scanning task may be reclaimed to prevent the target scanning robot from affecting continued execution of the scanning task by the candidate robot. There may be a plurality of idle scanning robots in the warehousing system, and the candidate robot may be any of the plurality of idle scanning robots, or the candidate robot may be the one of the plurality of idle robots that is closest to the current scanning cell, which is not limited in embodiments of the present disclosure.

[0080] In some examples, when a scanning robot cannot continue its scanning task due to special issues such as space or site conditions in the warehousing region, the current scanning task may be terminated through a stop key or button provided by the RMS, and the previous scanning result is saved. At the same time, the region where the scanning task has not been completed may be marked, so that a scanning task may be created subsequently once environmental factors are resolved. For example, once the environmental factors are resolved, the scanning robot only needs to continue performing the scanning task on the region where the scanning task has not been completed, without having to repeat the scanning task on the region where the scanning task has been completed.

[0081] In step 140, in a case where identification information of a target identification code corresponding to a target cell is different from initial identification information of the target cell, the initial identification information of the target cell is updated based on the identification information of the target identification code to obtain target identification information of the target cell.

[0082] The target cell is any of a plurality of cells.

[0083] In some embodiments, a scanning result of an identification code includes identification information of the identification code. The identification information of the identification code is identification information randomly generated when the identification code is generated.

[0084] For example, for each cell, after an identification code is set in its respective region (i.e., grid) in the warehousing region, initial identification information of the cell needs to be updated to identification information of the identification code corresponding to the cell. Since each grid is set with an identification code, a cell corresponding to a grid may be identified by identification

information of the identification code corresponding to the grid.

[0085] In some examples, in the related art, because identification information of each identification code is determined based on its position information, identification information of a QR code attached on a cell is pre-associated with the cell, so the cell may be identified and positioned by the identification information of the QR code. In embodiments of the present disclosure, the identification information of each identification code is random and is not associated with a cell, so after attachment of identification codes is completed, the identification information of each identification code needs to be associated with the respective cell, so as to achieve a one-to-one correspondence between cells and identification codes, that is, an identification code can uniquely identify a cell.

[0086] For example, in a case where a scanning result of the target identification code includes the identification information of the target identification code, the identification information of the target identification code is compared with the initial identification information of the target cell. In a case where the identification information of the target identification code is inconsistent with the initial identification information of the target cell, the initial identification information of the target cell is updated to the identification information of the target identification code to obtain the target identification information of the target cell. The target identification information of the target cell is used to identify the target cell.

[0087] For example, in a case where the identification information of the target identification code is consistent with the initial identification information of the target cell, the initial identification information of the target cell may not be updated, that is, the target identification information of the target cell is the initial identification information of the target cell.

[0088] In some examples, after target identification information of each cell is determined, each cell may be associated with its respective target identification information, i.e., a mapping relationship (may be referred to as a second mapping relationship) may be established between each cell and its respective target identification information. After the second mapping relationship is established, a robot may be positioned based on the second mapping relationship. For example, a cell corresponding to a robot and position information corresponding to the cell may be determined based on identification information of an identification code scanned by the robot and the second mapping relationship.

[0089] With the method for identifying an identification code according to embodiments of the present disclosure, the warehousing map corresponding to the warehousing region is obtained, the initial identification information of each cell is determined based on the position information of each cell, in the case where random setting of at least one identification code in the warehousing region is completed, the scanning robot in the warehousing system is controlled to scan the identification code corresponding to each cell according to the position information of each cell to obtain the scanning

result of the identification code corresponding to the cell; in the case where the identification information of the target identification code corresponding to the target cell is different from the initial identification information of the target cell, the initial identification information of the target cell is updated based on the identification information of the target identification code to obtain target identification information of the target cell. That is, according to embodiments of the present disclosure, the number of identification codes required for the warehousing region may be determined before the warehousing map corresponding to the warehousing region is generated, and the identification codes each are randomly generated. After the required identification codes are generated, they are randomly set in the warehousing region, and after attachment, each identification code is scanned by the scanning robot, and the initial identification information of each cell is updated according to the identification information of the respective identification code in the scanning result, thereby realizing the correspondence between each cell and the respective identification code. In embodiments of the present disclosure, since the identification information of each identification code is randomly generated, and the identification codes are attached randomly, the efficiency of the implementation process of the identification codes is greatly improved, as compared with the existing technique where the identification codes are attached according to position information.

[0090] During the scanning process of the scanning robot on the identification codes set in the warehousing region, scanning anomalies may occur. For example, the scanning robot may scan some abnormal identification codes. In the following, situations where the scanning robot scans abnormal identification codes will be described with reference to FIG. 3.

[0091] FIG. 3 is a schematic flowchart of another method for identifying an identification code according to some embodiments of the present disclosure. As shown in FIG. 3, after the step 130, the method further includes steps 310 to 340 as shown below.

[0092] In step 310, in a case where an angle deviation between angle information of the target identification code corresponding to the target cell and a preset angle is greater than an angle deviation threshold, the target identification code is determined to be an abnormal identification code, and abnormality prompt information is output.

[0093] In some embodiments, the scanning result of the target identification code may further include the angle information of the target identification code. The angle information of the target identification code is used to indicate whether the setting of the target identification code meets a setting requirement.

[0094] In some examples, in a case where the scanning result of the target identification code includes the angle information of the target identification code, and the angle deviation between the angle information of the target identification code corresponding to the target cell and the preset angle is greater than the angle deviation threshold, the target identification code is determined to be an abnormal identification code, and the abnormality prompt information is output. The angle information

of the target identification code includes a setting angle of the target identification code.

[0095] For example, the scanning robot may pre-store a standard setting angle (also called a preset angle) for an identification code. When the scanning robot captures the target identification code, it may determine the setting angle of the target identification code and compare the setting angle of the target identification code with the standard setting angle. In a case where it is determined that the angle deviation between the setting angle of the target identification code and the standard setting angle is small, such as less than or equal to the angle deviation threshold, it indicates that the setting angle of the target identification code is normal, that is, the setting of the target identification code meets the setting requirement. In a case where it is determined that the angle deviation between the setting angle of the target identification code and the standard setting angle is greater than the angle deviation threshold, it indicates that the setting angle of the target identification code is abnormal, that is, the setting of the target identification code does not meet the setting requirement.

[0096] For example, the standard preset angle and the preset angle threshold may be set as needed, for example, the preset angle threshold may be set to 50 degrees, and the standard preset angle may beset to 0 degrees. In a case where an angle between an upper or lower edge of an identification code and a horizontal straight line is greater than 50 degrees, that is, an angle deviation between angle information of the identification code and the preset angle is greater than 50 degrees, it is determined that the setting of the identification code does not meet the setting requirement.

[0097] In some examples, an abnormal identification code with an angle deviation between its angle information and the preset angle being greater than the angle deviation threshold may be referred to as a first type of abnormal identification code. In a case where the target identification code is determined to be the first type of abnormal identification code, a display device may be controlled to output abnormality prompt information, such as first abnormality prompt information. The first abnormality prompt information is used to prompt an operator to reset the target identification code, for example, to re-attach the target identification code. Alternatively, the first abnormality prompt information may prompt the operator to replace the target identification code, i.e., to replace the target identification code with another identification code.

[0098] In step 320, in a case where the identification information of the target identification code corresponding to the target cell is empty or is the same as identification information of at least one identification code that has been scanned, the target identification code is determined to be an abnormal identification code, and abnormal prompt information output.

[0099] In some examples, in a case where the scanning robot cannot obtain the identification information of the target identification code through scanning, that is, the identification information of the target identification code is empty, it indicates that the target identification code may be contaminated or damaged. In this case, the target identification code may be determined as an abnormal identification code.

[0100] In some other examples, after the scanning robot obtains the identification information of the target identification code, it may compare the identification information of the target identification code with the identification information of those identification codes that have been scanned. In a case where the identification information of the target identification code is the same as the identification information of any of the identification codes that have been scanned, that is, there are duplicate identification codes, the identification code that is scanned later (i.e., the target identification code) may be determined as an abnormal identification code. Alternatively, all duplicate identification codes may be determined as abnormal identification codes. Embodiments of the present disclosure do not make limitations in this aspect.

[0101] For example, in a case where multiple scanning robots scan their respective scanning regions, an identification code that has been scanned may be an identification code that has been scanned by the current scanning robot, or it may be an identification code that has been scanned by any other scanning robot. Each scanning robot may store identification information of identification codes that have been scanned by all scanning robots performing the scanning task, thereby enabling comparison with the identification information of each identification code.

[0102] In some examples, an abnormal identification code with empty identification information or duplicate identification information may be referred to as a second type of abnormal identification code. In a case where the target identification code is determined to be the second type of abnormal identification code, a display device may be controlled to output abnormality prompt information, such as second abnormality prompt information. The second abnormality prompt information is used to prompt an operator to replace the target identification code.

[0103] In step 330, in a case where the scanning robot scans the target identification code corresponding to the target cell for a time period exceeding a preset time threshold and fails to obtain the identification information of the target identification code, the target identification code is determined to be an abnormal identification code, and abnormal prompt information is output.

[0104] In some examples, when the scanning robot reaches the target cell, timing may be started. In a case where the identification information of the target identification code is scanned and obtained by the scanning robot before expiration of the preset time threshold, the scanning robot reports the identification information to the RMS, and moves to a next cell of the target cell according to the scanning path to continue scanning and restarts timing. In a case where the scanning robot fails to obtain the identification information of the target identification code by scanning when the preset time threshold expires, that is, the RMS does not receive the identification information of the target identification code from the scanning robot within the preset time threshold, the target identification code is determined to be an abnormal identification code. It should be noted that the preset time threshold may be set according to user’s needs, and the present disclosure does not limit the specific value of the preset time threshold.

[0105] In some examples, an abnormal identification code whose identification information is not obtained within the preset time threshold may be referred to as a third type of abnormal identification code. In a case where the target identification code is determined to be the third type of abnormal identification code, a display device may be controlled to output abnormality prompt information, such as third abnormality prompt information. The third abnormality prompt information is used to prompt an operator to check and process the target identification code.

[0106] In step 340, the scanning robot is controlled to move from the target cell to a next cell, and scans an identification code corresponding to the next cell.

[0107] For example, in a case where the RMS does not receive the identification information of the target identification code from the scanning robot within the preset time threshold, the RMS controls the scanning robot to move to a next cell to scan, thereby improving the scanning efficiency of the scanning robot.

[0108] It should be noted that abnormality handling manners corresponding to different types of abnormal identification codes may be different. For example, the abnormality handling manner for the first type of abnormal identification code may be to adjust an attachment angle of the target identification code or replace the target identification code; the abnormality handling manner for the second type of abnormal identification code may be to replace the target identification code; the abnormality handling manner for the third type of abnormal identification code may be determined by an operator after check, in a case where it is determined that the identification code is contaminated or damaged, the target identification code may be replaced, in a case where it is determined that the identification code is blocked by an obstacle, it just needs to clear the obstacle.

[0109] In some embodiments, outputting the abnormality prompt information as described in the above steps may include: controlling a display device in the warehousing system to display a cell corresponding to the abnormal identification code in the warehousing map in a target display manner to prompt a replacement subject to replace the abnormal identification code.

[0110] In some examples, cells corresponding to different types of abnormal identification codes (e.g., the first type of abnormal identification code, the second type of abnormal identification code, and the third type of abnormal identification code) may be displayed in different manners or in the same manner.

[0111] For example, the target display manner may be highlighting, flashing, or alarm prompting, etc. When the abnormal identification code is determined, the display device (such as an RMS front-end page) may display the position of the abnormal identification code (i.e., the position of the target cell) and related abnormal information in the warehousing map, to help a worker to find out the abnormal identification code based on the abnormality prompt information and perform relevant processing on the abnormal identification code, such as to replacing the abnormal identification code.

[0112] In some examples, the manner of outputting the abnormality prompt information may

also include that the RMS sends an abnormality prompt message, an abnormality prompt email or the like, as long as it can prompt a worker to discover the abnormality. Embodiments of the present disclosure do not limit the specific form of the abnormality prompt information.

[0113] For example, after the target identification code corresponding to the target cell is determined to be an abnormal identification code, if the abnormal identification code needs to be replaced, an identification code may be randomly selected from the remaining unused identification codes as a substitutive identification code to replace the abnormal identification code. For example, the substitutive identification code may be any identification code among the second number of identification codes that has not been attached.

[0114] In some examples, the replacement subject may be a replacement worker or a replacement device, which is not limited in embodiments of the present disclosure.

[0115] FIG. 4 is a schematic flowchart of another method for identifying an identification code according to some embodiments of the present disclosure. As shown in FIG. 4, in the case where the target identification code corresponding to the target cell is the abnormal identification code and a replacement subject replaces the target identification code with a substitutive identification code, the method further includes steps 410 to 420 as described below.

[0116] In step 410, the scanning robot is controlled to scan the substitutive identification code corresponding to the target cell according to position information of the target cell to obtain identification information of the substitutive identification code.

[0117] In some examples, after the target identification code (i.e., the abnormal identification code) is replaced with the substitutive identification code, the RMS may control the scanning robot to rescan the substitutive identification code. For example, the rescanning may refer to that the scanning robot scans the substitutive identification code separately or that the scanning robot scans the substitutive identification code when the scanning robot performs a subsequent scanning task (e.g., a second scan) on all identification codes in the warehousing region, which is not limited in embodiments of the present disclosure.

[0118] For example, the scanning robot that scans the substitutive identification code and the scanning robot that scans the target identification code may be the same scanning robot or different scanning robots.

[0119] In step 420, the initial identification information or the target identification information of the target cell is updated to the identification information of the substitutive identification code.

[0120] In some examples, in a case where the target identification code is determined by the scanning robot to be an abnormal identification code during the first scanning task, after the target identification code is replaced with the substitutive identification code, the initial identification information of the target cell is updated to the identification information of the substitutive identification code. In the case where the target identification code is the abnormal identification code,

the identification information of the target identification code cannot be obtained, so the target cell still keeps the initial identification information, after the target identification code is replaced with the substitutive identification code, the identification information of the substitutive identification code is used to update the initial identification information of the target cell, so as to obtain the target identification information of the target cell.

[0121] It should be noted that a premise for updating the initial identification information of the target cell to the identification information of the substitutive identification code is that the initial identification information of the target cell is different from the identification information of the substitutive identification code.

[0122] In some other examples, the target identification code is determined by the scanning robot to be an abnormal identification code during the subsequent task, that is, after the initial identification information of the target cell is updated to the identification information of the target identification code (i.e., the target identification information), the target identification code is damaged or contaminated during subsequent use. In this case, the target identification code is replaced with the substitutive identification code, the substitutive identification code is scanned, and the target identification information of the target cell is updated to the identification information of the substitutive identification code.

[0123] In some examples, after completing the setting of the identification codes in the warehousing region, the scanning robot may perform a first scan on the identification codes in the warehousing region. After completing the first scan, a second scan may be performed for the warehousing region. During the second scan, an identification code that is not scanned in the first scan or a substitutive identification code as a substitute to an abnormal identification code may be scanned, and at the same time, the scanning result of the first scan may also be verified. In a case where there exists an identification code whose scanning result in the second scan is different from its scanning result in the first scan, identification information of a cell corresponding to the identification code needs to be updated accordingly.

[0124] With the method for identifying an identification code according to embodiments of the present disclosure, whether an identification code is abnormal can be determined based on the scanning result of the scanning robot on the identification code. In a case where the identification code is determined to be abnormal, abnormality prompt information may be output to prompt an operator to handle the abnormal identification code. Furthermore, because the identification information of each identification code is random, if a certain abnormal identification code needs to be replaced, there is no need to regenerate an identification code separately, but any of the already generated identification codes may be directly used to replace the abnormal identification code, thereby improving the maintenance efficiency of the identification code and reducing maintenance costs.

[0125] In some embodiments, during the scanning process of the scanning robot on the

warehousing region, the display device in the warehousing system is controlled to display a scanned region, an unscanned region, and a region being scanned in the warehousing region in different display modes, respectively.

[0126] In some embodiments, during the scanning process of the scanning robot on the warehousing region, the display device in the warehousing system is controlled to display a scanned cell, an unscanned cell, and a cell corresponding to an abnormal identification code in the warehousing region in different display modes, respectively.

[0127] In some examples, the front-end page of the RMS is able to visualize the scanning status of the warehousing region. For example, in a case where the warehousing region includes multiple scanning regions, the front-end page may display scanning statuses of different scanning regions, such as among the multiple scanning regions, which scanning regions have been scanned, which scanning regions have not been scanned, and which scanning regions are currently being scanned.

[0128] For example, different scanning regions may be displayed in different display modes. For example, the scanned region, the unscanned region, and the region being scanned may be displayed in the warehousing map with different colors.

[0129] In some examples, for the region being scanned, the front-end page of the RMS may also display the scanned cell, the un-scanned cell, and the cell corresponding to the abnormal identification code in this region with different display modes. For example, the scanned cell, the unscanned cell, and the cell corresponding to the abnormal identification code may be displayed in the warehousing map with different colors.

[0130] With the method for identifying an identification code according to embodiments of the present disclosure, the scanning status may be visually displayed to enable the worker to clearly and intuitively acquire the current scanning status of the warehousing region and find out abnormalities in time, thereby ensuring that the scanning of each identification code in the warehousing region is not missed.

[0131] FIG. 5 is a schematic flowchart of another method for identifying an identification code according to some embodiments of the present disclosure. In the following, a specific scanning process is described with reference to FIG. 5 as an example. As shown in FIG. 5, the method includes steps 510 to 560 as described below.

[0132] In step 510, after a warehousing map is generated, an RMS pre-generates a QR code value A corresponding to each cell.

[0133] In step 520, the RMS issues a scanning task, and sends a coordinate of each cell in the warehousing map to one or more robots to make the one or more robots perform the scanning task.

[0134] In step 530, when a robot moves to a coordinate of a QR code, it scans the actually attached QR code and reports a QR code value B corresponding to the QR code to the RMS.

[0135] For example, the RMS may issue a full-field inspection task to one or more robots, and

one robot may be responsible for a scanning region. The RMS issues scanning coordinates. When a robot travels to a position of a QR code, it scans the QR code to obtain a QR code value B corresponding to the QR code.

[0136] In step 540, the RMS updates the QR code value A of a cell to the QR code value B according to the QR code value B actually reported by the robot.

[0137] For example, the robot reports the QR code value B corresponding to the actually attached QR code to the RMS, and the RMS updates the QR code value A of the cell to the QR code value B.

[0138] In step 550, the RMS displays a scanning status of each QR code through report forms.

[0139] In step 560, if a QR code is contaminated or damaged, the RMS provides a page display for quick replacement.

[0140] For example, a front-end page of the RMS may display the position of the contaminated or damaged QR code to prompt the worker to replace it. After the replacement, the QR code value of the cell will be updated.

[0141] FIG. 6 is a schematic diagram of a warehousing system according to some embodiments of the present disclosure. As shown in FIG. 6, the warehousing system 600 includes a scanning robot 610 and a control device 620.

[0142] The scanning robot 610 is configured to: scan a plurality of identification codes set in a warehousing region.

[0143] The control device 620 is configured to: obtain a warehousing map corresponding to the warehousing region, the warehousing map includes a plurality of cells, the plurality of identification codes are set in the warehousing region, and the plurality of identification codes correspond to the plurality of cells. Initial identification information of each of the plurality of cells is determined based on position information of each of the plurality of cells. In a case where random setting of at least one identification code in the warehousing region is completed, the scanning robot in the warehousing system is controlled to scan an identification code corresponding to each cell according to position information of the cell to obtain a scanning result of the identification code corresponding to the cell, and the scanning result of the identification code includes identification information of the identification code. In a case where identification information of a target identification code corresponding to a target cell is different from initial identification information of the target cell, the initial identification information of the target cell is updated based on the identification information of the target identification code to obtain target identification information of the target cell, and the target cell is any of the plurality of cells.

[0144] FIG. 7 is a schematic diagram of an identification device according to some embodiments of the present disclosure. As shown in FIG. 7, the identification device 700 includes an obtaining module 710, a determining module 720, a controlling module 730, and an updating module

740.

[0145] The obtaining module 710 is configured to: obtain a warehousing map corresponding to a warehousing region, the warehousing map includes a plurality of cells, a plurality of identification codes are set in the warehousing region, and the plurality of identification codes correspond to the plurality of cells.

[0146] The determining module 720 is configured to: determine initial identification information of each of the plurality of cells based on position information of each of the plurality of cells.

[0147] The controlling module 730 is configured to: in a case where random setting of at least one identification code in the warehousing region is completed, control a scanning robot in the warehousing system to scan an identification code corresponding to each cell according to position information of the cell to obtain a scanning result of the identification code corresponding to the cell, and the scanning result of the identification code includes identification information of the identification code.

[0148] The updating module 740 is configured to: in a case where identification information of a target identification code corresponding to a target cell is different from initial identification information of the target cell, update the initial identification information of the target cell based on the identification information of the target identification code to obtain target identification information of the target cell, and the target cell is any of the plurality of cells.

[0149] In some embodiments, the scanning result of the identification code further includes angle information of the identification code. The identification device 700 further includes an outputting module. The determining module 720 is further configured to: in a case where an angle deviation between angle information of the target identification code corresponding to the target cell and a preset angle is greater than an angle deviation threshold, determine the target identification code to be an abnormal identification code. The outputting module is configured to: output abnormality prompt information.

[0150] In some embodiments, the determining module 720 is further configured to: in a case where the identification information of the target identification code corresponding to the target cell is empty or is the same as identification information of at least one identification code that has been scanned, determine the target identification code to be an abnormal identification code. The outputting module is configured to: output abnormality prompt information.

[0151] In some embodiments, the determining module 720 is further configured to: in a case where the scanning robot scans the target identification code corresponding to the target cell for a time period exceeding a preset time threshold and fails to obtain the identification information of the target identification code, determine the target identification code to be an abnormal identification code. The outputting module is configured to: output abnormality prompt information. The controlling module

730 is further configured to: control the scanning robot to move from the target cell to a next cell and scan an identification code corresponding to the next cell.

[0152] In some embodiments, the controlling module 730 is further configured to: control a display device in the warehousing system to display a cell corresponding to the abnormal identification code in the warehousing map in a target display manner to prompt a replacement subject to replace the abnormal identification code.

[0153] In some embodiments, the controlling module 730 is further configured to: in a case where the target identification code corresponding to the target cell is the abnormal identification code and a replacement subject replaces the target identification code with a substitutive identification code, control the scanning robot to scan the substitutive identification code corresponding to the target cell according to position information of the target cell to obtain identification information of the substitutive identification code. The updating module 740 is further configured to: update the initial identification information or the target identification information of the target cell to the identification information of the substitutive identification code.

[0154] In some embodiments, the determining module 720 is further configured to: determine at least one target scanning robot from a plurality of scanning robots in the warehousing system and determine a respective target scanning region for each of the at least one target scanning robot, where the warehousing region includes a plurality of scanning regions, and the plurality of scanning regions include the target scanning region; and determine a starting scanning point of each target scanning robot in the respective target scanning region according to a position of each target scanning robot. The controlling module 730 is configured to: control each target scanning robot to scan an identification code corresponding to each cell in the respective target scanning region starting from the starting scanning point in the respective target scanning region according to a respective scanning path.

[0155] In some embodiments, the determining module 720 is further configured to: determine, for each target scanning robot, such a cell in the respective target scanning region that is closest to the position of the target scanning robot as the starting scanning point.

[0156] In some embodiments, the determining module 720 is further configured to: in a case where a target scanning robot encounters an abnormality during a scanning process of the target scanning robot on an identification code corresponding to each cell in a respective target scanning region, determine a current scanning cell of the target scanning robot. The controlling module 730 is further configured to: control a candidate scanning robot in the plurality of scanning robots to move to the current scanning cell and continue to scan an identification code corresponding to an unscanned cell in the respective target scanning region according to a respective scanning path.

[0157] In some embodiments, the controlling module 730 is further configured to: control a display device in the warehousing system to display a scanned region, an unscanned region and a region being scanned in the warehousing region in different display modes, respectively, during a

scanning process of the scanning robot on the warehousing region.

[0158] In some embodiments, the controlling module 730 is further configured to: control a display device in the warehousing system to display a scanned cell, an unscanned cell and a cell corresponding to an abnormal identification code in the warehousing region in different display modes, respectively, during a scanning process of the scanning robot on the warehousing region.

[0159] FIG. 8 is a schematic diagram of an electronic device according to some embodiments of the present disclosure. In some embodiments, the electronic device includes one or more processors and a memory. The memory is configured to store one or more programs. When the one or more programs are executed by the one or more processors, the one or more processors implement the map creation method as described in the above embodiments.

[0160] As shown in FIG. 8, the electronic device 1000 includes: a processor 1001 and a memory 1002. For example, the electronic device 1000 may further include a communication interface 1003 and a communication bus 1004.

[0161] The processor 1001, the memory 1002 and the communication interface 1003 communicate with each other via the communication bus 1004. The communication interface 1003 is configured to communicate with other devices, such as clients, servers or other network elements.

[0162] In some embodiments, the processor 1001 is configured to execute a program 1005, and specifically, to execute the relevant steps in the map creation method as described in the above embodiments. Specifically, the program 1005 may include a program code, which includes a computer-executable instruction.

[0163] For example, the processor 1001 may be a central processing unit (CPU), an application-specific integrated circuit (ASIC), or one or more integrated circuits configured to implement embodiments of the present disclosure. The electronic device 1000 may include one or more processors of the same type, such as one or more CPUs, or may include different types of processors, such as one or more CPUs and one or more ASICs.

[0164] In some embodiments, the memory 1002 is configured to store the program 1005. The memory 1002 may include a high-speed RAM memory, or a non-volatile memory (NVM), such as at least one disk memory.

[0165] The program 1005 may be specifically called by the processor 1001 to enable the electronic device 1000 to perform operations of the method for identifying an identification code.

[0166] Embodiments of the present disclosure provide a computer-readable storage medium having stored therein at least one executable instruction. The executable instruction, when executed on the electronic device 1000, causes the electronic device 1000 to perform the method for identifying an identification code as described in above embodiments.

[0167] The executable instructions can be specifically used to enable the electronic device 1000 to execute the operation of the method for identifying an identification code.

[0168] For example, the computer-readable storage medium may be a read-only memory (ROM), a random access memory (RAM), a compact disc read-only memory (CD-ROM), a magnetic tape, a floppy disk, an optical data storage device, or the like.

[0169] In some embodiments, embodiments of the present disclosure provide a computer program product, which includes a computer program stored on a non-transitory computer-readable storage medium, and the computer program includes a program instruction. The program instruction, when executed by a computer, causes the computer to perform the method for identifying an identification code as described in any of the above embodiments.

[0170] In some embodiments, embodiments of the present disclosure further provide a computer program that, when executed by a processor, causes the method for identifying an identification code as described in any of the above embodiments to be implemented.

[0171] For beneficial effects that are achievable by the warehousing system, the identification device, the electronic device, the computer-readable storage medium, the computer program product and the computer program according to embodiments of the present disclosure, reference may be made to the beneficial effects of the method for identifying an identification code as described above, which will not be repeated here.

[0172] It should be noted that, in the present disclosure, relational terms such as first, second, or the like are used to distinguish one entity or operation from another entity or operation, and do not necessarily require or imply the existence of any such actual relationship or order between these entities or operations. Moreover, terms “comprising”, “including” or any other variations thereof are intended to cover non-exclusive inclusion, so that a process, method, article, or apparatus including a series of elements includes not only those elements, but also other elements not explicitly listed, or elements inherent to such process, method, article, or apparatus. In the absence of further limitations, an element defined by the phrase “including ...” does not exclude the presence of other identical elements in the process, method, article, or apparatus including these elements.

[0173] Various embodiments in this specification are described in a related manner, for similar or same portions among embodiments, reference may be made to each other, and each embodiment focuses on the description of differences from other embodiments. In particular, for device embodiments, due to their similarity to method embodiments, they are described in a relatively brief way, and for related portions, reference may be made to the description of the method embodiments.

[0174] The logic and/or steps represented in a flowchart or described otherwise herein may be considered, for example, as an ordered list of executable instructions for realizing logical functions, and may be specifically embodied in any computer-readable medium for use by, or in conjunction with, an instruction execution system, apparatus, or device (such as a computer-based system, a system including a processor, or other system that is capable of obtaining instructions from an instruction execution system, apparatus, or device and executing the instructions).

[0175] As to the specification, the “computer-readable medium” may be any apparatus that may contain, store, communicate, propagate, or transmit a program for use by or in connection with an instruction execution system, apparatus, or device.

[0176] More specific examples (non-exhaustive list) of computer-readable media include: an electrical connection having one or more wires (electronic device), a portable computer disk cartridge (magnetic device), a random access memory (RAM), a read-only memory (ROM), an erasable and programmable read-only memory (EPROM or flash memory), a fiber optic device, or a portable compact disc read-only memory (CDROM).

[0177] In addition, the computer readable medium may even be paper or other suitable medium on which the program may be printed, because the program may be obtained electronically, for example, by optically scanning the paper or other medium, and editing, interpreting, or processing it in other suitable ways as necessary, and then storing it in a computer memory. It should be understood that various parts of the present disclosure may be implemented in hardware, software, firmware, or a combination thereof.

[0178] In above embodiments, multiple steps or methods may be implemented using software or firmware stored in a memory and executed by a suitable instruction execution system. For example, if implemented using hardware, as in another embodiment, any of the following technologies known in the art or a combination thereof may be used: a discrete logic circuit having a logic gate circuit for implementing a logic function on data signals, an application-specific integrated circuit having suitable combinational logic gate circuits, a programmable gate array (PGA), a field programmable gate array (FPGA), etc.

[0179] Embodiments of the present disclosure as described above do not constitute limitations on the scope of protection of the present disclosure.

WHAT IS CLAIMED IS:

1. A method for identifying an identification code, applied to a control device in a warehousing system, comprising:

obtaining a warehousing map corresponding to a warehousing region, wherein the warehousing map comprises a plurality of cells, a plurality of identification codes are set in the warehousing region, and the plurality of identification codes correspond to the plurality of cells;

determining initial identification information of each of the plurality of cells based on position information of each of the plurality of cells;

in a case where random setting of at least one identification code in the warehousing region is completed, controlling a scanning robot in the warehousing system to scan an identification code corresponding to each cell according to position information of the cell to obtain a scanning result of the identification code corresponding to the cell, wherein the scanning result of the identification code comprises identification information of the identification code; and

in a case where identification information of a target identification code corresponding to a target cell is different from initial identification information of the target cell, updating the initial identification information of the target cell based on the identification information of the target identification code to obtain target identification information of the target cell, wherein the target cell is any of the plurality of cells.

2. The method according to claim 1, wherein the scanning result of the identification code further comprises angle information of the identification code, and the method further comprises:

in a case where an angle deviation between angle information of the target identification code corresponding to the target cell and a preset angle is greater than an angle deviation threshold, determining the target identification code to be an abnormal identification code, and outputting abnormality prompt information.

3. The method according to claim 1, further comprising:

in a case where the identification information of the target identification code corresponding to the target cell is empty or is the same as identification information of at least one identification code that has been scanned, determining the target identification code to be an abnormal identification code, and outputting abnormality prompt information.

4. The method according to claim 1, further comprising:

in a case where the scanning robot scans the target identification code corresponding to the target cell for a time period exceeding a preset time threshold and fails to obtain the identification information

of the target identification code, determining the target identification code to be an abnormal identification code and outputting abnormality prompt information; and

controlling the scanning robot to move from the target cell to a next cell and scan an identification code corresponding to the next cell.

5. The method according to claim 3 or 4, wherein outputting the abnormality prompt information comprises:

controlling a display device in the warehousing system to display a cell corresponding to the abnormal identification code in the warehousing map in a target display manner to prompt a replacement subject to replace the abnormal identification code.

6. The method according to claim 3 or 4, further comprising:

in a case where the target identification code corresponding to the target cell is the abnormal identification code and a replacement subject replaces the target identification code with a substitutive identification code, controlling the scanning robot to scan the substitutive identification code corresponding to the target cell according to position information of the target cell to obtain identification information of the substitutive identification code; and

updating the initial identification information or the target identification information of the target cell to the identification information of the substitutive identification code.

7. The method according to any one of claims 1 to 4, wherein controlling the scanning robot in the warehousing system to scan the identification code corresponding to each cell according to the position information of the cell comprises:

determining at least one target scanning robot from a plurality of scanning robots in the warehousing system and determining a respective target scanning region for each of the at least one target scanning robot, wherein the warehousing region comprises a plurality of scanning regions, and the plurality of scanning regions comprise the target scanning region;

determining a starting scanning point of each target scanning robot in the respective target scanning region according to a position of each target scanning robot; and

controlling each target scanning robot to scan an identification code corresponding to each cell in the respective target scanning region starting from the starting scanning point in the respective target scanning region according to a respective scanning path.

8. The method according to claim 7, wherein determining the starting scanning point for each target scanning robot in the respective target scanning region according to the position of each target scanning robot comprises:

determining, for each target scanning robot, such a cell in the respective target scanning region that is closest to the position of the target scanning robot as the starting scanning point.

9. The method according to claim 7, further comprising:

in a case where a target scanning robot encounters an abnormality during a scanning process of the target scanning robot on an identification code corresponding to each cell in a respective target scanning region, determining a current scanning cell of the target scanning robot; and

controlling a candidate scanning robot in the plurality of scanning robots to move to the current scanning cell and continue to scan an identification code corresponding to an unscanned cell in the respective target scanning region according to a respective scanning path.

10. The method according to any one of claims 1 to 4, further comprising:

controlling a display device in the warehousing system to display a scanned region, an unscanned region and a region being scanned in the warehousing region in different display modes, respectively, during a scanning process of the scanning robot on the warehousing region.

11. The method according to any one of claims 1 to 4, further comprising:

controlling a display device in the warehousing system to display a scanned cell, an unscanned cell and a cell corresponding to an abnormal identification code in the warehousing region in different display modes, respectively, during a scanning process of the scanning robot on the warehousing region.

12. A warehousing system, comprising:

a scanning robot, configured to scan a plurality of identification codes set in a warehousing region; and

a control device, configured to:

obtain a warehousing map corresponding to the warehousing region, wherein the warehousing map comprises a plurality of cells, the plurality of identification codes are set in the warehousing region, and the plurality of identification codes correspond to the plurality of cells;

determine initial identification information of each of the plurality of cells based on position information of each of the plurality of cells;

in a case where random setting of at least one identification code in the warehousing region is completed, control the scanning robot in the warehousing system to scan an identification code corresponding to each cell according to position information of the cell to obtain a scanning result of the identification code corresponding to the cell, wherein the scanning result of the identification code comprises identification information of the identification code; and

in a case where identification information of a target identification code corresponding to a target

cell is different from initial identification information of the target cell, update the initial identification information of the target cell based on the identification information of the target identification code to obtain target identification information of the target cell, wherein the target cell is any of the plurality of cells.

13. An identification device, comprising:

an obtaining module, configured to obtain a warehousing map corresponding to a warehousing region, wherein the warehousing map comprises a plurality of cells, a plurality of identification codes are set in the warehousing region, and the plurality of identification codes correspond to the plurality of cells;

a determining module, configured to determine initial identification information of each of the plurality of cells based on position information of each of the plurality of cells;

a controlling module, configured to, in a case where random setting of at least one identification code in the warehousing region is completed, control a scanning robot in a warehousing system to scan an identification code corresponding to each cell according to position information of the cell to obtain a scanning result of the identification code corresponding to the cell, wherein the scanning result of the identification code comprises identification information of the identification code; and

an updating module, configured to, in a case where identification information of a target identification code corresponding to a target cell is different from initial identification information of the target cell, update the initial identification information of the target cell based on the identification information of the target identification code to obtain target identification information of the target cell, wherein the target cell is any of the plurality of cells.

14. An electronic device, comprising:

one or more processors; and

a memory, configured to store one or more programs that, when executed by the one or more processors, cause the one or more processors to implement the method for identifying an identification code according to any one of claims 1 to 11.

15. A computer-readable storage medium, having stored therein a computer program that, when executed by a processor, causes the method for identifying an identification code according to any one of claims 1 to 11 to be implemented.

16. A computer program product, comprising a computer program that, when executed by a processor, causes the method for identifying an identification code according to any one of claims 1 to 11 to be implemented.