METHOD FOR CARRYING GOODS BY ROBOT

FIELD

[0001] The present disclosure relates to the field of automated warehousing and logistics, and in particular to a method for transporting goods by a robot.

BACKGROUND

[0002] Robots are used for transport in the field of automatic material handling, which has many advantages such as high automation, high flexibility, high safety and reliability, high efficiency, and convenient maintenance. Thus, it is widely used in logistics and transportation places in the automotive manufacturing industry, food industry, tobacco industry, engineering machinery and the like, and also used in various public service places such as airports, hospitals and office buildings. Because of these advantages, the transport robot plays an important role in the modern logistics system, becoming a key member in the "machine substituting for labor" project.

[0003] In 2011, the corporation KIVA proposed a transport method of "shelf-to-person" and achieved great success, referring to patent US7850413B2 for detailed structure and method. Since then, many similar "shelf-to-person" methods have been developed in China with good effects. However, the "shelf-to-person" method has a disadvantage that, to take a piece of goods, an entire shelf has to be transported to a picking area, which causes great waste of resources, and only one kind of goods can be transported at a time.

[0004] Therefore, it is desired to develop a method for transporting goods by a robot, by which a variety of goods can be transported at a time, so as to improve the transport efficiency of the transport robots.

SUMMARY

[0005] In view of the above disadvantages of the conventional technology, the technical issue to be addressed by the present disclosure is how to improve the transport efficiency of the transport robots. Since it is a box to be transported and the volume and weight of the box are much smaller than the shelf, multiple boxes can be transported at a time. Since each box stores at least one type of goods, so multiple types of goods can be transported at a time.

[0006] To achieve the above object, a method for transporting goods by a robot is provided by the present disclosure, which includes the following steps 1 to 7.

[0007] In step 1, a transport robot and shelves are provided. The transport robot includes a drive unit, a box storage unit and a box conveying unit, where the drive unit carries the box storage unit and the box conveying unit to move together. The box storage unit and the shelves each include one or more box storage spaces.

[0008] In step 2, the transport robot automatically moves to a target shelf according to a picking instruction, the box conveying unit picks a box from one of the box storage spaces of the target shelf specified by the picking instruction, and then conveys the box to another box storage space of the box storage unit specified by the picking instruction.

[0009] In step 3, step 2 is repeated, if the picking instruction includes an instruction of picking another box from the same shelf.

[0010] In step 4, the transport robot automatically moves to another shelf, and step 2 is repeated, if the picking instruction includes an instruction of picking another box from the another shelf.

[0011] In step 5, the transport robot automatically moves to a target shelf according to a storing instruction, the box conveying unit picks a box from one of the box storage spaces of the box storage unit specified by the storing instruction, and then conveys the box to another box storage space of the shelf specified by the storing instruction.

[0012] In step 6, step 5 is repeated, if the storing instruction includes an instruction of storing another box into the same shelf.

[0013] In step 7, the transport robot automatically moves to another shelf, and step 5 is repeated, if the storing instruction includes an instruction of storing another box into another shelf.

[0014] Further, the box storage unit may store multiple boxes on layers at different heights, and each of the shelves may store multiple boxes on layers at different heights.

[0015] Further, the boxes on layers at different heights of the box storage unit may be stored on layers at different heights of one of the shelves through the box conveying unit; and the boxes on the layers at different heights of the shelves may be stored on layers at different heights of the box storage unit through the box conveying unit.

[0016] Further, the robot may place a box on a layer of the box storage unit to another layer of the box storage unit.

[0017] Further, the above automatic arrangement may be performed when the robot is moving or not moving.

[0018] Further, the transport robot may store a box on a layer of one of the shelves onto a specified layer of the box storage unit through the box conveying unit, and store a box on another layer of the same shelf onto another specified layer of the box storage unit through the box conveying unit.

[0019] Further, the transport robot may store a box on a layer of one of the shelves onto a specified layer of the box storage unit through the box conveying unit, and store another box on a layer of another shelf onto a specified layer of the box storage unit through the box conveying unit.

[0020] Further, the transport robot may store a box on a layer of the box storage unit onto a specified layer of one of the shelves through the box conveying unit, and store a box on another layer of the box storage unit onto another specified layer of the same shelf through the box conveying unit.

[0021] Further, the transport robot may store a box on a layer of the box storage unit onto a specified layer of one of the shelves through the box conveying unit, and store a box on another layer of the box storage unit onto a specified layer of another shelf through the box conveying unit.

[0022] Further, the transport robot may issue an alarm message when the robot executes the picking instruction but does not obtain any box, or when the robot executes the storing instruction but a target storage space is occupied.

[0023] Another method for transporting goods by a robot is provided by the present disclosure, which includes the following steps.

[0024] The transport robot automatically moves to a target shelf according to a picking instruction, the box conveying unit picks a box from a box storage space of the target shelf specified by the picking instruction, and then conveys the box to another box storage space of a box storage unit specified by the picking instruction.

[0025] Or, the transport robot automatically moves to a target shelf according to a storing instruction, the box conveying unit picks a box from a box storage space of a box storage unit specified by the storing instruction, and then conveys the box to another box storage space of the target shelf specified by the storing instruction.

[0026] Further, the box storage unit may store multiple boxes on layers at different heights;

and a shelf may store multiple boxes on layers at different heights.

[0027] Further, the boxes on layers at different heights of the box storage unit may be stored on layers at different heights of a shelf through the box conveying unit; and the boxes on layers at different heights of a shelf can be stored on the layers at different heights of the box storage unit through the box conveying unit.

[0028] Further, the robot can place a box on a layer of the box storage unit onto another layer of the box storage unit.

[0029] Further, the above automatic arrangement may be performed when the robot is moving or not moving.

[0030] Further, the transport robot may store a box on a layer of a shelf onto a specified layer of the box storage unit through the box conveying unit, and store a box on another layer of the same shelf onto another specified layer of the box storage unit through the box conveying unit.

[0031] Further, the transport robot may store a box on a layer of a shelf onto a specified layer of the box storage unit through the box conveying unit, and store a box on a layer of another shelf onto a specified layer of the box storage unit through the box conveying unit.

[0032] Further, the transport robot may store a box on a layer of the box storage unit onto a specified layer of a shelf through the box conveying unit, and store a box on another layer of the box storage unit onto another specified layer of the same shelf through the box conveying unit.

[0033] Further, the transport robot may store a box on a layer of the box storage unit onto a specified layer of a shelf through the box conveying unit, and store a box on another layer of the box storage unit onto a specified layer of another shelf through the box conveying unit.

[0034] Further, the transport robot may issue an alarm message when the robot executes the picking instruction but does not obtain any box, or when the robot executes the storing instruction but the target storage space is occupied.

[0035] Further, the method may include the following steps.

[0036] The process of storing is repeated, if the instruction includes an instruction of storing another box onto the same shelf, or the process of picking is repeated, if the instruction includes an instruction of picking another box from the same shelf.

[0037] The transport robot automatically moves to another shelf, and process of storing is repeated, if the instruction includes an instruction of storing another box onto the another

shelf; or the transport robot automatically moves to another shelf, and the process of picking is repeated, if the instruction includes an instruction of picking another box from the another shelf.

[0038] With the method for transporting goods by a robot according to the present disclosure, multiple types of goods can be transported at a time, having high work efficiency and low energy consumption.

[0039] The concept, the specific structure and the technical effects of the present disclosure are further described in conjunction with the drawings in order to fully understand the objects, features and effects of the present disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0040] Figure 1 is a schematic diagram of a method for transporting goods by a robot according to a preferred embodiment of the present disclosure.

[0041] Reference numerals in the drawings:

1 drive unit	2 box storage unit
3 box conveying unit	4 shelf
5 box	

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0042] Figure 1 is a schematic diagram of a method for transporting goods by a robot. The method involves a drive unit 1, a box storage unit 2 and a box conveying unit 3 mounted on the drive unit 1, a shelf 4, and boxes 5 which can be stored in the box storage unit 2 and the shelf 4.

[0043] The box storage unit 2 may store multiple boxes 5 on layers at different heights.

[0044] The shelf 4 may store multiple boxes 5 on layers at different heights.

[0045] The boxes 5 on the layers at different heights of the box storage unit 2 can be stored onto the layers at different heights of the shelf 4 through the box conveying unit 3.

[0046] The boxes 5 on the layers at different heights of the shelf 4 can be stored onto the layers at different heights of the box storage unit 2 through the box conveying unit 3.

[0047] The robot has a function of automatically moving and can move to any position under drive of the drive unit 1.

[0048] The robot has a function of automatically arranging the boxes 5. That is, the robot can place a box 5 on a layer of the box storage unit 2 onto another layer of the box storage unit 2.

[0049] When the robot is in operation, the robot may store a box 5 on any layer of the shelf 4 onto a specified layer of the box storage unit 2 through the box conveying unit 3, and store another box 5 on another layer of the same shelf 4 onto another specified layer of the box storage unit 2 through the box conveying unit 3.

[0050] When the robot is in operation, the robot may store a box 5 on any layer of the shelf 4 onto a specified layer of the box storage unit 2 through the box conveying unit 3, and store another box 5 on any layer of another shelf 4 onto a specified layer of the box storage unit 2 through the box conveying unit 3.

[0051] When the robot is in operation, the transport robot may store a box 5 on any layer of the box storage unit 2 onto a specified layer of the shelf 4 through the box conveying unit 3, and store another box 5 on another layer of the box storage unit 2 onto another specified layer of the same shelf 4 through the box conveying unit 3.

[0052] When the robot is in operation, the robot may store a box 5 on any layer of the box storage unit 2 onto a specified layer of the shelf 4 through the box conveying unit 3, and store another box 5 on another layer of the box storage unit 2 onto a specified layer of another shelf 4 through the box conveying unit 3.

[0053] The transport robot may issue an alarm message when the robot executes a picking instruction but cannot obtain the box, or when the robot executes a storing instruction but the target storage space is occupied.

[0054] The preferred embodiment according to the present disclosure is described above in detail. It should be understood that, according to the concept of the present disclosure, many modifications and changes can be made by those skilled in the art without any creative efforts. Therefore, any technical solution that can be obtained through logic analysis, reasoning or limited experimentation on the basis of the prior art by a person skilled in the art according to the concept of the present disclosure should be within the scope of protection determined by the appended claims.

Claims

1. A method for transporting goods by a robot, comprising

step 1, providing a transport robot and shelves, wherein the transport robot comprises a drive unit, a box storage unit and a box conveying unit, and the drive unit is configured to carry the box storage unit and the box conveying unit to move together, and the box storage unit and the shelves each comprise one or more box storage spaces;

step 2, automatically moving, by the transport robot, to a first target shelf according to a picking instruction, picking a first box by the box conveying unit from a first box storage space of the first target shelf specified by the picking instruction, and conveying, by the box conveying unit, the first box to a second box storage space of the box storage unit specified by the picking instruction;

step 3, repeating step 2, if the picking instruction comprises an instruction of picking a second box from the first target shelf;

step 4, automatically moving to a second shelf and repeating step 2, if the picking instruction comprises an instruction of picking a third box from the second shelf;

step 5, automatically moving, by the transport robot, to a second target shelf according to a storing instruction, picking a fourth box by the box conveying unit from a third box storage space of the box storage unit specified by the storing instruction, and conveying, by the box conveying unit, the fourth box to a fourth box storage space of the second target shelf specified by the storing instruction;

step 6, repeating step 5, if the storing instruction comprises an instruction of storing a fifth box into the second target shelf; and

step 7,automatically moving to a third shelf and repeating step 5, if the storing instruction comprises an instruction of storing a sixth box into the third shelf;

wherein the robot has a function of automatically moving and can move to any position under drive of the drive unit;

wherein the method further comprises: performing automatic arrangement by the transport robot when the transport robot is moving or not moving; and

wherein performing automatic arrangement comprises placing a box on a layer of the box storage unit onto another layer of the box storage unit.

2. The method for transporting goods by a robot according to claim 1, comprising:

storing a plurality of boxes on layers at different heights of the box storage unit, and

storing a plurality of boxes on layers at different heights of each of the shelves.

3. The method for transporting goods by a robot according to claim 1, comprising:

storing, by the box conveying unit, the boxes on layers at different heights of the box storage unit onto layers at different heights of any of the shelves, and

storing, by the box conveying unit, the boxes on layers at different heights of any of the shelves onto layers at different heights of the box storage unit.

4. The method for transporting goods by a robot according to claim 1, comprising:

storing, by the transport robot, a box on a layer of any one of the shelves onto a specified layer of the box storage unit through the box conveying unit, and

storing, by the transport robot, a box on another layer of the same one of the shelves onto another specified layer of the box storage unit through the box conveying unit.

5. The method for transporting goods by a robot according to claim 1, comprising:

storing, by the transport robot, a box on a layer of any one of the shelves onto a specified layer of the box storage unit through the box conveying unit, and

storing, by the transport robot, a box on a layer of another one of the shelves onto a specified layer of the box storage unit through the box conveying unit.

6. The method for transporting goods by a robot according to claim 1, comprising:

storing, by the transport robot, a box on a layer of the box storage unit onto a specified layer of one of the shelves through the box conveying unit, and

storing, by the transport robot, a box on another layer of the box storage unit onto another specified layer of the same one of the shelves through the box conveying unit.

7. The method for transporting goods by a robot according to claim 1, comprising:

storing, by the transport robot, a box on a layer of the box storage unit onto a specified layer of one of the shelves through the box conveying unit, and

storing, by the transport robot, a box on another layer of the box storage unit onto a specified layer of another one of the shelves through the box conveying unit.

8. The method for transporting goods by a robot according to claim 1, comprising:

issuing, by the transport robot, an alarm message when the transport robot executes the picking instruction but does not obtain any box, or when the transport robot executes the storing instruction but a target storage space is occupied.

9. A method for transporting goods by a robot, comprising:

automatically moving, by a transport robot, to a target shelf according to a picking instruction, picking a box by a box conveying unit from a box storage space of the target shelf specified by the picking instruction, and conveying the box to another box storage space of a box storage unit specified by the picking instruction; or

automatically moving, by a transport robot, to a target shelf according to a storing instruction, picking a box by a box conveying unit from a box storage space of a box storage unit specified by the storing instruction, and conveying the box to another box storage space of the target shelf specified by the storing instruction;

wherein the robot has a function of automatically moving and can move to any position under drive of the drive unit;

wherein the method further comprises: performing automatic arrangement by the transport robot when the transport robot is moving or not moving; and

wherein performing automatic arrangement comprises placing a box on a layer of the box storage unit onto another layer of the box storage unit.

10. The method for transporting goods by a robot according to claim 9, comprising:

storing a plurality of boxes on layers at different heights of the box storage unit, and

storing a plurality of boxes on layers at different heights of a shelf.

11. The method for transporting goods by a robot according to claim 9, comprising:

storing, by the box conveying unit, boxes on layers at different heights of the box storage unit onto layers at different heights of a shelf, and

storing, by the box conveying unit, boxes on layers at different heights of the shelf onto layers at different heights of the box storage unit.

12. The method for transporting goods by a robot according to claim 9, comprising:

storing, by the transport robot, a box on a layer of a shelf onto a specified layer of the box storage unit through the box conveying unit, and

storing, by the transport robot, a box on another layer of the same shelf onto another specified layer of the box storage unit through the box conveying unit.

13. The method for transporting goods by a robot according to claim 9, comprising:

storing, by the transport robot, a box on a layer of a shelf onto a specified layer of the box storage unit through the box conveying unit, and

storing, by the transport robot, a box on a layer of another shelf onto a specified layer of the box storage unit through the box conveying unit.

14. The method for transporting goods by a robot according to claim 9, comprising:

storing, by the transport robot, a box on a layer of the box storage unit onto a specified layer of a shelf through the box conveying unit, and

storing, by the transport robot, a box on another layer of the box storage unit onto another specified layer of the same shelf through the box conveying unit.

15. The method for transporting goods by a robot according to claim 9, comprising:

storing, by the transport robot, a box on a layer of the box storage unit onto a specified layer of a shelf through the box conveying unit, and

storing, by the transport robot, a box on another layer of the box storage unit onto a specified layer of another shelf through the box conveying unit.

16. The method for transporting goods by a robot according to claim 9, comprising:

issuing, by the transport robot, an alarm message when the transport robot executes the picking instruction but does not obtain any box, or when the transport robot executes the storing instruction but a target storage space is occupied.

17. The method for transporting goods by a robot according to claim 9, further comprising:

repeating the picking if the instruction comprises an instruction of picking another box from the same shelf, or repeating the storing if the instruction comprises an instruction of storing another box to the same shelf; and

moving automatically to another shelf and repeating the picking if the instruction comprises an instruction of picking another box from the another shelf, or moving automatically to another shelf and repeating the storing if the instruction comprises an instruction of storing another box to the another shelf.