

CLAIMS

What is claimed is:

1. A robot, comprising: a movable base, a robot shelving unit, a lifting device, and an object transferring device, wherein

the robot shelving unit is mounted on the movable base;

the movable base is configured to move to a first target object position comprised in a first transferring task and move to a second target object position comprised in a second transferring task, wherein the first target object position is different from the second target object position, one of the first transferring task and the second transferring task is a goods taking task, and the other one is a returning task; the second carrying task is received during performance of the first carrying task;

the lifting device and the object transferring device are mounted on the robot shelving unit, and the lifting device is configured to drive the object transferring device to move up or down relative to the robot shelving unit;

wherein the object transferring device is configured to transfer a first target object between the robot shelving unit and the first target object position, the object transferring device is configured to transfer a second target object between the robot shelving unit and the second target object position; and

wherein the robot is configured to perform the second carrying task during the performance of the first carrying task.

2. The robot according to claim 1, wherein when the second transferring task is the returning task, the second target object position is a returning position, the movable base reaches a returning position during traveling to the first target object position; and the object transferring device cooperates with the lifting device to transfer the second target object from the robot shelving unit to the returning position.

3. The robot according to claim 2, wherein the returning position is any one of an initial storage position of the second target object, and a position of a vacant storage space, ~~and a position of the first target object; and when the returning position is the position of the first target object, the object transferring device transfers the first target object to the robot shelving unit and then transfers the second target object to the position of the first target object.~~

4. The robot according to claim 1, wherein the object transferring device comprises at least one transferring mechanism mounted on the robot shelving unit, and the transferring mechanism is configured to pick or place a target object.

~~5. The robot according to claim 4, wherein the object transferring device comprises at least one of a suction-cup fork assembly and/or a machine-clamping arm.~~

65. The robot according to claim 4, wherein when the object transferring device comprises at least two transferring mechanisms, the at least two transferring mechanisms are arranged in parallel along a direction perpendicular to a lifting direction or arranged in different layers in a the lifting direction.

76. The robot according to claim 65, wherein when the at least two transferring mechanisms are arranged in parallel, the at least two transferring mechanisms are located on the robot shelving unit, and the at least two transferring mechanisms are an integrated structure; or

~~8. The robot according to claim 6, wherein when the at least two transferring mechanisms are arranged in parallel, the robot shelving unit comprises three or more columns arranged on the movable base in a same vertical plane; each transferring mechanism is mounted between two adjacent columns and moves up or down relative to the columns; and the transferring mechanisms are allowed or not allowed to move relative to each other; or~~

~~9. The robot according to claim 6, wherein when the at least two transferring mechanisms are arranged in parallel, the lifting device comprises two lifting assemblies, wherein the two lifting assemblies are respectively mounted on two opposing sides of the robot shelving unit, two ends of the object transferring device are respectively connected to the two lifting assemblies, and the two lifting assemblies drive the object transferring device to move up or down relative to the robot shelving unit.~~

~~107. The robot according to claim 65, wherein when the at least two transferring mechanisms are arranged in different layers in the lifting direction, the transferring mechanisms are allowed or not allowed to move relative to each other; or~~

~~11. The robot according to claim 6, wherein when the at least two transferring mechanisms are arranged in different layers in the lifting direction, the at least two transferring mechanisms are located on the robot shelving unit, and the at least two transferring mechanisms are an integrated structure; or~~

~~12. The robot according to claim 6, wherein when the at least two transferring mechanisms are arranged in different layers in the lifting direction, the lifting device comprises two lifting assemblies, wherein the two lifting assemblies are respectively mounted on two opposing sides of the robot shelving unit, two ends of each of the transferring mechanisms are respectively connected to the two lifting assemblies, and the two lifting assemblies drive each of the transferring mechanisms to move up or down relative to the robot shelving unit.~~

138. The robot according to claim 4, wherein when there are two transferring mechanisms, one of the transferring mechanisms is configured to transfer a target object on a warehouse shelving unit to the robot shelving unit, and the other one of the transferring mechanisms is configured to move a target object on the robot shelving unit to the warehouse shelving unit.

5 149. The robot according to any one of claims 4 to 138, wherein when the first transferring task is the goods taking task, and the robot performs the first transferring task~~goods taking task~~, the robot travels to a goods taking position of the first target object, the goods taking position of the first target object is the first target object position; and

10 one of the at least one transferring mechanism in the object transferring device moves to the goods taking position of the first target object through the lifting device and takes out the first target object from the warehouse shelving unit and then places the first target object on the robot shelving unit; or

15 when the second transferring task is the goods returning task, and the robot performs the second transferring task, the robot travels to a returning position of the second target object, the returning position of the second target object is the second target object position; and one of the at least one transferring mechanism in the object transferring device moves the second target object on the robot shelving unit to the returning position of the second target object through the lifting device, and pushes the second target object to the returning position of the second target object.

20 1510. The robot according to claim 149, wherein after the goods taking task for the first target object is performed, one of the at least one transferring mechanism in the object transferring device moves the second target object on the robot shelving unit to the goods taking position of the first target object through the lifting device, and pushes the second target object to the goods taking position of the first target object.

25 ~~16. The robot according to any one of claims 4 to 13, wherein when the robot performs the returning task, the robot travels to a returning position of the second target object; and~~

~~one of the at least one transferring mechanism in the object transferring device moves the second target object on the robot shelving unit to the returning position of the second target object through the lifting device, and pushes the second target object to the returning position of the second target object.~~

30 ~~17. The robot according to any one of claims 4 to 13, wherein at least two storage spaces for storing target objects are arranged on the robot shelving unit.~~

~~18. The robot according to any one of claims 4 to 13, wherein each transferring mechanism~~

~~comprises a temporary storage tray and two telescopic arms oppositely arranged on the temporary storage tray in parallel, inner arms of the telescopic arms comprise a transferring assembly, and the transferring assembly comprises a push rod assembly and/or a clamping assembly.~~

5 ~~1911. A goods transferring method, applicable to the robot according to any one of claims 1 to 18, wherein the method comprises:~~ executed by a robot and comprising:

~~acquiring a transferring task sequence to perform the~~ a first transferring task, wherein a first target object position is acquired from the first transferring task; and

~~performing the~~ a second transferring task when the first transferring task is performed,
10 wherein a second target object position is acquired from the second transferring task, the first target object position is different from the second target object position, one of the first transferring task and the second transferring task is a goods taking task, and the other one is a returning task, and

~~wherein the second carrying task is received during performance of the first transferring task the second transferring task is acquired during execution of the first transferring task, or the acquired transferring task sequence comprises the second transferring task.~~

~~2012. The method according to claim 1911, wherein the robot periodically or aperiodically reports at least one piece of information of position information and vacant slot information to a server;~~ or

20 ~~21. The method according to claim 19,~~ wherein when receiving a requirement of a server, the robot reports at least one piece of information of position information and vacant slot information to the server.

~~2213. The method according to claim 19 11,~~ wherein when the second transferring task is the returning task, the performing the second transferring task when the first transferring task
25 is performed comprises:

 acquiring a first target object position from the first transferring task, and acquiring a returning position of a second target object from the second transferring task;

 reaching the returning position of the second target object to perform the returning task during traveling to the first target object position; and

30 traveling to the first target object position to perform the goods taking task.

~~2314. The method according to claim 2213,~~ wherein the returning position of the second target object in the second transferring task comprises:

 an initial storage position of the second target object; or

 a position of a vacant storage space;~~or~~

~~a position of the first target object.~~

2415. The method according to claim 2314, wherein the acquiring a returning position of a second target object from the second transferring task comprises:

acquiring positions corresponding to U vacant storage spaces from the second transferring task, wherein distances between the positions corresponding to the U vacant storage spaces and a goods taking path of the robot are within a first preset range, and/or distances between the positions corresponding to the U vacant storage spaces and the robot are within a second preset range; U is a natural number greater than 0; and the goods taking path is generated according to the position information and the first target object position comprised in the first transferring task.

2516. The method according to claim 2314, wherein the acquiring a returning position of a second target object from the second transferring task comprises:

acquiring positions corresponding to U vacant storage spaces from the second transferring task, wherein a first increased time generated when the robot returns goods according to the positions corresponding to the U vacant storage spaces is not greater than a first preset threshold, and/or a first movement distance increased when the robot returns goods according to the positions corresponding to the U vacant storage spaces is not greater than a second preset threshold; and U is a natural number greater than 0.

2617. The method according to claim 1911, wherein when the second transferring task is the goods taking task, the performing the second transferring task when the first transferring task is performed comprises:

acquiring a first target object position from the first transferring task, and acquiring a goods taking position of a second target object from the second transferring task;

reaching the goods taking position of the second target object to perform the goods taking task during traveling to the first target object position; and

traveling to the first target object position to perform the returning task.

2718. The method according to claim 2617, wherein the acquiring a goods taking position of a second target object from the second transferring task comprises:

acquiring goods taking positions of N second target objects from the second transferring task, wherein distances between the goods taking positions of the N second target objects and a returning path are within a third preset range, and/or distances between the goods taking positions of the N second target objects and the robot are within a fourth preset range; N is a natural number greater than 0; and the returning path is generated according to the position information and the first target object position comprised in the first transferring task.

2819. The method according to claim 2617, wherein the acquiring a goods taking position of a second target object from the second transferring task comprises:

acquiring goods taking positions of N second target objects from the second transferring task, wherein a second increased time generated when the robot takes goods according to the goods taking positions of the N second target objects is not greater than a third preset threshold, and/or a second movement distance increased when the robot takes goods according to the goods taking positions of the N second target objects is not greater than a fourth preset threshold, and N is a natural number greater than 0.

2920. The method according to any one of claims 19-11 to 2819, wherein the first transferring task and the second transferring task are related to any one or more of the following constraints:

a total moving duration for which the robot completes the goods taking task and the returning task;

a total quantity of times that a goods taking operation and a returning operation are performed when the robot completes the goods taking task and the returning task;

a total traveling distance by which the robot completes the goods taking task and the returning task; and

a goods loading rate when the robot completes the goods taking task and the returning task.

3021. The method according to any one of claims 19-11 to 2819, wherein when a shelving unit for placing goods has two or more storage positions in a depth direction of the shelving unit, and a target object position indicated by the goods taking task or the returning task is a second position or a position after the second position among the storage positions, the method further comprises:

transferring non-target goods placed before the target object position to a vacant slot of the robot;

performing the goods taking task or the returning task for the target object position; and

returning the non-target goods to an original storage position of the non-target goods on the shelving unit, or returning the non-target goods to a vacant storage position, wherein the vacant storage position and the target object position belong to a same shelving unit or different shelving units.

3122. The method according to any one of claims 19-11 to 2819, further comprising:

receiving a tally task allocated by the server, wherein the tally task comprises: performing goods sorting on target objects, and/or adjusting storage positions of the target objects; and

performing the tally task, wherein an execution occasion of the tally task comprises any one of the following cases:

before the first transferring task and the second transferring task;

between the first transferring task and the second transferring task;

5 after the first transferring task and the second transferring task; and

during execution of any task in a task sequence formed by the first transferring task and the second transferring task.

~~32~~23. A server, comprising:

a processor; and

10 a memory, configured to store executable instructions of the processor, wherein

the processor is configured to allocate a first transferring task and a second transferring task for the robot according to any one of claims 1 to ~~18~~10 by executing the executable instructions.

~~33~~24. A warehousing system, comprising: the robot according to any one of claims 1 to

15 ~~18~~10, the server according to claim ~~32~~23, a shelving unit, and an operating platform, wherein the robot is communicatively connected to the server;

the server allocates the first transferring task and the second transferring task to the robot; and

the robot performs the goods transferring method according to any one of claims ~~19~~11 to

20 ~~31~~22, to implement goods transferring between the shelving unit and the operating platform.

~~34~~25. A storage medium, having a computer program stored thereon, wherein when the program is executed by a processor, the goods transferring method according to any of claims ~~19~~11 to ~~31~~22 is implemented.