

DESCRIPTION

TITLE OF INVENTION: A CONTROL METHOD, DEVICE, EQUIPMENT, AND STORAGE MEDIUM FOR BAGGAGE HANDLING ROBOT

FIELD OF THE INVENTION

The present disclosure relates to the field of robotics, and in particular, to a control method, device, equipment, and storage medium for a baggage handling robot.

BACKGROUND OF THE INVENTION

Currently, travelers often carry their own baggage when arriving at hotels. However, many hotels do not offer baggage handling services. As a result, guests often must carry their baggage themselves or rely on assistance from hotel staff. This manual handling process is laborious, time-consuming, and inefficient. Furthermore, it is prone to human error and poses safety risks, such as injuries from handling heavy items.

SUMMARY OF THE INVENTION

An objective of the present disclosure is to provide a control method, device, equipment, and storage medium for a baggage handling robot, which solves the problems in the prior art of inefficient, labor-intensive, and error-prone manual baggage handling.

To achieve the above objective, the technical solution of the present disclosure is described as follows:

Step S1: activating the baggage handling robot and setting a target position;

Step S2: performing an automatic baggage handling operation based on the target position;

Step S3: performing real-time monitoring of a performance of the automatic baggage handling operation and outputting real-time monitoring data.

In some embodiments, prior to commencement of said step S1, said baggage handling robot completes a self-check.

In some embodiments, the method further comprises:

Step S4: reading the real-time monitoring data, parsing and evaluating the real-time monitoring data, and outputting a corresponding determination result.

In some embodiments, said step S4 comprises:

Step S41: detecting baggage placed on a tray of said baggage handling robot;

Step S42: reading real-time position data of said baggage handling robot, and comparing said real-time position data with said target position to generate a position comparison result.

In some embodiments, the method further comprises:

Step S5: adjusting an operating state of said baggage handling robot based on said determination result.

In some embodiments, said step S5 comprises:

Step S51: receiving said position comparison result of said baggage handling robot;

Step S52: adjusting a path of said baggage handling robot based on said position comparison result.

In some embodiments, the method further comprises:

Step S6: performing, by said baggage handling robot, a room inspection operation after completion of the automatic baggage handling operation.

In another aspect, the present disclosure provides:

A baggage handling robot device, comprising:

a control module configured to receive an activation command and set a target position request;

an execution module configured to parse and execute the target position request from said control module;

a monitoring module configured to perform real-time monitoring based on a position of the baggage handling robot device and output real-time monitoring data.

In another aspect, the present disclosure provides:

A baggage handling robot device, comprising: a memory; a processor; and a baggage handling robot program stored in the memory and executable by the processor, wherein the baggage handling robot program is configured to implement the control method.

In another aspect, the present disclosure provides:

A tangible non-transitory computer-readable storage medium having stored thereon a computer program which, when executed by a processor, causes the processor to perform the control method.

Compared to the prior art, the control method of the present disclosure

controls the baggage handling robot to automate the handling process, saving time and labor, and thereby significantly improving handling efficiency.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic diagram of a hardware structure of a baggage handling robot according to one embodiment.

FIG. 2 is a flowchart of a first embodiment of a control method for a baggage handling robot according to one embodiment.

FIG. 3 is a flowchart of a second embodiment of the control method according to one embodiment.

FIG. 4 is a flowchart of a third embodiment of the control method according to one embodiment.

FIG. 5 is a flowchart of a fourth embodiment of the control method according to one embodiment.

FIG. 6 is a flowchart of a fifth embodiment of the control method according to one embodiment.

FIG. 7 is a flowchart of a sixth embodiment of the control method according to one embodiment.

FIG. 8 is a flowchart of an eighth embodiment of the control method according to one embodiment.

FIG. 9 is a block diagram of a first embodiment of a baggage handling robot apparatus according to one embodiment.

DESCRIPTION OF THE EMBODIMENTS

The following describes various embodiments in detail to clearly illustrate the objectives, technical solutions, and advantages of the present disclosure. It is to be understood that the embodiments described herein are provided to explain the disclosure and are not to be construed as limiting.

As used in this description, terms of orientation (e.g., "vertical," "horizontal," "front," "rear") refer to the relative positions as shown in the accompanying drawings and are used for clarity of description only, not to limit the actual orientation of any apparatus. Similarly, unless expressly stated otherwise, terms such as "mounted," "connected," and "coupled" are to be construed broadly. For example, a connection may be permanent or removable, mechanical or electrical, direct or through an intermediary. The specific meaning of such terms will be readily understood by a person having ordinary skill in the art in the relevant context.

FIG. 1 is a schematic diagram of a hardware environment of a baggage handling robot according to one embodiment.

As shown in FIG. 1, a baggage handling robot may include: a processor 1001 (e.g., a Central Processing Unit (CPU)), a communication bus 1002, a user interface 1003, a network interface 1004, and a memory 1005. The communication bus 1002 is configured to provide communicative coupling between these components. The user interface 1003 may include a display, an input device (e.g., a keyboard), and, optionally, a standard wired interface and/or

a wireless interface. The network interface 1004 may include a standard wired interface and/or a wireless interface (e.g., a Wi-Fi interface). The memory 1005 may be a high-speed random access memory (RAM), a persistent non-volatile memory (e.g., a disk drive), or may be a storage device separate from the processor 1001.

A person having ordinary skill in the art will appreciate that the configuration shown in FIG. 1 is exemplary. The baggage handling robot may include components different from those illustrated, and may incorporate fewer, more, or different components, or have a different arrangement thereof.

As shown in FIG. 1, the memory 1005 may include an operating system, a network communication module, a user interface module, and a baggage handling robot program.

In the device illustrated in FIG. 1, the network interface 1004 is configured for data communication with a network server, and the user interface 1003 is configured for user interaction. The baggage handling robot, via the processor 1001, executes the baggage handling robot program stored in the memory 1005 to perform the control method according to an embodiment.

An embodiment of the present disclosure provides a control method for a baggage handling robot. FIG. 2 is a flowchart of a first embodiment of the control method.

In this embodiment, the control method for the baggage handling robot comprises the following steps:

Step S1: activating the baggage handling robot and setting a target position.

In a specific implementation, a request to activate the baggage handling robot includes characteristic data for initiating activation. After activation, the robot determines navigation or operational software data based on the set target position. The target position may include a hotel room number, a front desk, a lobby, or other baggage storage areas.

Step S2: performing an automatic baggage handling operation based on the target position.

After a user safely places the baggage on a tray or a fixed position of the robot, the baggage handling robot autonomously navigates along a default path to the set target position, thereby transporting the baggage to the destination.

Step S3: monitoring an execution status of the automatic baggage handling operation and outputting real-time monitoring data.

During operation, the baggage handling robot monitors its route in real-time. It may encounter pedestrians or obstacles and will autonomously adjust its path to avoid them, thereby ensuring the safe handling of the baggage.

FIG. 3 is a schematic flowchart of an embodiment 2 of a control method for a baggage handling robot according to the present invention.

Based on the first embodiment, the method further comprises the following step prior to Step S1: performing, by the baggage handling robot, a self-check.

Prior to activation, the baggage handling robot verifies that its battery level is sufficient for the maximum anticipated range and checks the operational status

of its internal components.

FIG. 4 is a schematic flowchart of an embodiment 3 of a control method for a baggage handling robot according to the present invention..

Based on the embodiment 1, the method further comprises:

Step S4: reading the real-time monitoring data to parse and evaluate it, and outputting a corresponding determination result.

During the baggage handling operation, the robot performs an analysis to determine adjustments to its path, calculates an optimal path. The determined optimal path is then fed back to the baggage handling robot, which autonomously transports the baggage to the target location.

FIG. 5 is a schematic flowchart of an embodiment 4 of a control method for a baggage handling robot according to the present invention.

Based on the aforesaid embodiment 1, the method further comprises:

Step S5: adjusting an operating state of the baggage handling robot based on said determination result.

The adjustment of the operating state comprises optimizing a path of the baggage handling robot based on the determination result.

FIG. 6 is a schematic flowchart of an embodiment 5 of a control method for a baggage handling robot according to the present invention.

Based on the aforesaid embodiment 1, the method further of Step 4 comprises:

Step S41: detecting that baggage has been placed on a tray of the baggage

handling robot;

Step S42: reading real-time position data of the baggage handling robot and comparing the real-time position data with the target position to generate a position comparison result.

The baggage handling robot is equipped with sensors and cameras. During operation, it collects data using these sensors and cameras and uploads the data in real-time to a control module, which analyzes the data for navigation and path planning.

FIG. 7 is a schematic flowchart of an embodiment 6 of a control method for a baggage handling robot according to the present invention.

Based on the aforesaid embodiment 1, the method further of Step 5 comprises:

Step S51: receiving the position comparison result from the baggage handling robot;

Step S52: adjusting a path of the baggage handling robot based on the position comparison result.

The control module adjusts the path based on the position comparison result and sensor data collected during obstacle avoidance.

FIG. 8 is a flowchart of a seventh embodiment of the control method according to one embodiment.

Based on the first embodiment described above, the present embodiment further comprises step S6, performing, by said baggage handling robot, a room

inspection operation after completion of the automatic baggage handling operation.

Step S6 comprises:

Step S61: configuring inspection items and performing an inspection operation;

Step S62: performing real-time monitoring and outputting real-time monitoring data;

Step S621: inspecting electrical appliances and room tidiness in a user-occupied room;

Step S622: reading imaging data and comparing the imaging data with a preset value to generate an imaging determination result;

Step S623: upon completion of the inspection, transmitting inspection results to a user and returning to a charging station.

Upon confirming arrival at the target position, the baggage handling robot prompts the user to unload the baggage and initiates an inspection of the room. The inspection includes checking electrical appliances and overall cleanliness. Upon completion, the robot generates a detailed inspection report and transmits it to the control module. The system can then notify the front desk to request maintenance for faulty appliances or cleaning for an unsatisfactory room condition.

The baggage handling robot connects to a terminal device, such as a mobile phone, tablet, or computer. On this device, a user can view the robot's status in

real-time, set a target position for baggage handling, and access room-specific information, including the room number and electrical appliance status. A user can launch a control application on a tablet or mobile phone, connect to the robot via Wi-Fi or Bluetooth, and authenticate themselves. A hotel can synchronize guest check-in information with the robot, enabling registered guests to utilize the in-room service.

Upon arriving at a charging station, the baggage handling robot automatically initiates charging, ensures proper charging contact, and checks its battery status. The robot's functions and components are regularly inspected to ensure proper operation, and its sensors and external surfaces are cleaned to maintain operational readiness.

FIG. 9 is a block diagram of a first embodiment of a baggage handling robot apparatus according to one embodiment.

As shown in FIG. 9, the apparatus comprises:

- a control module configured to receive an activation command and set a target position request;

- an execution module configured to parse and execute the target position request from the control module;

- a monitoring module configured to perform real-time monitoring based on a position of the apparatus and output monitoring data.

The control module is responsible for high-level task planning, navigation algorithms, and image processing. It communicates with the execution module

via a serial port to transmit motion commands and receive feedback data.

The execution module includes a motion controller based on an STM32 Microcontroller Unit (MCU) for real-time motion control. This module receives motion commands from the control module, processes them to control motor movement, and feeds back data from an Inertial Measurement Unit (IMU) and odometry sensors to the control module.

In this embodiment, the baggage handling robot is activated and a target position is set upon receiving an activation command and a target position request. An automatic baggage handling operation is performed based on the target position. The execution of this operation is monitored in real-time, and real-time monitoring data is output. Features such as autonomous navigation, autonomous following, hands-free operation, precise motion control, and a multi-functional inspection system significantly improve hotel service efficiency and quality, reduce labor costs and potential safety hazards, and introduce substantial improvements and innovation to hotel management.

The autonomous following and hands-free functions utilize the real-time monitoring capability of the baggage handling robot. When a user activates the autonomous following function, cameras or sensors on the robot detect if a user in front is a designated object. If so, the robot follows the person, moving when they walk and stopping when they stop. Similarly, for the hands-free function, the robot detects a designated user behind or beside it. When that user walks, the robot moves forward, and stops when the user stops, thereby enabling hands-free operation and preventing collisions or loss of tracking.

The foregoing examples are provided as illustrative embodiments of the

present disclosure and are not to be construed as limiting. A person having ordinary skill in the art may make various modifications in practice without departing from the scope of the disclosure.

The workflows and embodiments described herein are provided to illustrate the present disclosure and are not to be construed as limiting its scope. A person having ordinary skill in the art may utilize some or all of the described steps and elements, or their equivalents, to achieve the disclosed objectives without departing from the scope of the disclosure.

Details regarding [specific technical aspect, e.g., sensor data processing] not fully elaborated in this embodiment may be found in the descriptions of other embodiments within this disclosure.

Moreover, it is to be understood that, as used herein, the terms "comprise," "comprising," "include," "including," or any other variation thereof, are intended to denote non-exclusive inclusion, such that a process, method, article, or system that includes a series of elements not only includes those elements, but also other elements not expressly recited, or elements inherent to such process, method, article, or system. Absent any further limitation, an element limited by the phrase "comprising an..." does not preclude the presence of one or more additional identical elements in the process, method, article, or system comprising that element.

The sequence numbers of the foregoing embodiments of the present invention are solely for descriptive purposes and are not indicative of the relative merits of the embodiments.

From the description of the above embodiments, one of ordinary skill in the art can clearly appreciate that the methods of the above embodiments can be

implemented by way of software in conjunction with a necessary general-purpose hardware platform. Certainly, implementation purely through hardware is also possible; however, in many cases, the former is the preferred mode of implementation. Based on this understanding, the technical solution of the present invention, in essence, or the part of the present invention that contributes to the prior art, can be embodied in the form of a computer program product. This computer program product is stored on a tangible non-transitory computer readable medium (such as Read Only Memory (ROM)/RAM, a magnetic disk, or an optical disk), and comprises a plurality of instructions for causing a terminal device (which may be a mobile phone, a computer, a server, or a network device, etc.) to perform the methods described in the various embodiments of the present invention.

The foregoing are merely preferred embodiments of the present invention, and are not intended to limit the patent scope of the present invention. Any equivalent structures or equivalent process modifications made based on the disclosure of the specification and accompanying drawings of the present invention, or directly or indirectly applied to other related technical fields, are similarly encompassed within the scope of patent protection of the present invention.

Claim

1. A control method for a baggage handling robot, the method comprising:
Step S1: activating the baggage handling robot and setting a target position;
Step S2: performing an automatic baggage handling operation based on the target position;
Step S3: performing real-time monitoring of a performance of the automatic baggage handling operation and outputting real-time monitoring data.
2. The control method of claim 1, wherein prior to commencement of said step S1, said baggage handling robot completes a self-check.
3. The control method of claim 1 or 2, wherein the method further comprises:
Step S4: reading the real-time monitoring data, parsing and evaluating the real-time monitoring data, and outputting a corresponding determination result.
4. The control method of claim 3, wherein said step S4 comprises:
Step S41: detecting baggage placed on a tray of said baggage handling robot;
Step S42: reading real-time position data of said baggage handling robot, and comparing said real-time position data with said target position to generate a position comparison result.
5. The control method of claim 3, wherein the method further comprises:
Step S5: adjusting an operating state of said baggage handling robot based on said determination result.
6. The control method of claim 5, wherein said step S5 comprises:
Step S51: receiving said position comparison result of said baggage handling

robot;

Step S52: adjusting a path of said baggage handling robot based on said position comparison result.

7. The control method of claim 6, wherein the method further comprises:

Step S6: performing, by said baggage handling robot, a room inspection operation after completion of the automatic baggage handling operation.

8. A baggage handling robot device, comprising:

a control module configured to receive an activation command and set a target position request;

an execution module configured to parse and execute the target position request from said control module;

a monitoring module configured to perform real-time monitoring based on a position of the baggage handling robot device and output real-time monitoring data.

9. A baggage handling robot device, comprising: a memory; a processor; and a baggage handling robot program stored in the memory and executable by the processor, wherein the baggage handling robot program is configured to implement the control method as in any one of claims 1-7.

10. A tangible non-transitory computer-readable storage medium having stored thereon a computer program which, when executed by a processor, causes the processor to perform the control method as in any one of claims 1-7.