

TITLE

AUTONOMOUS SERVICE ROBOT

TECHNICAL FIELD

[001] The present invention relates to a robotic apparatus for one or more types of services that is able to operate and navigate in an autonomous and self-propelled manner.

BACKGROUND ART

[002] The background description provided herein is for the purpose of generally presenting the context of the disclosure and to provide more a complete scientific background. Any work described in this background section, as well as aspects of the description that may not otherwise qualify as prior art at the time of filing, are neither expressly or impliedly admitted as prior art against the present disclosure.

[003] Conventionally, the service industry is supplied by manual labour. For example, concierge services at hotels, helpdesk services at malls or hospitals, and delivery of food items in restaurants, luggage in airports or mail in post offices. Manual delivery is labour intensive and can be costly.

[004] Moreover, service work may be deemed as “low-skilled” and are generally of a lower pay range. Consequently, such work is unattractive to job seekers and can result in a manpower shortage issues.

[005] In some industries, some services have been automated. For example, certain bank teller tasks have been replaced by the automated teller machine (ATM) and helpdesk roles have been replaced by touchscreen e-concierge.

SUMMARY OF INVENTION

Technical Problem

[006] Although some services tasks have been automated, such alternatives are stationary and have limited interactive capabilities.

[007] It is therefore an object of the invention to alleviate one or more of the above problems.

Solution to Problem

[008] In various embodiments of the invention, there is disclosed a robotic apparatus for service comprising a main body housing defining an internal volume for containing electrical and/or mechanical components; a frame contiguous with the main body housing, the frame configured to receive one or more pallets; at least one pallet to be received by the frame, the at least one pallet configured to receive an article to be delivered; a computer (also referred to as an internal computer) contained in the main body housing; a set of three or more drive wheels which allow the main body housing to move in a plurality of directions (preferably omni-directionally); a drive mechanism such as a motor to power the drive wheels; and a battery to power at least the internal computer and motor. The internal computer is configured for the operations of the various components of the robotic apparatus system as a whole.

[009] The robotic apparatus may be able to move omni-directionally using the drive wheels located at the base of the housing. Utilising the onboard computer and internal logic, coupled with an onboard battery, the system may apply power to the drive motors that enables the robotic apparatus to navigate and move over a target area in a self-propelled, artificially intelligent fashion. The system may provide proper time-on-target via speed control, and the capability to make several passes or to rely on a pre-programmed routine. The system may allow two or more robotic apparatus to cooperate within a target area. In some embodiments the two or more robotic apparatus may be configured or arranged in data communication with a server computer so as to facilitate the two or more robotic apparatus to cooperate within the target area. The data communication may be provided via wireless or wired data

communication devices. The server computer may be a central server, such as a cloud based server.

[010] The frame may comprise a user interface, such as but not limited to, a touchscreen display configured to provide visual output and to receive an input by simple or multi-touch. This allows a user to input a query or a command and depending on the scenario, the system may then provide a visual response or the robotic apparatus may move to guide the user or deliver an article on the at least one pallet.

[011] The frame may comprise a deep visual learning sensor that is able to capture and identify the user's emotions. Coupled with a display, for example LED-display on the frame, the robotic apparatus can provide an interactive communication with the user by depicting a number of bionic and vivid expression packages mimicking human-like emotions such as happiness and sadness.

[012] The frame may also comprise one or more sensors for detecting the presence or absence of an article to be delivered. The sensors may be infrared sensors.

[013] The frame may also comprise touch sensors for receiving an external cue. It is contemplated that receipt of an external cue may direct the robot apparatus to return to a predetermined location.

[014] The robotic apparatus may also comprise an audio input for receiving an external cue and/or an audio output for the issuance of verbal cues or to "speak".

[015] The external sensors onboard the system may allow for detection of obstacles, and the measurement of ambient conditions, that may enable the internal computer to make decisions on how to effectively move within a target area, to provide full coverage of the location while avoiding stationary and/or movable obstacles such as objects or humans. Should there be any obstacles in the path of the robotic apparatus, the internal computer may provide alternative

navigation guidance, and may move the robotic apparatus based on alternative paths or routes to arrive at a target location.

Advantageous Effects of Invention

[016] The present invention establishes a system that is able to navigate and move in a target area in a responsive and adaptive manner, and therefore provide full and effective coverage of the location of interest. The ability to respond to obstacles and the specific configurations of any location allows the system to autonomously persist in executing a given directive.

[017] The robotic apparatus of the invention is able to move, under the guidance of the internal computer, to provide a guiding service, for example to guide a person from point A to point B.

[018] The robotic apparatus of the invention may be configured to deliver an article, which may be received on the at least one pallet, from a predetermined location to another predetermined location.

[019] The robotic apparatus of the invention is able to provide an interactive user experience with the usage of deep learning sensors to capture and identify the user's emotions. The internal computer may include a non-transitory computer readable medium, the non-transitory computer readable medium configured to execute one or more artificial intelligence algorithms. With the application of artificial intelligence by the internal computer, the system can provide an interactive communication with the user with its ability to move, speak or depict bionic and vivid expression packages mimicking human-like emotions.

[020] Additionally, the robotic apparatus of the invention is able to detect the presence or absence of an article on the at least one pallet. It is contemplated that sensors can also be used to determine if an article has been altered due to changes in height of the article, for example, a difference in height between a loaded plate and an emptied plate. Detection of such can enable

the internal computer to make decisions on whether the robotic apparatus should move to a predetermined location.

BRIEF DESCRIPTION OF THE DRAWINGS

[021] [Fig. 1] is a front side view showing a robotic apparatus according to an embodiment of the present invention.

[Fig. 2] is a rear side view showing a robotic apparatus according to the embodiment of the present invention.

[Fig. 3] is another side view showing the robotic apparatus according to the embodiment of the present invention.

[Fig. 4] is a perspective view showing the robotic apparatus according to the embodiment of the present invention.

[Fig. 5] is a top view showing the robotic apparatus according to the embodiment of the present invention.

[Fig. 6] is a bottom view showing the robotic apparatus according to the embodiment of the present invention.

DETAILED DESCRIPTION

[022] Hereinafter, an embodiment of the present invention is described with reference to the drawings. Fig. 1 is a front side view showing a robotic apparatus 1 according to an embodiment of the invention. The robotic apparatus 1 comprises a main body housing 2 with a frame 3, sensor ports 4, a display 5, deep visual learning sensors 6. Not shown, the robotic apparatus comprises an internal computer, a battery, electrical connections to the battery, charging connectors, and a motor, which are contained in the main body housing. The motor draws electrical energy from the battery, and powers the drive wheels 7 based on directions as provided by the internal computer.

[023] The sensor ports 4 may be adapted for receiving at least one of a LIDAR sensor, simultaneous localization and mapping (SLAM) sensor, machine vision sensor, sonar sensor, infrared sensor, a contact sensor. The display 5 may be a LED-display to depict a number of bionic and vivid expression packages mimicking human-like emotions such as happiness and sadness.

[024] Fig. 2 is a front side view showing a touchscreen display 8 of the robotic apparatus. The touchscreen display 8 is configured to provide visual output and to receive an input by simple or multi-touch.

[025] Fig. 3 is another side view of the robotic apparatus 1, with pallets 9 held within the frame 3. The pallet 9 may be a tray shaped and dimensioned for receiving at least one article to be delivered. Each pallet may support a load up to 10kg. Each pallet may hold multiple articles. As shown in Figure 3, the robot apparatus 1 further comprises a multi-functional light source 10.

[026] Fig. 4 is a perspective view of the robotic apparatus 1, showing sensors 12 for detecting presence or absence of an article to be delivered. Sensor 12 may be an infrared sensor.

[027] Fig. 5 is a top view showing the robotic apparatus 1, showing a touch sensor 11 for receiving an external cue by contact.

[028] Fig. 6 is a bottom view showing the robotic apparatus according to the embodiment of the invention. Located underneath are three separate sets of drive wheels 7, which when used in combination provides omni-directional mobility to the robotic apparatus 1.

[029] Throughout the description, the term 'service' refers to the provision of non-manufacturing skills, in particular in labour intensive industry including, but not limited to, healthcare, concierge, helpdesk, delivery, luggage handling, mail handling etc.

[030] It should be appreciated by the person skilled in the art that variations and combinations of features described above, not being alternatives or substitutes, may be combined to form yet further embodiments falling within the intended scope of the invention.

CLAIMS

1. A robotic apparatus for service comprising:
 - a main body housing defining an internal volume for containing electrical and/or mechanical components;
 - a frame contiguous with the main body housing, the frame configured to receive one or more pallets;
 - at least one pallet to be received by the frame, the at least one pallet configured to receive an article to be delivered;
 - a computer contained in the main body housing;
 - a set of three drive wheels configured to allow the main body housing to move omnidirectionally;
 - a motor to power the drive wheels; and
 - a battery to power at least the internal computer and motor.
2. The robotic apparatus for service according to claim 1, wherein the frame comprises a touchscreen display configured to provide visual output and to receive an input by simple or multi-touch.
3. The robotic apparatus for service according to claim 1 or claim 2, wherein the frame further comprises a deep visual learning sensor.

3. The robotic apparatus for service according to any one of the preceding claims, wherein the frame further comprises a display for depicting bionic and vivid expression packages mimicking human-like emotions.
4. The robotic apparatus for service according to any one of the preceding claims, wherein the frame further comprises one or more sensors for detecting presence or absence of an article to be delivered.
5. The robotic apparatus for service according to any one of the preceding claims, wherein the frame further comprising a touch sensor for receiving an external cue.
6. The robotic apparatus for service according to any one of the preceding claims, further comprising an audio input for receiving an external cue.
7. The robotic apparatus for service according to any one of the preceding claims, further comprising one or more sensors for the detection of surroundings or ambient conditions are situated on the main body housing.
8. The robotic apparatus for service according to any one of the preceding claims, further comprising audio output and speaker grilles situated on the main body housing for the generation and issuance of verbal cues.
9. The robotic apparatus for service according to any one of the preceding claims, further comprising a multi-functional light source situated on the main body housing.

10. The robotic apparatus for service according to any one of the preceding claims, further comprising electrical connections situated on the main body housing to allow for the charging of the battery within the main body housing.