Intelligent Hotel Robot Theory&Realization

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Abstract

Due to the rise of artificial intelligence (AI) technology, discussions are processing on how robots could replace human labor.[1] Base on the conventional surveys, this paper present a conceive on the intelligence hotel robot, which simplify the check-in process. Also considered in different environment settings, robot can self-adaption with the different cases. [2]Combine with the Hokuyo Lidar and Kinect Xbox camera, the robot can plan the routes accurately, besides robot can reach to the different floors. Focus on the analysis of the numbers on the elevator's wall, we assume that robot has the ability to read the numbers and symbols, then press the corresponding button. What is more, the intelligent voice system provides an assistant for the customers. Furthermore, the intelligent order sending system provides fully-automatic food delivery. However, the hotel not only divides human work but also reconstructs it from tasks. Moreover, the purpose of reconstruction is not simply for replacement of works. Such modification of a task is often observed taking place in human- system interactions. It is an extremely creative process of labor emerging in this area.

Introduction

The conceive of hotel robots have 4 functions. (i) When the guests arrived in the setting region, the intelligent voice system will greet the customer. Also, the voice system is used to remind guests in the following sections. [3] (ii) After checking in, the G-mapping manager can plan the nearest route to the destination after typing the room number on the digital keyboard. (iii) Besides, the robot can lead the customer to the corresponding room. In the process of getting to the room, the robot will consider taking the elevator if necessary. Also, the mechanical arm needed to press the button in the elevator and pick up food during the automatic food delivery. (iv) In addition, the robot also has a transport service. When consumers purchase Hotel's order, robots have an ability to complete the automatic delivery service. [4]

Test drawings

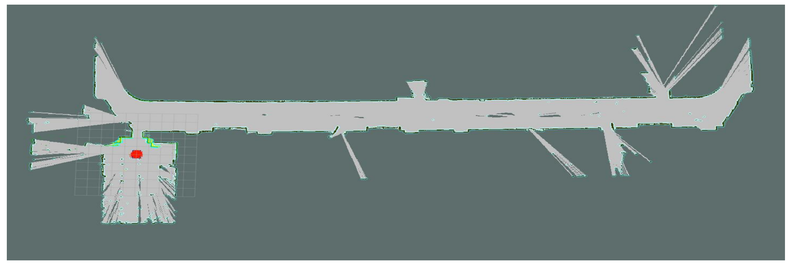


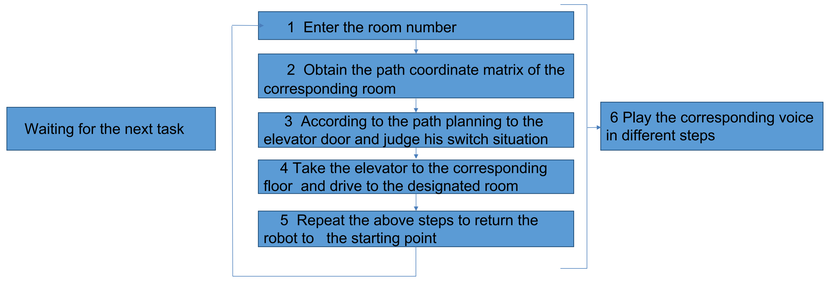
Figure 1. Test drawings

G-mapping and Navigation

Our fundamental purpose is based on navigation. The theory of navigation is D* arithmetic. The robot plans a reasonable route to the destination through the navigation system.Navigation is the two-dimensional navigation function package of ROS is simply based on the information flow of the sensor such as the input odometer and the global position of the robot, and the safe and reliable robot speed control command is calculated through the navigation algorithm.(Figure 1)

We plan to travel the route in Global frame: the overall path planning according to a given target destination. In the navigation of ROS, the global route of the robot to the target location is first calculated through global path planning. This feature is implemented by the "navfn" package. Navfn calculates the minimum cost path on the costmap through the Dijkstra optimal path algorithm as the global route of the robot. In the future, the VFH algorithm or others should be added to the algorithm.

Block Diagram



1 Select the room you want to go to
2 Plan your route to your destination
3 Enter the elevator
4 Arrive at the destination
5 Return to the starting point
6 Introduce itself when it start executing the command; tell the guest to follow the robot when you choose a room; tell the guest to arrive at the destination after arrival

Results

We assume four rooms on the second floor: 238, 236. The points that setting in the middle of the starting point and the destination. During the test, we can find that the average success rate can reach more than 80% only on the second floor. On the other hand, with the increasing of the journey, the accuracy rate dramatic dropped. Beside we found the accuracy rate increase with the rising of the points in the middle of the journey. Furthermore, the traveling time decreased with the increase of the points at most of time.

Figure 3. Experiments Live Diagram

Second floor test point data

Room Number	Times	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7
238	Travel 1	(4.58,-0.48,0)	(3.27,-4.64,0)	(4.56,-4.56,0)	(4.29,-0.0458,0)	(0,0,0)	/	/
	Travel 2	(4.58,-0.48,0)	(4.56,-4.56,0)	(3.27,-4.64,0)	(4.56,-4.56,0)	(4.29,-0.0458,0)	(0,0,0)	/
	Travel 3	(4.58,-0.48,0)	(4.29,-0.046,0)	(4.56,-4.56,0)	(3.27,-4.64,0)	(4.56,-4.56,0)	(4.29,-0.0458,0)	(0,0,0)
236	Travel 1	(4.58,-0.48,0)	(4.4,-10.8,0)	(3.34,-10.7,0)	(4.29,-0.0458,0)	(0,0,0)	/	/
	Travel 2	(4.58,-0.48,0)	(4.4,-10.8,0)	(3.34,10.7,0)	(4.4,-10.8,0)	(4.9,0.00614,0)	(0,0,0)	/
	Travel 3	(4.58,-0.48,0)	(4.89,-5.48,0)	(4.4,-10.8,0)	(3.34,-10.7,0)	(4.4,-10.8,0)	(4.9,0.00614,0)	(0,0,0)

Room Number	Times	Time 1	Time 2	Time 3	Time 4
238	Travel 1	01:52.0	02:31.0	02:58.0	02:47.0
	Travel 2	01:55.0	02:11.0	02:08.6	02:11.1
	Travel 3	01:58.7	02:06.3	02:44.0	02:24.7
236	Travel 1	03:41.2	02:59.7	03:31.3	03:18.5
	Travel 2	02:51.5	02:58.6	03:34.3	03:33.1
	Travel 3	03:12.3	03:27.7	02:49.9	03:04.6

Conclusions

The developed algorithm enables the robot to reach different points in succession and is capable of obstacle avoidance navigation in the middle. The voice library with the corresponding situation allows the robot to take the guest to the corresponding room instead of manually.

Essentially, a robot is a mobile computer that is connected to a hotel application (such as a PMS), and the robot can easily obtain information about the guest and provide personalized services. The robot is a computer that can handle the language of different countries. It can process data anytime, anywhere, which will improve the registration experience for guests.

Contact

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Reference

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[3] H.Osawaetal.,"Analysisofrobothotel:Reconstructionofworkswithrobots,"in201726thIEEEInternationalSymposiumonRobotandHumanInteractiveCommunication(RO-MAN),2017,pp.219-223

[4] Pioneer 3 Operations Manual with MobileRobots Exclusive Advanced Robot Control & Operations Software, 2006 MobileRobots Inc.