

Issues in Existing Robotic Service in Restaurants and Hotels

Neelima Mishra^a, Dr. Dinesh Goyal^b, Dr. Ashish Dutt Sharma^c

^a*Research Scholar, Centre for Cloud Infrastructure & Security, Suresh Gyan Vihar University, Jaipur 302025, India*

^b*Director, Centre of Cloud Infrastructure and Security, Suresh Gyan Vihar University, Jaipur 302025, India*

^c*Director, Gurukul Institute of Engineering and Technology, Kota 325003, India*

Abstract

There are various public sectors where we actually need robotic services, either to help human or to do complete task of human labor. There are many sectors where a human can be replaced by robots, so that human can use their brain for some other constructive work, (sectors like airport or restaurants). We chose restaurants sector in India to serve food by robots. This already exists in China and Japan but still improvements are required. For example, issue like navigation, serving on table and room service etc. In existing serving robots, they are using line follower technique that is a track followed by a robot and customer has to stop it by its own which does not achieve the relevance of innovation because that machine is not able to serve food on table as human does.

Similarly many issues are there discussed in this research paper from the existing serving robot and proposed some possible solutions also under the heading issues.

Keywords: Serving robot, RFID, Gyro, Backbone.

1. Introduction

Robots are not new for us. Earlier too many medium are there which grab our attention towards robots, like science fiction movies, robotic arm in automobile industries etc. Now we are experiencing the robot's services in our daily routine, the best examples to understand this point are robotic toys for kids and washing machine for household works.

Numbers of robots are there providing services in different areas, especially in public areas. Recently a robot Troika had been introduced in South Korea airport which help passenger find their gate. (Youkyung Lee, 2017) The guiding bot responds to its name. Travelers can insert their tickets into its scanner to get flight information, and Troika will then ask if they want to be escorted to their gates, warning laggards to "Please stay closer so I can see you."

Like Troika there is one more robot that is used to clean the airport floor. Basically it is an autonomous vacuum cleaner by LG (Bill Read, 2017), the Airport Cleaning Robot is a large vacuum cleaner fitted with cameras, light sensors, and sensor-laden bumpers which moves around the airport vacuuming up rubbish.

Like airport, there is another most popular public place i.e. restaurants. In India, Jaipur is one of the most famous tourist places. Tourist came here not only for sightseeing but also for tasty food of Rajasthan. That's the reason why restaurants and hotels

owner's always do the improvising either in food, environment or ambience. With this research we are trying to add one more star into the improvisation in restaurants and hotels by introducing the robotic waiter in India with updates. As it is the time for robotic automation in restaurants of Jaipur. There are number of parameters on which we are improving the robot, and in this paper we are going to discuss the comparison between our robot and the existing serving robot. Our purpose with this comparison is to develop a serving robot with updates.

1.1. Background

Serving robots are recently used in China and Japan. Japan does not have that much of population compare to India, still they became the most innovative country in terms of robotic technology, then why not India. These countries are using robotic services in restaurants in many ways; they are serving sushi through conveyor belt and serving robots are used in place of waiters that are navigating through the fixed path to serve. There are number of research papers also which we are considering.

2. Issues

2.1. Navigation

Lots of picture and description are available online (Clinton Nguyen, 2016) regarding serving robots introduces in China and

Japan. They are using line follower technique to navigate the robots.



Fig.1- Line follower robotic waiter in China (Clinton Nguyen, 2016)

In spite of these robots, there are number of research papers also on serving robots. In those papers also they used line follower technique for the navigation. Abin A Varghese et. al. (Abin A Varghese et. Al., 2017) had proposed the autonomous serving robot using the line following technology. Another research paper (Neeti Malik et. Al., 2016) describing the serving robot. There they used line following technique again.

This line following navigation is good but if we want the robot to intelligently serve the food on customer's table as human waiter do, and then on that situation the only possibility is to make the robot stop toward the table but can't serve on table because of the need of space for the movement of robot.

Four school students also prepared a project of serving robot name Bob (Shweta Modgil, 2017) that too is following a line. They tried it in a particular small area of restaurant by draw a thin black line to navigate the robot.



Fig.2- Line follower robotic waiter in China (Shweta Modgil, 2017)

Drawing line on floor and rearranging the furniture may not be accepted by already existing restaurants and hotels, especially in India. To overcome from this, we can use RFID tags in place of metal/black line. These tags are just like small stickers with unique number. We can stick these tags on floor, its unique number will help robots to navigate to the next sticker comes along the path to the destine table.

2.2. Serving

Serving food on table is the most important part of our research. People came to restaurants either for chilling with friends and family or for some corporate meeting. In both conditions they really don't need any kind of interruption and also don't want to sit conscious about their order. Like now, when customer order to human waiter than they sit calm and relax after ordering of their desire food but with the robotic waiter existing in China and Japan, the customers have to sit very aware about their order. They have to continually keep noticing on each and every robot carrying tray and should pick the tray of their desire order from robot on their own. This will exactly seem same as they are busy in their mobile phones and not enjoying the moment.



Fig.3- Serving robot (Amanda R., 2015)

At the time of serving, some of the robots in China and Japan can't stop on their own, customers have to tap on their head to stop them and then pick their food. After picking, they again have to tap on its head to let it go.

Keeping this in mind, we are proposing our robot to be trained (supervised learning, as discussed in the previous point navigation) to recognize the table and serve the meal. This is done by RFID tags that are attached on the edge of the table. Robot will read the RFID tag by the sensor on its chest and will stop near the edge of the table and do serve the tray on table. This will make the people feel same as waiters do come to serve but with this it also seems new, attractive, and innovative and hygiene.

2.3. Ordering system

This feature is most common in many hotels and restaurant. (Patel, Mayurkumar, 2015) System presents an interactive and up-to-date menu with all available options in an easy to use manner. Customer can choose one or more items to place an order which will land in the Cart.

In China there are two methods of ordering of food. First, a dedicated tab is on the table always through which customer can order the food. Second, a robot will came within 5 minute after the customer's arriving, with the tablet.

The Pengheng Space Capsules Hotel in Shenzhen, China has robot staff (Deni Kirkova, 2013). This hotel stopped recruitment, as they

are having robots for each and every service. Even for the guard on door also they have a robot. In this case they do take the order by a single common tab computer at lounge area.

The online food ordering applications is the foremost requirement during recruitment of serving robots to serve in restaurants and hotels. Imagine if you enter in a restaurant for delicious meal but nobody is there for hospitality, only a single message on wall i.e. to access the Wi-Fi of premises. This will land a page of menu on your smart mobile, through which you can order your desire meal. That will than serve by robot. In moment if you need water or anything else than that also come to you on a single click only (restaurants can also keep tablets on each table for the same).

2.4. Balancing

In China and Japan, as robotic waiters are navigating on black magnetic line, along with this their hands are static holding tray. Also the floor or surface is plane always (i.e. there is no incline path). These are the reason that the robotic waiters in China and Japan moves very smoothly on their defined path without any issue of balancing.

But at the time of serving tray (loaded with delicious food) on the table by robot, balancing will definitely come with the big issue. Robots have to be very precise at the time of serving on table and also at the time of movement through the little incline path. At these moments the main aim is to transport the food without spilling it on the floor. There is a wonderful example explained by Jacob et. al. to understand balancing (Jacob et. Al., 2016) is the cup holder in car. They explained that the cup holder in a car keeps the glass perfectly level and still, but the liquid inside would nevertheless splash out during sharp turns or sudden stops. If the cup holder was to be tilted as described, the content of the glass would be still as if the glass was standing still.

We need a robot which can be comfortable with a little tilted floor also, as we are not asking the restaurant owner to rearrange the interior. At this moment, there is a need of keep the hand balanced always to do not split the food on floor. At tilted position of robot the complete body is always on the 90 degree angle of floor (as law) but it is necessary to keep the hand still as the tray is loaded with delicious food. To avoid this accident, we can use Gyro in our project. There is a great example of gyro i.e. the compass in smart phones. Either you are tilting the phone but gyro sensor brings it in stable position again. Gyro (Sensors-definition) measures the angular rotational velocity. This feature is definitely become a money saving feature for the restaurant's and hotel's owners, as they do not need labor to modify their floor.

2.5. Lift communication

Like food service in restaurants, room service is also an important job. We didn't find any information about robotic waiter providing room service in China or Japan, but recently in Singapore two relay robots had been introduced name Jeno and Jena (Kim Soo-Jin, 2017).



Fig. 4- Jena, a relay robot, making a delivery at hotel Jen Tanglin Singapore (Kim Soo-Jin, 2017)

We can instruct our robots to communicate with the lift and can serve the customers even in the rooms. As already discussed in (Kim Soo-Jin, 2017), Jeno can carry non-spitting things whether it is packed food or an extra towel etc.

But in India people do not prefer packed food while staying in restaurants. With this, it is necessary to take care of both. To overcome from this issue we can use a tray with a little depth clutched with robot's hand, which can carry both food, glass of water and extra towel etc.

2.6. Design

Products of single things always differ by their unique design, for example there are too many famous companies like Bisleri and other similar companies doing their business with the same product i.e. pure drinking water supply in bottles. The main thing that makes them different from each other is the design of water bottle.

Like this, the design of our robot should also be differ from the robots already exists in China, Japan and even in Singapore. In our proposed serving robot, there is most important thing that makes it differ from other is the Backbone in it. Backbone is the support of complete body and composed of many nerve cells (Odyssey, 2016). As in humans, in robots also the backbone will work as a support system for it. The main thing that backbone provides is Center of Gravity (CG). Also the complete connection of robot from head to wheel will be from that backbone. So, as like human the part need to be cure at the time of illness (i.e. trouble in robot) will be the Backbone.

3. Comparison table

Table 1: Comparison between existing serving robots with our proposed solution

Parameters	Existing serving robots.	Our proposed serving robot.
------------	--------------------------	-----------------------------

Navigation	Using line follower technique.	Can use RFID tags.
Serving	Does not serve on table.	Can serve on table.
Ordering System	Generally using a touch screen or bell to call robot.	A web based application which customer can open on their smart phones using restaurant's Wi-Fi.
Balancing	No need, because these robots are just moving along the path.	Gyro is used to balance the tray at tilt floor and during serving food on table.
Lift Communication/ Room service	Existing can only serve packed food, towel and soap etc.	Our robot can serve Indian food (daal, chapatti, lassi etc.) in rooms also.

4. Conclusion

Gradually we are accepting robots in various sectors like airport, mall, automobile industries etc. Like these, there is one more area which is directly connected to public i.e. restaurants. China and Japan had already introduced serving robots in their restaurants. But there is always scope of improvement.

In this paper we discussed some issues like navigation, lift communication/room service, serving on table and balance food on tilt floor also from the previous literature regarding existing serving robots in China and Japan.

In restaurants people do come to relax and spent some precious time with their friends and family. With this observation we propose Gyro in our coming robot to balance the tray loaded with delicious food on tilt floor and at the time of serving on table.

We proposed possible solutions of each issue to overcome from these. In our next research paper, we will explain the implementation of our proposed solutions.

References

- Youkyung Lee, Associated Press, "Robots at South Korea airports to help passengers finding their gates" [Online] Jul 04, 2017. Available: <https://skift.com/2017/07/04/robots-at-south-korean-airports-to-help-passengers-find-their-gates/>.
- Bill Read, "Invasion of the autonomous vacuum cleaners" [Online] Aug 15, 2017. Available: <https://www.aerosociety.com/news/rise-of-the-airport-robots/>.
- Clinton Nguyen, "Restaurants in China are replacing waiters with robots" [Online] Jul 27, 2016. Available: <https://www.businessinsider.in/Restaurants-in-China-are-replacing-waiters-with-robots/articleshow/53405361.cms>
- Abin A Varghese et. Al., "Autonomous Serving Drone for Intelligent Restaurant System". International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol. 6, Issue March 03, 2017
- Neeti Malik et. Al., "Serving Robot: New Generation Electronic Waiter". International Journal of Engineering Science and Computing, Vol. 6, Issue 4, April 2016
- Shweta Modgil, "India's First Food-Serving Robot 'BOB' Is Here" [Online] April 22, 2017. Available: <https://inc42.com/buzz/indias-first-food-serving-robot/>
- Patel, Mayurkumar, "Online Food Order System for Restaurants", 2015. *Technical Library*. Paper 219. <http://scholarworks.gvsu.edu/cistechlib/219>
- Deni Kirkova, "The Chinese hotel run by robots: From doormen to waiters, all your needs are met by cyborg staff" [Online] Nov 21, 2013. Available: <http://www.dailymail.co.uk/femail/article-2510658/The-Chinese-hotel-thats-staffed-ENTIRELY-robots.html>
- Chuck Thompson and Elaine Yu, CNN, "New order? China restaurant debuts robot waiters" [Online] April 19, 2016. Available: <http://edition.cnn.com/travel/article/china-robot-waiters/index.html>
- Jacob et. Al., "Balancing arm for a robotic waiter" Bachelor's Thesis MMKB 2016:19 MDAB080, Jun 07, 2016.
- Kim Soo-Jin, "Room service is now delivered by robots at these hotels in Singapore" [Online] Nov 09, 2017. Available: <http://www.scmp.com/magazines/style/travel-food/article/2119123/room-service-now-delivered-robots-singapores-hotel-jen>
- Odyssey, "The importance of a backbone" [Online] 2016. Available: https://www.theodysseyonline.com/the-importance-of-backbone?utm_expid=.oW2L-b3SQF-m5a-dPEU77g.0&utm_referrer=Sensors_definition_online_available,https://www.gsmarena.com/glossary.php3?term=sensors
- Amanda R., "Robot Restaurant in Harbin, China", [Online] 31 Aug, 2015. Available: <http://www.twoamericansinchina.com/2015/08/robot-restaurant-in-harbin-china.html>