



ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijareeie.com

Vol. 6, Issue 3, March 2017

Automation of Restaurant (Ordering, Serving, Billing)

Shiny.J.S, Ashok Kumar.M, Nanthagopal.V, `Raguram.R

Dept. of Electrical and Electronics Engineering, Dr.Mahalingam College of Engineering and Technology, Coimbatore,
Tamilnadu, India.

ABSTRACT: The restaurant Industry is now gaining more importance in terms of automation. The usual procedure used for food ordering in restaurants is a manual process. It involves the waiters noting down the menu from customers, transferring the orders to the kitchen, serving the menu and finally preparing bills. This process even though looks simple, is prone to human errors while note making and delays involved. So the customers end-up with unsatisfactory service. Considering this fact and with an aim to improve efficiency and reduce errors in conventional food ordering system, new technology is introduced to automate the process. The ordering process is made simple through which the customer can order the food item from the table itself. It consists of keypad and LCD display to order the food item and to display the ordered food item to the customer respectively. The ordered food item will be transferred to the kitchen using the WIFI module ESP8266 .The serving process consists of food serving robot which is used to serve the foods to the customer depending upon their order. The robot uses arduino microcontroller for programming. The cost of the ordered food item will get added up and the total bill amount will be shown to the customer and it will be sent to the billing counter. Website will also be created for the restaurant.

1. INTRODUCTION

Restaurant is a place where people come, sit and eat meals that are cooked and served by the chef and the waiters respectively. In traditional restaurant system, orders are taken by a waiter and they bring the food when it is ready. After eating the food, customers will pay the bill. This system relies on large numbers of manpower to handle customer reservation, inquiry about them, ordering food, placing order on table, reminding dishes of customer. Currently, there are a lot of ways of serving the customers. For instance, waiter serving system (conventional), conveyor belt serving system (Japanese style), self-carrying system (fast food), pen-and-paper self-ordering system, etc. These systems are made in order to get attraction from customers and to reduce the need of hiring more employees in their workplace. When there is a robot that can conduct all the tasks done by human being, it will strictly reduce the need of hiring more employees. Therefore, a serving robot is proposed.

The proposed system reduces the man power and makes the whole process in the restaurant to be done automatically starting from welcoming the customer to payment of bill. The proposed system consists of three main blocks. First block deals with ordering process through which the customer can order the food item without the need of the server. The customer table is provided with the keypad and LCD display using which the customer can type the item code and can see the ordered food item along with cost respectively. The second block is to serve the ordered food to the customer. It is done by using the food serving robot. It will modify the real time problem of time delay and delivering of incorrect food item. It consists of the vehicle which moves according to the sensor output .The robot consists of proximity sensor to count the wheel rotation and IR sensor for obstacle detection. The third block is for payment of bill amount. The cost of the ordered food item will be displayed to the customer at the time of ordering itself and if the customer finished ordering, the total amount of the ordered food item will be calculated and the entire bill amount will be displayed to the customer.

The other technique in this paper includes the common display of available food item with their code so that the customer can be aware of the menu. There will be a helping technique available at each customer table which is used



International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijareeie.com

Vol. 6, Issue 3, March 2017

by the customer to order the food item. In this technique the instruction for the entire process will be played at the time of ordering the food item.

This system replaces the conventional method in restaurant and it reduces the human need and makes the process simple and efficient. This system is also meant for the attraction of the customer. By seeing this technology the amount of customer will be increased and so the profit will be increased.

The main objective of this paper is

- To order the food item without the need of the server
- To serve the ordered food item to the customer automatically without any human need
- To calculate the bill amount and to display the amount to the customer
- To provide a website for ordering from their home place

II. LITERATURE SURVEY

A. PDA METHOD

PDA-Portable Digital Assistant. PDA is small and portable device. In the PDA based system, the small portable device is given to the customer for ordering the food item. When order completes, these PDAs are to be collected by the waiters to be used by other customers. With wireless technology, the communication between the server and PDA is feasible^[1].

Even though the PDA based system provided a better option to conventional food ordering system they possess some limitations:

- A number of PDAs are to be prepared to serve the number of customers during peak hours. Thus increasing the restaurant expenditures.
- PDAs do not provide provision to order from workplace. Thus the customer has to be physically present in restaurant to place order.
- It lacks real time feedback between restaurant owner and customers.
- The user interface consist only textual information. UI has become unattractive and uninformative due to lack of images.

B. AUTONOMOUS ROBOT

There are some basic requirements in creating an autonomous mobile robot: openness, abstraction and modularity. These requirements are crucial so that a new function of robot can be constructed from small changes of hardware and software design. Line following based on Infrared (IR) photoelectric sensor is the basic knowledge to construct an autonomous mobile robot. It is an intelligent system to ensure that the robot moves according to the line, in which if it moves out of the line, the position corrective feedback will send data to the microcontroller. In order to perform a good line following robot, the principle of IR sensor should be followed. The robot build has to detect the line in the shortest time. Thus, the IR sensor has to produce the best output so that the information can be sent to the microcontroller, and gives faster reaction. In order to improve system reliability and accuracy, the received reflected light will convert into output signal voltage (Vout), which directly affected by the distance between the reflector and the sensor^[2]. There is a threshold voltage, where the distance of IR sensor and reflector is optimum. The output received from IR sensor will pass through a comparator in order to compare the voltage and send data to microcontroller. The sensor installation mode will also affect the performance of sensor. Basically, the distance between the IR set sensor and the black line should be more than 5mm. Also, the IR sensor will be fixed perpendicular to the reflector^[3].

C. BOOK SEARCHING ROBOT

This robot is an application of the line following robot used in the library inventory management system (LIMS). A LIMS is created in order to search the books required from the rack, through the reading of barcode. The robot inclusive of EEPROM, which is used as input and output device for input author name, title and barcode. The result of searching will be shown on LCD display. The outcome of this robot is that it is able to search the availability of the book in the rack specified. However, the robot manages to search books at the bottom row of the rack only^[4].

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijareeie.com

Vol. 6, Issue 3, March 2017



Automated food delivery system is designed to overcome the growing population, as more people prefer to have their meal out of their home. The overall idea of this robot is to send the food from the kitchen to the customer's sitting place. When the order from the customer is sent to the kitchen, through ordering system, a signal will send to the robot while the chef locate those dish on the tray of the robot. The robot 'walkway' will be at the side of the restaurant so that no collision will happen between the people and the robot. Centre-Wheel Drive Motion System is used in order to minimize the space used by the robot to make any turning. Five color sensors are used to guide the robot moving according to the line. It can also be used in medical department. In medical care department, the tasks included can be divided into two: directly care task and indirectly care task. For instance, changing attire and feeding patients need direct care from hospital staff, whereas food delivering to patients is indirectly care task that can be replaced by robotics system. Basically, the robot performs two tasks: delivering trays and collecting trays. The robot will detect obstacles on the over bed table before grasp the tray by the gripper. The overall project produces a robot that can be applied in real-life environment ^[5].



D. RFID-BASED ROBOT

The performance of GPS in indoor environment is not satisfactory. Thus, a passive RFID technology based tracking indoor system is proposed, which is able to locate autonomous entities accurately. In this research, comparison of technologies performance is done (Wi-Fi, Bluetooth, and Infrared system, Ultrasound, INS & Sensors, Scene Analysis and RFID). Basically, the advantage of using RFID technology is the lack of requirement of having line sight with the tag (compared with Infrared system), the ability to work under harsh environment conditions (compared with



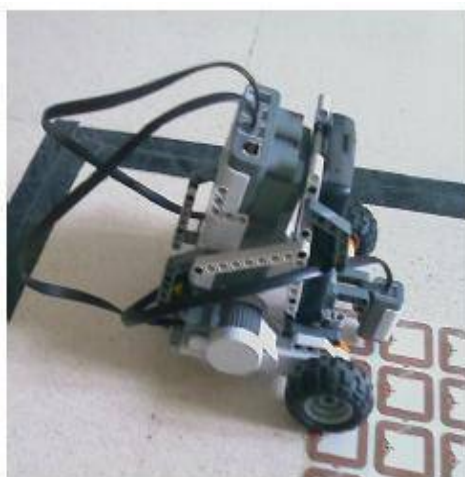
International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijareeie.com

Vol. 6, Issue 3, March 2017

Ultrasound sensors), faster response time and cost effectiveness, life time and low maintenance. The tracking autonomous entities system is based on passive RFID technology. A sensing surface is divided into a grid of small squared surfaces, which consist of passive RFID tag. The passive RFID reader is attached on PDA that supports Wi-Fi connection, and this autonomous entity is carried by wheel robot. The robot is then controlled by an application that runs in a desktop PC^[7]. The location of the robot on sensing surface will then be shown on the desktop. Trial has made on tracking error calculation. RFID technology can be applied on a warehouse robot as well. The function of the robot is to pick up the item, read the predefine location (through RFID tag on the item) and locate the item back to its original place. Basically the hardware involves the RFID reader and PIC microcontroller. An LCD display is fixed on the robot so that the ID read from the tag can be shown. The wheel-motion of the robot is based on the line following module, with black stripe on the white background. The design of the prototype robot is similar to forklift. Overall, it is a great design of autonomous robot to locate an item back to its original location. Figure 2.11 shows the complete design of RFID warehouse robot^[9].



III .SYSTEM DESCRIPTION

A. ORDERING SYSTEM

The proposed system consists of keypad, arduino, LCD display, WIFI module esp8266 for ordering the food item. Keypad and LCD display are placed in the customers table. Each food item will be given a code; the customer can type the code of the food item using the keypad. The quantity of the food item can be incremented and decremented using + and – button. The name of the food item, quantity, and cost of the food item will be displayed in the LCD display placed in the table. The name of the food item will be transmitted to the kitchen using WIFI module ESP8266 and it will be displayed in the kitchen LCD .The availability of the food item along with the code and cost will be displayed in the common LCD display placed in the restaurant. When the customers occupy the table the instruction will be played, so that the customer can order the food item according to the instruction. There is also a voice guider module which provides guide to the customer while ordering. This module consists of voice recording IC which records the voice about ordering and it will be played once the customer presses corresponding button for ordering.

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

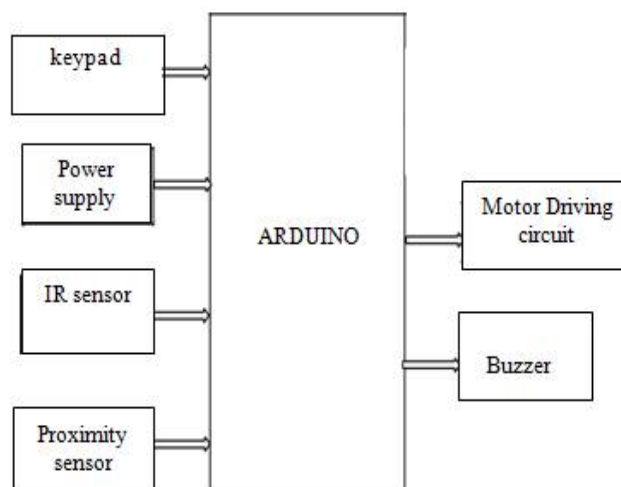
Website: www.ijareeie.com

Vol. 6, Issue 3, March 2017



B.SERVING PROCESS

This system uses food serving robot to serve the food to the customer. The robot includes proximity sensor, IR sensor. The distance between the robot, kitchen and table is fixed. The direction of the movement is fixed, it will move according to the number of wheel rotation. For each rotation a count gets incremented and it will move according to the count. IR sensor is used for obstacle detection. When an obstacle is detected in its path, the robot will wait for 5 seconds and if the obstacle persists in same place it will give a buzzer sound and if it is there for 10 seconds it will move in an alternate path. When the customer finish ordering, the robot will be called and it will directly move to the kitchen and after placing the food on the robot, the chef can press the table number in the keypad placed in the robot and the robot will be moved to the table and it will serve the food .After serving the food, the robot will wait for the further call. If there is a call between the serving processes then it will wait for the current process to be completed and then it will be taken for consideration. After finishing the orders the robot will move for the place that is allocated for it. The battery will be charged when it will be placed in the allocated place. The robot will be moved only between table to table, table to kitchen or vice versa. The robot will not change the movement at the middle only at the mentioned place, it will be moved.



C.RESTAURANT WEBSITE AND ANDROID APP

Webpage has been created for the restaurant for ordering the food item from their home place and then it will be delivered to the customer. The webpage contains the details of restaurant, menu, cost of the item and the ordering site.

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijareeie.com

Vol. 6, Issue 3, March 2017

The ordering site contains the input box where customer needs to enter the details of ordering. Mobile Android application is developed for the restaurant and it will be provided to the customer so that they can easily order the food item.

IV. RESULTS AND DISCUSSIONS

A. ORDERING PROCESS

1) INSTRUCTIONS FOR ORDERING

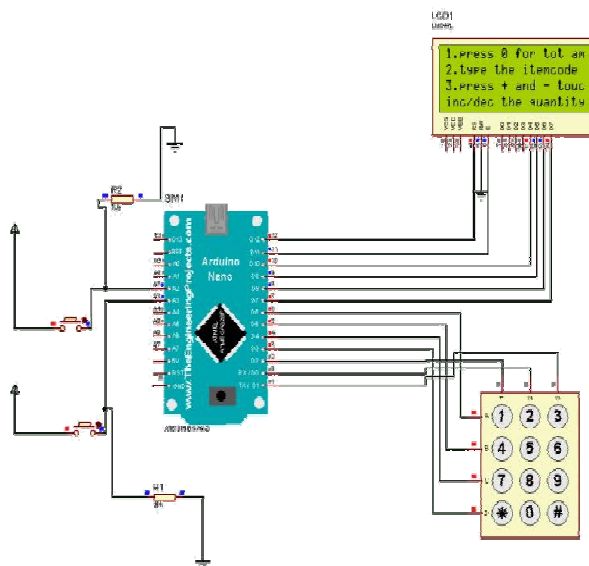
When the customer occupies their table the LCD will show greetings to the customer and it will tell to press 5 to read the instruction.

So, the customer has to press 5 if they want to read the instruction if the customer is familiar with the instruction then they can move to the next step.

The instruction is as follows:

- Press 0 to start ordering.
- Type the item code of the food that they wish to order by seeing the menu list menu displayed on the common LCD.
- Press + and – button to increment and decrement the quantity.

Once the ordering is finished press 8 to print the total amount. The common LCD display will be present at the restaurant to display the food item that are present in the kitchen .The LCD display will contain the details of item code, name of the food item and its cost.



International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

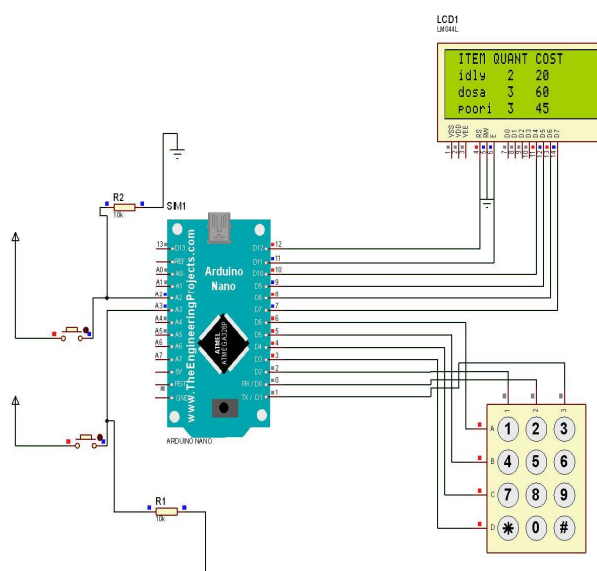
Website: www.ijareeie.com

Vol. 6, Issue 3, March 2017

2) ORDERING METHOD

The item code, name of the food item and cost of it will be displayed in the common LCD kept at the restaurant. By seeing that, the customer needs to type the item code by using the keypad for eg., if they type ‘1’ using the keypad then ‘idly’ will be displayed on the LCD. Then the quantity is given by means of + and – button. If + is pressed the quantity will be increase and if – is pressed, the quantity will be decrease. The cost of each ordered food will be simultaneously printed on the LCD display.

Once the first item has been ordered then the customer can precede the same step for the next item. The customer can order any number of items at the time. This type of food ordering will replace the conventional method of using pen and paper. It provides accurate means of ordering system where there will be no error of changing the item and the customer no need to wait for the server. The customer will also be aware of the cost of item while ordering the item.



B.SERVING PROCESS

When the robot is called it will be moved in a programmed path. For each rotation of the wheel the count gets incremented, it will move to the kitchen and get the order and then it will delivered to the ordered customer.

When the obstacle is detected in its path, it will stop and if the obstacle presents there for more than 5 seconds, then it will give a buzzer sound.

V. CONCLUSION

Thus, If this system is implemented then the customer can easily order the food item without the need of the server and without any error. It is recommended that use of touch screen instead of the keypad and LCD screen. It can also include a module which provide greetings to the customer such as saying welcome and thank you to the customer and using any money payment method to pay the bill amount to respective account of the owner.

REFERENCES

- [1] Juhana Jauhiainen ,Sakari Pieska , , Antti Auno , Markus Liuska , Antti Auno Intelligent Restaurant System Smart- menu CogInfoCom 2013, 4th IEEE Conference on Cognitive Info communications, December , 2013 , Budapest, Hungary
- [2] Bajestani SEM & Vosoughinia A. Technical Report of Building a Line Follower Robot. 2015 International Conference on Electronics and Information Engineering (ICEIE 2010); 2015. p. V1-1 – V1-5.
- [3] Thirumurugan J, Kartheeswaran G, Vinoth M, Vishwanathan M. Line Following Robot for Library Inventory Management System;2015. Coimbatore, India: Sri Ramakrishna Institute of Technology. IEEE. p. 1-3.



ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijareeie.com

Vol. 6, Issue 3, March 2017

- [4] Lv XF, Chen Y. A Design of Autonomous Tracing in Intelligent Vehicle Based on Infrared Photoelectric Sensor; 2013. Chongqing, China: Automation Institute, Chongqing University of Posts and Telecommunications.
- [5] Masuda T, Misaki D. Development of Japanese Green Tea Serving Robot “T-Bartender”. Proceeding of the IEEE International Conference on Mechatronics & Automation; July 2012; Niagara Falls, Canada. Fukuroi-shi, Toyosawa, Japan: Department of Mechanical Engineering, Shizuoka Institute of Science and Technology; 2005. p. 1069-1074.
- [6] Kim MS, Chong NY, Ahn HS, Yu WP. RFID-enabled Target Tracking and Following with a Mobile Robot using Direction Finding Antennas. Proceedings of the 3rd Annual IEEE Conference on Automation Science and Engineering; 22-25 Sept 2012; Scottsdale, AZ, USA: IEEE; 2012. p. 1014-1019.
- [7] www.businessinsider.com
- [8] A book named “Robot Restaurant Redux” written by Hunter.S.Thompson.
- [9] A book named “Robotics:A Refence guide to the new technology” written by Joseph A.Angelo Jr.