

Hotel Automation by Wireless Menu Ordering & Serving Robot: New Generation Electronic Waiter

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Abstract - In today's world the use of robot is going on increasing. Robots are able to carry out every work more effectively and efficiently than a man can do. Hence one of such application of robot could be SERVING ROBOT. There are many areas of research that could be done for a serving robot. In this project we have try to demonstrate a prototype of Autonomous Serving Robot which will serve the food to the customer. The implementation is done with available resources to reduce the cost of project.

In today's restaurant Digital multi-touch menu cards and other forms of digital facility are replacing old fashioned services like-waiters can take order from customer and serve them. Intelligent Restaurant system delivers almost infinite flexibility in promoting meal and snack options. Intelligent Restaurant system uses technologies innovatively in a modern restaurant such as multi-touch LCD with microcontroller, Bluetooth module, database & line following Robot to enhance quality of services and to enrich customer's dining experience. A line following robot is designed using sensor operated motors to keep track the line path predetermined for meal serving. PayPal is used for online payment. In this paper we demonstrate the idea of automatic menu serving robot. In this paper we have made a robot which provides proper service to customer in restaurant. If a person wants to give an order then he can call the robot by simply pressing a switch on his table. The whole system makes use of Bluetooth technology.

Key Words: Serving Robot, Bluetooth Module, Android App, PIC Control, LCD Display, DC Motor.

1. INTRODUCTION

Technology is such a term which can change the complete operation of a particular system. In today's world we find that each and every field is based on the use of some kind of technology. In such a world wherein developments are being taking place in many field, but we find that the most commonly visited place by every person that is a hotel, is still the same. No advancements have been made in the ordering system of a menu in the hotel. We will still find the earlier paper based systems in many of the hotels. People visit a hotel in order to have a tasty food in less time and of their desired choice. The customer requirements are very necessary while considering the hotel business. If we

analyses the different types of customer requirements, we will find that they are almost the same. The customer needs a good service, good quality food, less time consumption, no confusion in placing and receiving an order, quick billing with no errors. All this can be made possible with a new type of system named as the zigbee based ordering system for hotels for this system there will be a system administrator who will have the rights to enter the menu with their current prevailing prices. The system administrator can enter anytime in the system by a secured system password to change the menu contents by adding or deleting an item or changing its price. Now when the customer enters the restaurant, customer will place his order with the help of the touch screen using the intuitive graphical user interface, right from the selection of menu items, confirming the order and viewing offers. The customer will select from the food options according to his choice and the system will display the payment amount customer has to make once finished with the order To get order of each table waiter requires more attention to all tables. If he do not get attained one of customer on time, the customer get bored and angry, so we develop system to this system to place order from table customer itself place order from table customer itself. People visit a hotel in order to have a tasty food in less time and of their desired choice. The customer requirements are very necessary while considering the hotel business. If we analyze the different types of customer requirements, we will find that they are almost the same. There are two types of units, one in kitchen which displays (indicates) item ordered & table number. Another is at each table from which customer can place order by using up, down, enter, shift, keys & LCD display. Once order placed customer, if customer wants to cancel it, can be cancel within 1 minute only. After item ready in kitchen waiter cancel its status. Bill is automatically generated when order placed. At the other end, a LCD interface is designed for taking the order from different table and to give the confirmation.

1.2. LITERATURE REVIEW

Serving Robot is designed to reduce the work load of waiter and to increase the efficiency. In the paper by Sakari Pieska, Juhana Jauhiainen, Markus Liuska, Antti Auno [1] has propose that the customer's application works on an Android tablet. This application is connected to the database and download real-time restaurant's menu. The customer can browse the menu and order it. Using the software, customer can call the waiter by pressing a button. The waiter comes to

confirm the order and count the bill. This menu can be displayed in the kitchen's display. When this food items are ready then the kitchen staff can mark them as done. And this food items are visible in the cashier and also in waiter application so that they deliver them to the customer. Another paper by Tan-Hsu Tan, Ching-Su Chang, and Yung-Fu Chen [2] has proposed an intelligent e-restaurant for customer centric service. This system provides an online menu ordering and reservation-making process, and also personal menu recommendation service. With the help of RFID-based membership cards, waiters can immediately identify help of arduino. LEDs will be place on the path of robots customers according to their consumption records. The waiter uses a PDA to take orders from the customer and with the use of WLAN order is send to the kitchen. Then chefs prepare the menu and waiter can deliver it to customer. When the customer has finished the meal, the cashier uses RFID-based PDA to identify the membership ID to calculate the bill. Another paper by Sun Guiling, SongQingqing [3] has proposed self service ordering information system based on ZigBee wireless technology. This system uses FFD (Full Function Device) and RFD (Reduced Function Device). FFD is network coordinator that can communicate with other device; RFD is used in star topology network, which can communicate with the FFD. Another paper by Rupali Sapli, Ketaki Zujarrao, Siddhi Patil, Ketan Deshmukh[4] has proposed that the restaurant will be consisting of the black lines, LED and tables with switches. For interconnection the LEDs to glow and switches is done with the help of arduino. LEDs will be place on the path of robots. When the customer comes he will press the button to get refreshment. As the button will be pressed (switch is on), the LED at the starting point and the LED at the junction from where robot will move to serve towards the table will glow. As the LED at starting point will glow the robot will initiate its program to follow black line. The robot will start following black line, when it will get a white light in the way it will turn left or right accordingly, and serve the refreshment. After serving it will again follow the returning black line path and come to the starting position.

2. PROPOSED SYSTEM

A Line Following Robot is an autonomous robot which is able to follow either a black or white line that is drawn on the surface consisting of a contrasting color. It is designed to move automatically and follow the made plot line. The robot uses several sensors to identify the line thus assisting the robot to stay on the track. The array of four sensors makes its movement precise and flexible. The robot is driven by DC gear motors to control the movement of the wheels. The Microcontroller interface is used to perform and implement algorithms to control the speed of the motors, steering the robot to travel along the line smoothly. This project aims to implement the algorithm and control the movement of their robot by proper tuning of the control parameters and thus achieve better performance. Here we are using PIC 18f4520 microcontroller, which is 40 pin IC. We needed 12V and 5V power supply.

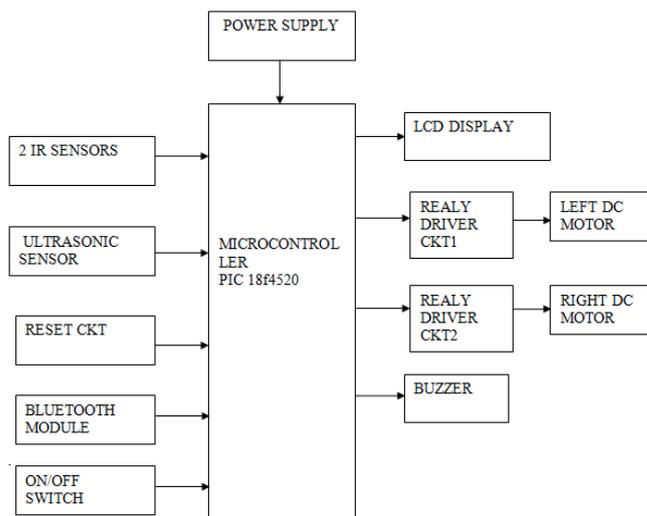


Fig -1: Block Diagram (Robot Unit)

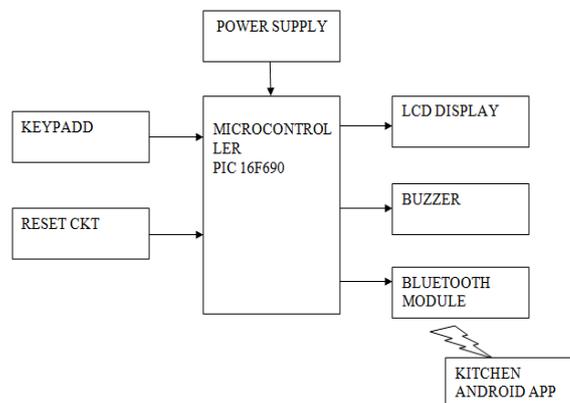


Fig -2: Block Diagram (Table Unit)

2.1 PIC 18F4520 MICROCONTROLLER:

Data Memory up to 4k bytes Data register map - with 12-bit address bus 000-FFF

- Divided into 256-byte banks
- There are total of F banks
- Half of bank 0 and half ofbank 15 form a virtual (oraccess) bank that is accessibleno matter which bank isselected – this selection isdone via 8-bits
- Program memory is 16-bits wide accessed through a separate program data bus and address bus inside the PIC18.
- Program memory stores the program and also static data in the system.
- On-chip External

- On-chip program memory is either PROM or EEPROM.
- The PROM version is called OTP (one-time programmable) (PIC18C) The EEPROM version is called Flash memory (PIC18F).
- Maximum size for program memory is 2M n Program memory addresses are 21-bit address starting at location 0x000000



Fig -3: PIC18f4520

wireless keyboard and many more consumer applications.

- It has range up to <100m which depends upon transmitter and receiver, atmosphere, geographic & urban conditions.
- It is IEEE 802.15.1 standardized protocol, through which one can build wireless Personal Area Network (PAN). It uses frequency-hopping spread spectrum (FHSS) radio technology to send data over air.



Fig -5: Bluetooth Module HC05

2.2 Ultrasonic Sensor

Ultrasonic sensors work by sending out a sound wave at a frequency above the range of human hearing. The transducer of the sensor acts as a microphone to receive and send the ultrasonic sound. Our ultrasonic sensors, like many others, use a single transducer to send a pulse and to receive the echo. Typically, a microcontroller is used for communication with an ultrasonic sensor. To begin measuring the distance, the microcontroller sends a trigger signal to the ultrasonic sensor. The duty cycle of this trigger signal is 10µs for the HC-SR04 ultrasonic sensor.



Fig -4: Ultrasonic Sensor

2.3 Bluetooth Module:

HC-05 is a Bluetooth module which is designed for wireless communication.

- This module can be used in a master or slave configuration It is used for many applications like wireless headset, game controllers, wireless mouse,

2.4. Relay Unit:

A relay driver circuit is a circuit which can drive, or operate, a relay so that it can function appropriately in a circuit.

The driven relay can then operate as a switch in the circuit which can open or close, according to the needs of the circuit and its operation.

Now that we're using a transistor to drive the relay, we can use considerably less power to get the relay driven. Because a transistor is an amplifier, we just have to make sure that the base lead gets enough current to cause a larger current to flow from the emitter of the transistor to the collector. Once the base receives sufficient power, the transistor will conduct from emitter to collector and power the relay.

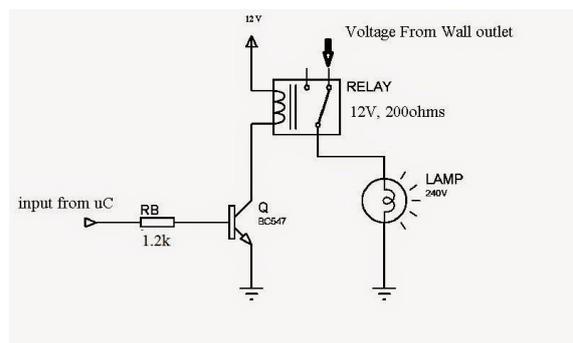


Fig -6: Relay Unit

2.5. LCD display:

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an

instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD.

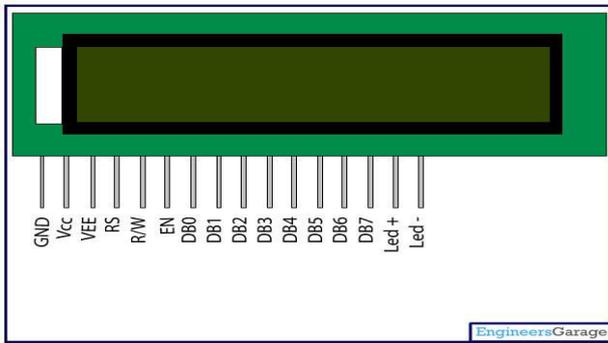


Fig -7: LCD Display

2.6. IR Sensor:

Proximity Sensor is used to detect objects and obstacles in front of sensor. Sensor keeps transmitting infrared light and when any object comes near, it is detected by the sensor by monitoring the reflected light from the object. It can be used in robots for obstacle avoidance, for automatic doors, for parking aid devices or for security alarm systems, or contact less tachometer by measuring RPM of rotation objects like fan blades.



Fig -8: IR Sensor

2.6. DC Motor:

“A DC motor is an electrical machine which converts electrical energy into mechanical energy. The basic working principle of the DC motor is that whenever a current carrying conductor places in the magnetic field, it experiences a mechanical force.



Fig -9: DC Motor

3. Result:

Here we successfully implemented “hotel automation by wireless ordering menu ordering and serving robot”. Photographs of actual hardware shown in fig 10(a) and fig.10(b).

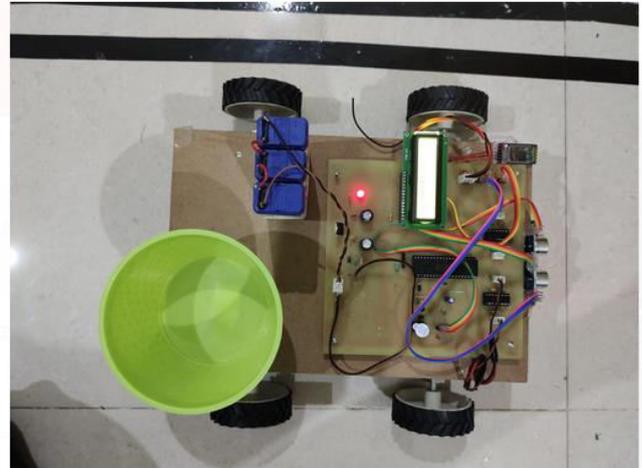


Fig -10(a): photograph of Serving Robot



Fig -10(b): photograph of table unit

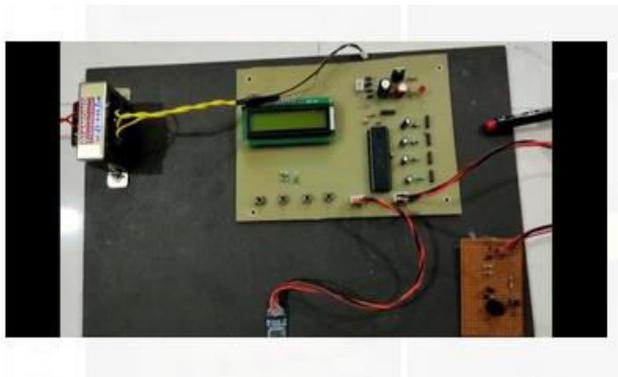


Fig -10(c): photograph of table unit

4. CONCLUSIONS

As we see the robots are increasingly becoming the part of everyday life; the use of Serving Robot can be extending to various functional purposes. This system allows customers to order food by LCD module surface which is programmed by embedded c, which is wirelessly connected to the counter via RF module. A line following robot is used to carry meal from counter to customer. We have tried to implement the robot waiter from the existing appliances which could be used by elderly people or disabled people for house service. Such types of robot system can work in different areas of human societies like hospitals, libraries and restaurants with small change in programming areas.

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REFERENCES

- [1] Sakari Pieska, Markus Liuska, Juhana Jauhainen, Antti Auno —Intelligent Restaurant System Smart- menu 14th IEEE International Conference on Cognitive Infocommunications . December 2–5, 2013 , Budapest, Hungary
- [2] Tan-Hsu Tan, Ching-Su Chang, and Yung-Fu Chen —Developing an Intelligent e-Restaurant With a Menu Recommender for Customer-Centric Service| IEEE Transactions on systems, man, and cybernetics-part c: Applications and reviews, vol.42,no-5, September 2012.
- [3] Sun Guiling, SongQingqing “Design of the Restaurant Self-service Ordering System Based on ZigBee Technology” Communications and embedded system lab College of Information Technology and Science, Nankai University Tianjin, China.
- [4] M. Z. H. Noor, A. A. A. Rahman, M. F. Saaid, M. S. A. M. Ali, M. Zolkapli “The Development of Self-service Restaurant Ordering System (SROS)”2012 IEEE Control and System Graduate Research Colloquium (ICSGRC 2012)
- [5] Soon Nyeon Cheong, May Hui Tze Yeong, Jia Jia Neoh, Chun Yee The, Wen Jiun Yap “Enriching Dining Experience with the

Multi-Touchable Entertainment Applications” 2010 International Conference on Science and Social Research (CSSR 2010), December 5 - 7, 2010, Kuala Lumpur, Malaysia

[6] YongChai Tan, BentFei Lew, KhimLeng Tan, KaeVin Goh, KienLoong Lee, ZhiChao KhoT “A New Automated Food Delivery System Using Autonomous Trackl Proceedings of the 2010 IEEE Conference on Sustainable Utilization and Development in Engineering and Technology Universiti Tunku Abdul Rahman 20 & 21 November 2010, Faculty of Engineering, Kuala Lumpur, Malaysia

[7] Ching-su Chang, Che-Chen Kung, Tan-Hsu Tan — Development and Implementation of an E-Restaurant Customer-Centric Service Using WLAN &RFID Technologies| Proceedings of the Seventh International Conference on Machine Learning and Cybernetics, Kunming, 12-15 July 2008