© 2016 IJSRSET | Volume 2 | Issue 2 | Print ISSN : 2395-1990 | Online ISSN : 2394-4099
Themed Section: Engineering and Technology - Type: Technical

Automation in Food Ordering System and Bill Payment in Hotels using TFT Display

H. Shruthi Nandhini, C. P. Sunandha, S. Subasri, V. Sivaranjani

Department of ECE, Sri Shakthi Institute of Engineering and Technology, Tamil Nadu, India

ABSTRACT

The growing number of restaurants and population of restaurant-goers have emphasized the need to enhance the working of hospitality industry. This paper aims at improving the quality of services and business of the hospitality industry by incorporating technology. A detailed study on the integration and utilization of technology in hospitality industries showcased that various applications based on wireless technologies are already in use enabling partial automation of the food ordering process. In this paper, we proposed about the usage of display units in each table/ cabin to swipe the food items that the customer is in need of in restaurant's. This system is a basic dynamic database utility system which fetches all information from a centralized database. The wireless application (Wi-Fi) thus used is user-friendly, improves efficiency and accuracy for restaurants by saving time, reduces human errors and provides customer feedback. This system successfully overcomes the drawbacks in earlier automated food ordering systems and is less expensive as it requires a one-time investment for gadgets. In order to make the hotel management work systematic, standardization and automation, achieve the aim of improving the efficiency of hotel guest room management. This paper designs the hotel management system, the overall mission of system development is to make the office staff can quickly and easily complete the hotel guest room management task.

Keywords: Automated food-ordering system, Wi-Fi module, Dynamic Database, Hotel Management, System Modelling, Design, Personal Digital Assistant (PDA), TFT (Thin Film transistor), GSM (Global System for Mobile Communication), GPRS(General Packet Radio Service), RFID (Radio Frequency Identification).

I. INTRODUCTION

Modern embedded systems are often based on microcontrollers (i.e. CPUs with integrated memory or peripheral interfaces), but ordinary microprocessors (using external chips for memory and peripheral interface circuits) are also common, especially in more-complex systems. In either case, the processor(s) used may be types ranging from general purpose to those specialized in certain class of computations or even custom designed for the application at hand. A common standard class of dedicated processors is the digital signal processor (DSP) [1][2].Since the embedded system is dedicated to specific tasks, design engineers can optimize it to reduce the size and cost of the product and increase the reliability and performance. Some embedded systems are mass-produced, benefiting from economics of scale. We are living in the era of automation. Recently, field of automation in homes is flourishing which has made our life more convenient. Fully automated rooms, where controlling of home appliances like light, curtains, TV, fan and AC through a single device is possible, are mainly available in luxurious hotels.[5][6]We have designed a system that can be an additional amenity in luxurious hotels. Task of this system is to deliver the food in particular hotel room. The sudden and rapid growth and development of communication technology, emergence of wireless technology and android devices has created quite a stir in the business transactions.[12][13] Business in the hospitality industry has been greatly influenced and competition has increased due to improved food ordering techniques. In order to effectively run a restaurant, time saving and cost optimizations are essential. Reduction in time by a few seconds for each table can speed up order processing, increase efficiency

and boost profits. The biggest obstacle most restaurants face is the migration from a paper-pencil system to a completely automated touch-screen system. The sudden and rapid growth and development of communication technology, emergence of wireless technology and android devices has created quite a stir in the business transactions. [7][8]Business in the hospitality industry has been greatly influenced and competition has increased due to improved food ordering techniques. In order to effectively run a restaurant, time saving and cost optimizations are essential. Reduction in time by a few seconds for each table can speed up order processing, increase efficiency and boost profits. The biggest obstacle most restaurants face is the migration from a paper-pencil system to a completely automated touch-screen system. The food ordering system, till a few years ago, was a completely manual process where a waiter used to note down orders from the customers using pen and paper, take the orders to the kitchen, bring the food and make the bill. Although this system was simple it required extensive investment in purchase and storage of paper, large manpower and also was prone to human errors and greater time consumption. In order to overcome these limitations in manual system, some systems were developed later like PDA based systems and multi-touchable restaurant management systems to automate food ordering process. PDAs (personal digital assistants) are much in use because of their portability feature and ability to communicate with personal computers but they too have some limitations [14]. A PDA-based system lacks ubiquitous communication, is exposed to health hazards, requires training of attendants, the need of having attendants to operate, the inefficiency during peak hours and small screen size.

II. METHODS AND MATERIAL

1. Related Work

A. Existing System

In the Existing system, the user has to wait for long time for the food delivering and for service. The journey for getting up to the peak of joy and facilities that we are presently experiencing started with initial footstep of a wireless technology. The developed a control system for autonomous mobile robots used in Hotel management. Mobile robot having minimal centralized control was developed. The work focused on the development of two basic motion control algorithms, namely a GOTO algorithm and a FOLLOW algorithm, for use in a master–slave system. These robot motion control algorithms would have wide applicability in hotel operations. The most common blunder is waiters making mistakes with customer's orders. At times, a waiter can forget to add a specific item, make a change because a customer is allergic to certain substance, or forget to give the order to the kitchen. Customers have to wait for a waiter to take their order. They must rely on the waiter to remember their order and specific details. Their food may take longer to be prepared and served if the waiter has multiple tables. They may also get wrong bills since they cannot see their bill amount until their meal is complete.

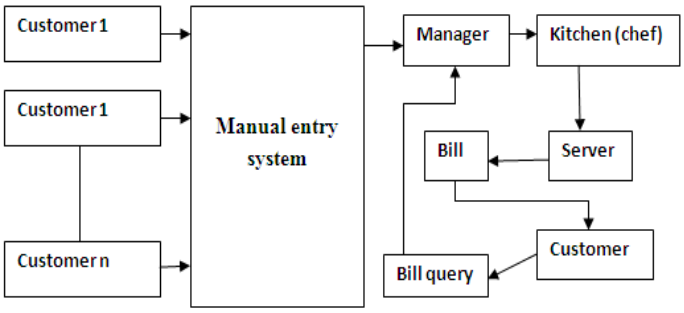

Figure 1. Existing System Architecture

1. Impatient customers also call over the waiter/waitress frequently to find out the status of their order several times during their visit, wasting the waiter's service time. Waiters need to constantly check with the chefs to determine when food is ready. Conversely, chef needs to make sure waiters know that food is ready. This can cause the food to get cold over time and lead to potential food-poisoning. It may also lead to wrong orders and an unsatisfied customer.
2. Keeping track of empty, clean and reserved tables within a restaurant. Busboys must always be alert as to which tables need clearing. This means that they must be always checking for tables. Waiters need to usually alert them. This takes extra time from other staff. Managers have to analyze hundreds of paper `receipts to determine best-selling items, popular hours and customer satisfaction. They also require re-printing of menus when food is not available or a price needs to be changed. This can be costly and time-consuming to a restaurant.

B. Problems in Existing System

The proposed system when implemented will overcome disadvantages caused in other previous ordering system. There are many differences in previous systems and proposed system which can be given by comparison below **Table 1**.

- ✓ The most common blunder is waiters making mistakes with customer's orders. At times, a waiter can forget to add a specific item, make a change because a customer is allergic to certain substance, or forget to give the order to the kitchen.
- ✓ Customers have to wait for a waiter to take their order. They must rely on the waiter to remember their order and specific details. Their food may take longer to be prepared and served if the waiter has multiple tables. They may also get wrong bills since they cannot see their bill amount until their meal is complete.

Table-1. Comparison to Existing Systems

	Paper menu card	KIOSK Technology	QORDER system	Touchscreen based menu card (GSM)
Wireless network	No	No	Yes	Yes
Touchscreen	No	Yes	Yes	Yes
Dependency on waiter	High	Less	High	Less
Customized order	No	Yes	No	Yes
Order	High	High	High	Less

- ✓ Impatient customers also call over the waiter/waitress frequently to find out the status of their order several times during their visit, wasting the waiter's service time.
- ✓ Waiters need to constantly check with the chefs to determine when food is ready. Conversely, chef needs to make sure waiters know that food is ready. This can cause the food to get cold over time and lead to potential food-poisoning. It may also lead to wrong orders and an unsatisfied customer.
- ✓ Keeping track of empty, clean and reserved tables within a restaurant.
- ✓ Busboys must always be alert as to which tables need clearing. This means that they must be always checking for tables. Waiters need to usually alert them. This takes extra time from other staff.
- ✓ Managers have to analyze hundreds of paper receipts to determine best-selling items, popular hours and customer satisfaction. They also require re-printing of menus when food is not available or a price needs to be changed. This can be costly and time-consuming to a restaurant.
- ✓ The traditional system was not capable of intimidating the waiter about the availability of a dish.

2. Proposed System

To overcome the limitations of above systems, we propose this integration of touch technology in restaurants based on TFT technology. Keypad is used to select the item in the list of menu. RFID is used for valid ling the Customer.GSM is used for Billing the item and send a short messages to the user mobile phone. As a remedy for the above mentioned systems, we propose a restaurant with a touch technology system. Our system aims at providing the following features:

- ✓ Combining of Wireless technology to automate food ordering process.
- ✓ Allow the restaurant to operate faster (faster seating, faster order preparation, faster turnaround on food).
- ✓ Reduce employee error, thereby increasing customer happiness. This also reduces waste as when the wrong item is ordered, the food must be discarded.

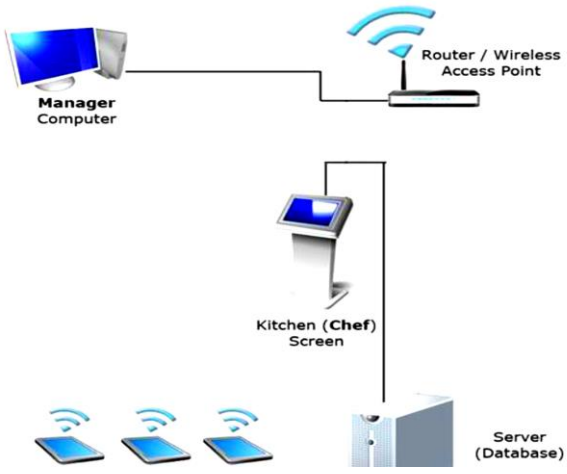

Figure 2. System Architecture

- ✓ To minimize the flaws in conventional system by atomizing the working of a restaurant.

✓ To provide a mechanism for obtaining feed-back from the customers and provide the restaurant a means of review of their service.

3. Block Diagram of The Automation System

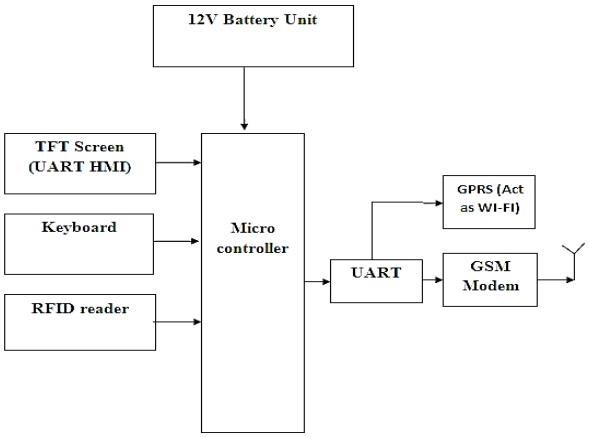

Figure 3. Block diagram of the automation system

4. System Design

A. Manage Menu

In this part we present some of the system sequence diagrams such as use case diagrams, which provide a clear system overview. Figure 2, 3 and 4 depicts the use case diagrams for managing menus, food ordering and bill payment of the touch technology based restaurant system. Firstly the restaurant owner/manager will log into the system and update the menu as per the availability of the dishes. The manager can also promote the various offers of the day. The information and menu choices selected by the customer are sent to the system over wireless network.

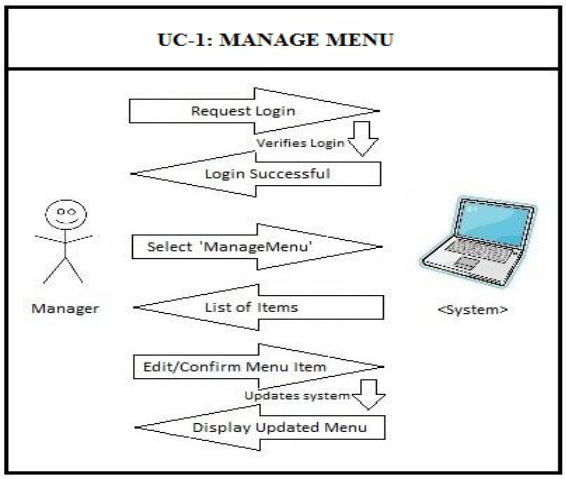

Figure 4 : System Sequence Design for Manage Menu

The above diagram **Fig-4** depicts the system sequence for the manage menu. In the manage menu initially the login is requested. After the login has been verified then the login is successful. Then the manage menu is requested to view the menu items. Then the list of items for ordering is conformed and updated.

B. Menu and Ordering System

The kitchen staff and the restaurant owner will receive the lists of items ordered by the respective customers from the system. The restaurant owner can also update the order status into the system. The customer is also able to view the order status. The entire application will be readily installed and kept open on the tablets on the tables. The shutdown option of the application will remain disabled for the customers. The customer's won't be able to turn off or minimize the application and do any other work on the tablets. After completion of the meals, the customers can make payment and enter feedback regarding restaurant system and services.

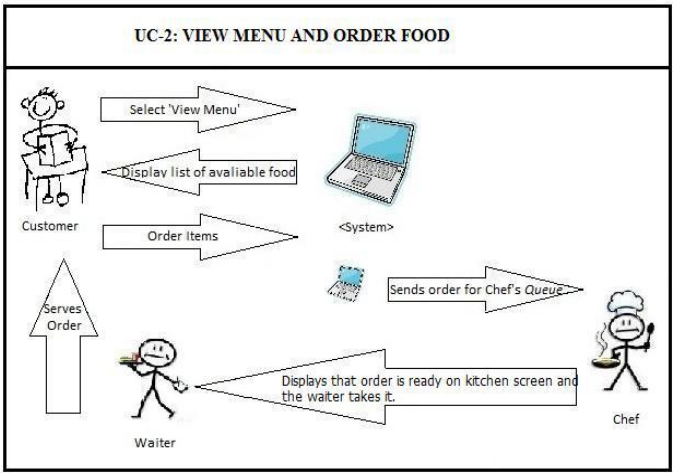

Figure 5 : System Sequence Diagram for Order Food

The above **Fig-5** shows the viewing menu and ordering system. Initially the view menu is selected and it shows the list of menu. Then the customer has to order the items from the list. Then the items are ordered to the kitchen (chef). Then the display system shows that the food is ready to be served and the food is placed to the customer via waiter/server.

5. Paybill

To pay the bill the customer has to give view bill option. Then the display system shows the price amount to be paid for the ordered items. Then if the customer wants to

calculate the amount by himself/herself the can go for the option tip calculator to calculate the amount.

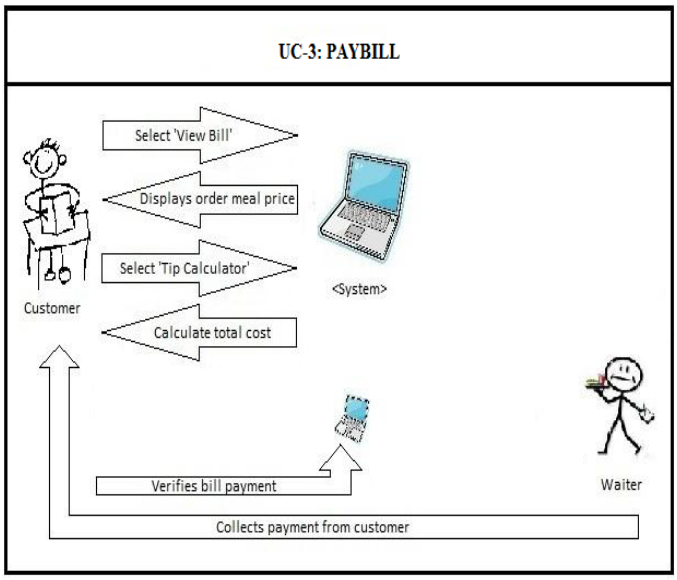

Figure 6. System Sequence Diagram for Bill Payment

The main modules of this project are as follows:

- Display systems are places at the customer's table.
- These display systems are designed for the use of normal users arriving at the restaurant. These display systems displays the whole menu of the restaurant. The menu contains text and graphics that describe each item to an average customer. The items in the menu are non-editable for these types of the tablets.
- They will work efficiently by enabling Wi-Fi connectivity.
- The customer can view the menu of the restaurant and add menu items to cart, see total price, specify quantity and add notes (e.g. "no onions", or "less garlic"). The menu also displays a brief description of the item when selected.
- Customers can also go through the features of the restaurant, take a look at the facilities provided by the restaurant and check for various offers available.

When the desired list of dishes is finally selected, customer can click on „Confirm Order". This order is then sent to the chef via the kitchen display and to the cashier's desk as well. The display systems also provide a feature for providing real-time feedback.

Manager Desktop

These desktops cater to the needs of the restaurant manager. The manager controls the functioning of whole restaurant from a single desktop/tablet. He is authorized to access any tablet and is provided the authority to make changes to the menu. He can perform various updates like changing the price of a particular item or disabling a particular item which is not available at that particular time.

Kitchen Display Interfaces

These displays are set up at the kitchen near chef so that he is able to view the orders requested from customer. All the ordered items along with their table numbers are displayed punctually at the chef"s interface. The resolution and font size is sufficiently large to be seen by chef at a reasonable distance. The display allows the chef to update the estimated time of completion of each order once he starts cooking it. The chef's screen displays two-three orders simultaneously which updates the chef about what to expect once the current order is closed. Chef is able to notify and close an order when a particular item is ready.

6. Hardware And Software Required

A. Required Hardware

- ✓ Arduino uno
- ✓ UART
- ✓ Relay
- ✓ Rechargeable battery/power supply unit
- ✓ **GPRS AND GSM.**

Figure 7 : GSM AND GPRS module

GPRS - General Packet Radio Service.
GSM - Global System for mobile communication.
GSM is a digital mobile telephony system that is widely used in Europe and other parts of the world. GSM uses a variation of time division multiple access (TDMA) and is the most widely used of the three digital wireless

telephony technologies (TDMA, GSM and CDMA). GSM digitalizes and compress data, then sends it down a channel with two other streams of user data, each in its own time slot. It operates at either the 900 MHz or 1800 MHz frequency band. Mobile services based on GSM technologies were first launched in Finland in 1991.**GPRS** technology brings a number of benefits for users and network operators alike over the basic GSM system. It was widely deployed to provide a realistic data capability via cellular telecommunication technology as shown in **Fig – 7**.

✓ **Keypad**

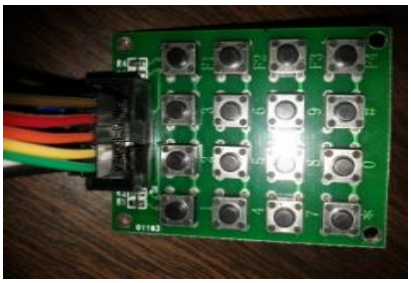

Figure 8 : Keypad System

A keypad is a set of buttons or keys bearing digits, symbols and/or alphabetical letters placed in order on a pad, which can be used as an efficient input device. A keypad may be purely numeric, as that found on a calculator or a digital door lock, or alphanumeric as those used on cellular phones. Aside from the row of number keys found on the upper portion of a computer keyboard, a separate numerical pad is also located for efficient data entry as shown in **Fig – 8.**

✓ **RFID**

Figure 9 : RFID Module

RFID – Radio Frequency Identification.
RFID is the use of radio waves to read and capture information stored on a tag attached to an object. A tag can be read from up to several feet away and does not need to be within direct line-of-sight of the reader to be tracked. RFID uses electromagnetic fields to automatically identify and track tags attached to objects. The tags contain electronically stored information. Passive tags collect energy from a nearby RFID reader's interrogating radio waves. Active tags have a local power source such as battery and may operate at hundreds of meters from the RFID reader. Unlike a barcode, the tag need not be within the line of sight of the reader, so it may be embedded in the tracked object.

✓ **TFT**

Figure 10. TFT display unit

TFT – Thin film transistor.
A display screen made with TFT technology is a liquid crystal display(LCD), common in notebook and laptop computers, that has a transistor for each pixel. Having a transistor at pixel means that the current that triggers pixel illumination can be smaller and therefore can be switched on and off more quickly. TFT is also known as active matrix display technology. A TFT or active matrix display is more responsive to change. For example, when you move your mouse across the screen, a TFT display is fast enough to reflect the movement of the mouse cursor. A more development is organic thin – film transistor technology, which makes it possible to have flexible display surfaces.

B. SOFTWARE REQUIRED

- Arduino IDE
- Embedded C

7. Flow Chart

A. Transmitter Flowchart

The above **Fig -11** shows the transmitter flow chart where the menu is displayed and has to wait for the selection of the menu items. If the menu items are selected the select the quantity else again go for the display menu. If the quantity of the items selected is >0 then transmit the order else again go back to the display system to order the items. After the order has been

placed customer will ask for the bill. If the bill is enquired then the bill amount is displayed.

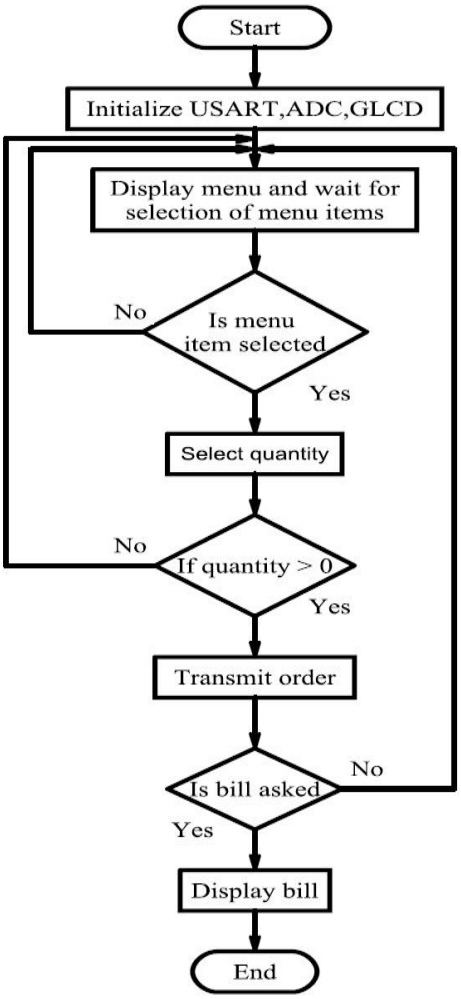

Figure 11. Transmitter Flow Chart

B. Receiver Flowchart

In the receiver flowchart initially the USART and the LCD display systems are initialized. Then the order received is verified. If the order has been received then the order is displayed. If the has not been received then the control goes to the initial stage. The receiver flowchart in **Fig-12** depicts the system at the receiver side.

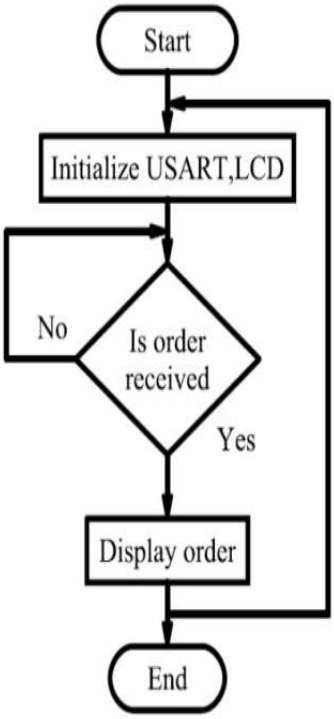

Figure 12. Transmitter Flow Chart

The receiver side of the system is placed at the kitchen (chef) to view the ordered items for preparation as shown by the above **Fig-12**.

III. RESULTS AND DISCUSSION

A. Starting the application

Initially the user needs to install the "Smart food ordering System" application on his android based device. After the installation, the icon of the app will feature on the Home screen of the user's device. Then want to create the user name and password.

B. Registration

The below shown are the images for the automation in the hotel management system where the customer need not wait for a long time in a restaurant to order and consume the food. Here we tried to propose a system where it cut downs the time consumed and it is an efficient system where the customer can directly place the order in the kitchen (chef) without any queue within a fraction of second as shown in **Fig-13**.

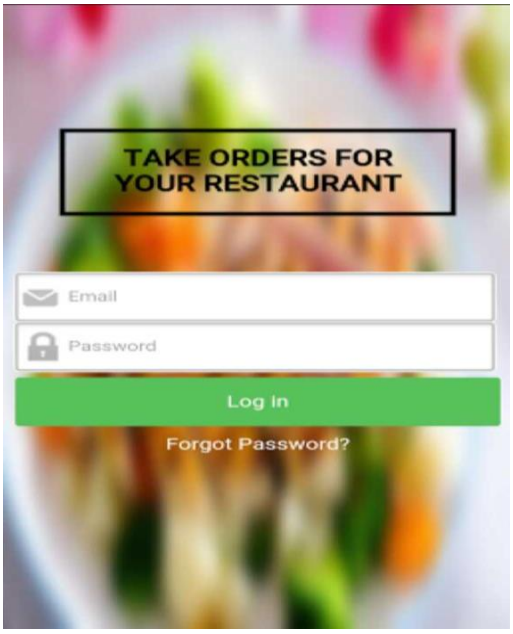

Figure 13. Registration

The above **Fig – 13** shows the initial stage of the ordering process. In the above registration process the user has to create their own login.

B. Select the location

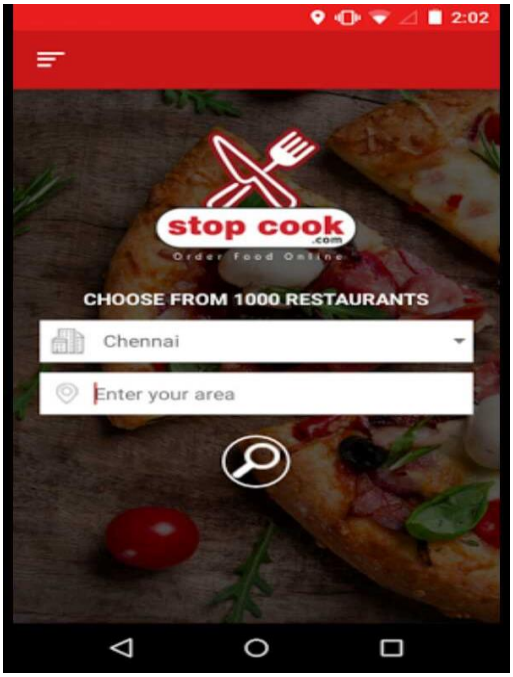

Figure 14. To select location

In the online food ordering system the food can also be delivered to the place where the customer is in. In this system the customer needs to give the location and the particular area to deliver the ordered foods. In the above **Fig – 14** the customer can also search the place automatically without typing. This saves time.

D. Food Items

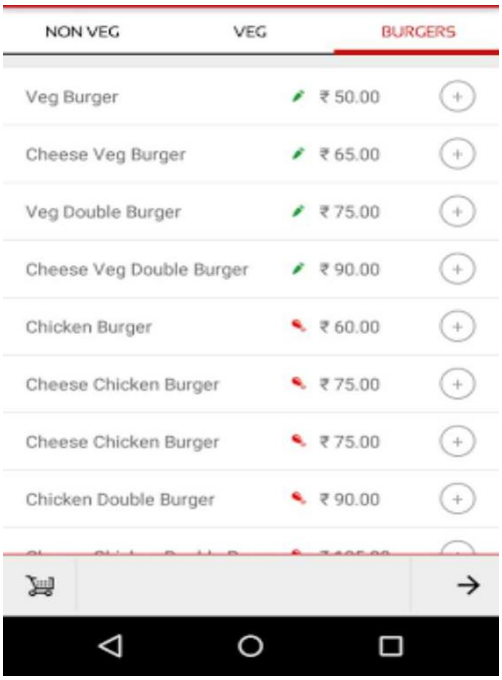

Figure 15. List of food items

The above shown **Fig-15** consists of the list of items along with their cost price for both vegetarian and non-vegetarian. The above picture displays various items according to their respective category.

MAIN MENU

PRODUCT ID	PRODUCT NAME
1	DOSA
2	IDLY
3	VEG BURGER
4	ICE CREAM
5	PONGAL
6	TANDOORI ROTI

NEXT

Figure 16. Items with their product ID

The above **Fig-16** represents the main menu. In the main menu the list consists of the product ID and the product name. Each product name is assigned to an particular product ID. So that the customer can choose the food item with the help of the product ID.

E. Reservation and Ordering

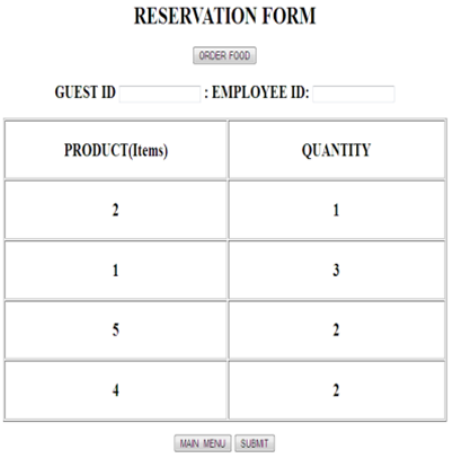

Figure 17. Reservation form

The **Fig-17** depicts the reservation form to order the food items. In the reservation form each customer / group of customer's are assigned with an employment ID. With the help of this ID they can reserve the table and order the food along with the quantity of the food needed. For further reference with the main menu icon at the left bottom we can go back to the main menu. Then it is submitted for preparation of the food. After the order has been placed by the customer the order is directly placed at the LCD display at the kitchen (chef) for the preparation of the food. In the reservation form the quantity of the ordered items can be varied according to the customer convenience.

F. Bill Payment

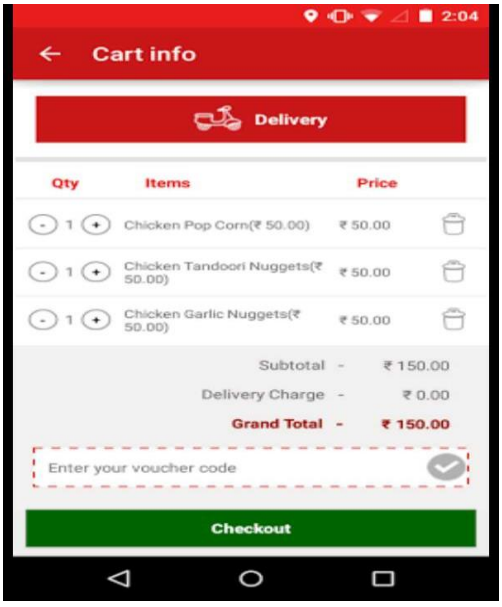

Figure 18. Consolidated bill payment

The above **Fig-18** shows the consolidated bill payment sheet where it consists of the list of items that is ordered by the customer. Then the grand total is displayed to the customer. If there occurs any error in the bill the customer itself can able to modify or can contact the manager of the organization.

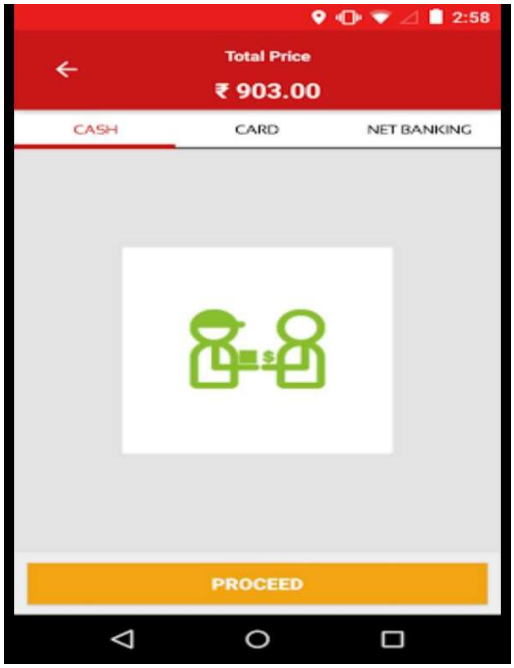

Figure 19. Type of Payment

The above **Fig – 19** shows the type of payment that the customer is going to pay whether it is credit card/debit card/cash/wallet/net banking. When the customer selects the required payment field and if there no errors then he/she can proceed. This is the system which reduces the time consumed.

Figure 20. Hardware

IV. CONCLUSION

In this paper, we compare the major automaton tools in Restaurant sector namely, the PDA based System, QORDER system and Android based system. The GUI of Android applications are more attractive and informative than the PDA and QORDER systems. The processing speed of Android system and QORDER system is almost the same whereas the PDA based systems are slower than the other two systems. Therefore, it is clearly visible that Android based systems are the cheapest automation solution for the restaurant owners.

Thus, we present an automated food ordering system with features of feedback and wireless communication. This system is convenient, effective and easy thereby improving the performance of restaurant"s staff. This system also ensures good quality of service and customer satisfaction. Thus, the proposed system has the potential to attract customers and also adds to the efficiency of maintaining the restaurant's ordering and billing sections.

V. REFERENCES

[1] Software Engineering by Ivan Marsic, Rutgers University.

[2] Ashutosh Bhargave, Niranjan Jadhav, Apurva Joshi, Prachi Oke, Prof. Mr. S. R Lahane, "Digital Ordering System for Restaurant using Android", in International Journal of Scientific and Research Publications, Volume 3, Issue 4, April 2013.

[3] Soon Nyean Cheong, Wei Wing Chiew, Wen Jiun Yap, "Design and Development of Multi-Touchable E-Restaurant Management System", in 2010 International Conference on Science and Social Research (CSSR 2010), December 5 - 7, 2010, Kuala Lumpur, Malaysia.

[4] Shweta Shashikant Tanpure, Priyanka R. Shidankar, Madhura M. Joshi, "Automated Food Ordering System with Real-Time Customer Feedback", in International Journal of Advanced Research in Computer Science and Software Engineering, Vol. 3, Issue 2, February 2013.

[5] V. Swapna, M. Firdouse Ali Khan, "Design and Implementation of Ordering System for Restaurants", in International Journal of Engineering Research & Technology (IJERT), Vol. 1, Issue 10, December-2012.

[6] Khairunnisa K., Ayob J., Mohd. Helmy A.Wahab, M. Erdi Ayob, M. Izwan Ayob, M. Afif Ayob, "The Application of Wireless Food Ordering System", in MASAUM Journal of Computing, Volume 1 Issue 2, September 2009.

[7] J. A. Bardi. (2011). Wiley::Hotel Front Office Management 5th Edition. Available. http://eu.wiley.com/WileyCDA/WileyTitle/productCd-EHEP001784.html?filter=TEXTBOOK.

[8] Y. Ming-Ju, et al., "Multicast Services of Digital Television in a New Management Framework," in Intelligent Information Technology Application Workshops, 2008. IITAW '08. International Symposium on, 2008, pp. 296-299.

[9] M. Ben Ghalia and P. P. Wang, "Intelligent system to support judgmental business forecasting: the case of estimating hotel room demand," Fuzzy Systems, IEEE Transactions on, vol. 8, pp. 380-397, 2000.

VI. AUTHORS BIOGRAPHY

H.SHRUTHI NANDHINI

Currently pursuing the B.E degree at Sri Shakthi Institute of Engineering and Technology. Her research interest includes Embedded systems, Telecommunications and Artificial intelligence.

Email: shrusamyu@gmail.com

C.P.SUNANDHA

Currently pursuing the B.E degree at Sri Shakthi Institute of Engineering and Technology. Her research interest includes Embedded systems.

Email: sunandhagrg@gmail.com

S.SUBASRI

Currently pursuing the B.E degree at Sri Shakthi Institute of Engineering and Technology. Her research interest includes VLSI and programming.

Email:subasriselvaraj17049@gmail.com

V.SIVARANJINI

Currently pursuing the B.E degree at Sri Shakthi Institute of Engineering and Technology. Her research interest includes Embedded systems.

Email: sivaranjini12ece130@gmail.com