ZIGBEE BASED E-MENU ORDERING SYSTEM

B. Shabari[1], B. Ashok Nayak[2]

[1]Pursuing M.Tech (ES), Working as Assistant Professor,

Visvesvaraya College of Engineering and Technology (VCET), M.P.Patelguda, Ibrahimpatnam,

RangaReddy, Telangana, (India)

ABSTRACT

A design methodology for restaurant menu ordering system is prosed in this paper. The system proposed in this paper is developed to be useful in all kinds of restaurants who maintains a menu system. And also it should be affordable to even a small restaurants. The 802.15 ZigBee technology is used as wireless communication standard in this paper. The system proposed in this paper will consists of two sections, one is a hand held device placed on every table in the restaurant and another section should be placed at billing section and supply section. The system also having a touch screen and graphical LCD interface for providing a smarter user interface menu ordering.The paper describes about the algorithm used in implementation of advanced menu ordering system by with a wireless communication technology ZigBee and the steps involved in its protocol stack. The proposed system is intended to use by all kinds of restaurants for all classes of people. The graphical LCD used in it enables the feature of menu display with the graphical representation that will be easy to understand by illiterate people also.

Keywords: ZigBee, 802.15, Wireless network, touch screen, Graphical LCD

I. INTRODUCTION

The development in the food catering industry is getting strong in its roots day by day in these ultra-modern days where people always prefer readymade or ready to use things. The hotel management is also improving the quality of service in the form of hospitality in receiving the customers as well as hygienic maintenance in food supply. The information technology is always be welcomed by the restaurant business for improving its processes even stronger with integration of technology. The technological upgrade in billing methods is already succeeded in restaurant business. The people always concerned about their valuable time to be spent in restaurants other than money and taste. The conventional methods of menu ordering involves more human efforts for getting an order from the customer by giving the customer a menu card on their table and also billing is a special attention need to pay for every table and their orders. The menu ordering through an electronic system interface will get a n ultimate response from the users due to the time saving methodology and smarter to communicate. The wireless communication interface will provide a faster and accurate data transmission in a low cost. The implementation of electronic menu ordering systems may have some differences in interface design and methodology and also wireless technology preference based on the level of the restraint. The proposed system is made up to all classes of restaurants, so that the ZigBee communication is used as wireless interface and the graphical LCD with touch screen is used as customer interface.

II. RESEARCH METHODOLOGY

The background methodology involves the background study about the Wireless technologies in the market, alternatives for display methods and also about the bill processing and claim methods.

There are various wireless communication technologies in the market are leading the market in their category of communication ranges. While choosing a communication technology for out implementation, the first concern to make is, the requirement of communication range. The communication technology to be used should always be enough capable of providing the range of communication as per the application requirement and the frequency band also should be enough to carry by the hardware implemented. The next concern about the communication technologies is to choose the less expensive technology which will also satisfies the frequency range. Apart from this all, one more concern is about the modulation technique using in thecommunication technology. The modulation technique will effects the service quality in data exchange.

The next step of research is about the interface/display technologies, the interface involves displaying the menu items on any output device. Since our proposed system consists of a portable handheld device for menu display at every table, it should be always less expensive and easy to operate by anyone. The portable interfaces can be used with the microcontroller are having the choices like Alphanumeric LCD display, that it can display alphanumeric characters on it with the help of inbuilt microcontroller in it. The next stage from the alphanumeric LCDs is Graphical LCD, it can display the monochrome images also along with the alphanumeric characters.

The research about the billing methods followed by the most of the restaurants is all manual billing method by monitoring the items issued to a particular table, and finally they will issue a paper statement of bill to the customer. The manual billing may not much accurate than the computing methods.

III. HARDWARE DESIGN
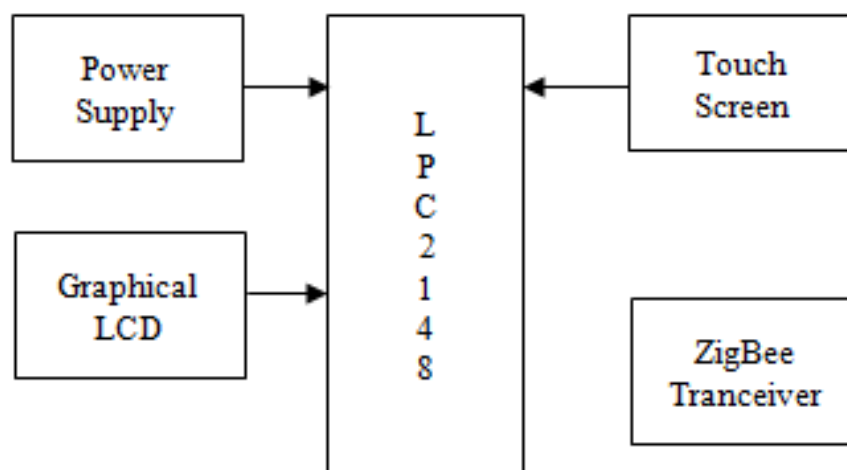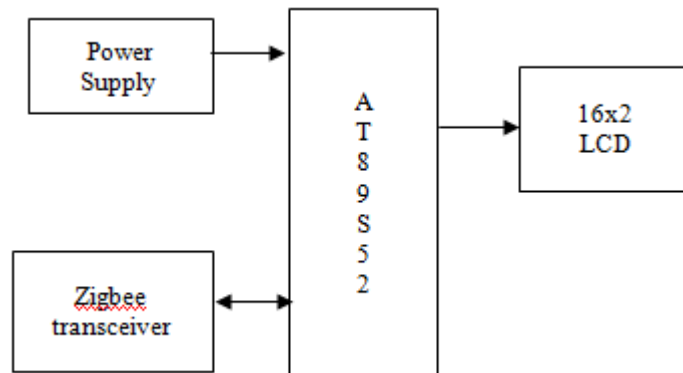
3.1 Customer Section

Fig 1: Block Diagram of Customer Section

3.2 Billing Section

Fig 2: Block Diagram of Billing Section

The above block diagrams shows the primary elements involved in two section of the proposed menu ordering system.

*LPC2148:*The LPC2148 is a 32 bit microcontroller with ARM7 TDMI core in it. The 64 pin Quad pack ICs are available in general in the market. Among 64 pins, 48 are the user programmable GPIO pins. All this GPIO are multipurpose pins integrated with various internal features such as UART, SPI, I2C, ADC, and RTC etc. It also has 2 timers with Compare, Capture and PWM feature. It also having the interrupt sources up to 16. LPC2148 is also an ISP (In System Programmable) featured microcontroller with the use of UART pins in it. It has two UARTs and UART0 is dedicated to ISP.

*ZigBee:*The IEEE 802.15 standard is named as ZigBee. It is a wireless communication protocol that operates in the frequency range of 2.4GHz. The reason behind choosing the ZigBee as wireless interface is, it is an open source communication standard. No licensing for band usage is required. It use the OQPSK modulation technique, where the phase of the message signal will vary in terms of its phase with 4 angles. The ZigBee is also faster in data transfer with 20 to 250Kbps based on the frequency used. The major preferable feature in ZigBee is, the Zigbee devices can be used as either receivers or transmitters. So there is no need to use the separate devices for transmission and reception. The operating range of a ZigBee device practically tested is nearly 50m which is an enough range for a restaurant geographical measurements.

*Graphical LCD:*The graphical LCD used in this proposed system is JHD12864E. The graphical LCD is in general a display which can able to handle the numeric, alphabets and monochrome images. It has two inbuilt controller KS1080. The 128x64 graphical LCD is having two pages and each page can be controlled by one KS1080. The displayingof images or text can be separated into pages and columns in the LCD. First the page should be selected by giving the appropriate command and then the columns selection. Any data to be displayed is gven in the form of calculating the pixels in binary form.

Touch Screen: The resistive touch screen used in this system is used for obtain input about the required food order of the customers and bill request too. The touch screen is interfaced to the LPC2148 through UART. The touch screen will be positioned on the graphical LCD and the menu items can be shown in the display in the form of images for easy representation. The required item can be selected by tapping the touch screen in the corresponding item position. The touch screen will gives an accurate values of axis based on the tapped position. The touch screen operation will make the menu ordering system more technologically stronger and smarter.

AT89S52: The billing section is contained with AT89S52 which is 8-bit microcontroller. It has 32 GPIO pins, internal UART, two timers. It is a powerful microcontroller in 8-bit microcontrollers range. The programming methodology is also simple in this. As our billing section involves only one UART interface device i.e. ZigBee whereas the customer unit contains two UART interface devices i.e. ZigBee and touch screen, in a thought of cost reduction, we preferred At89S52 in the billing section.

IV. SOFTWARE DESIGN

The entire proposed system uses two software tools. They are
1.   Keil uVision
2.   Flash Magic

Keil uVision: It is an IDE for various microcontrollers such as 8051, ARM family microcontrollers. It is an integrated tool with all the requirements for programming of a microcontroller. It is having a text editor for writing the program code in it. It is having a compiler/debugger for error checking. And also having the Hex file generator for converting the code into binary format for writing it into microcontroller. It provides a programming platform for various microcontrollers with all their library headers.

Flash Magic: After writing the code in IDE, compiling and debugging will be completed in IDE itself. The next step is to write the binary form of the code into microcontroller's flash memory. Flash magic is the tool that provides the writing Hex file into flash memory through UART interface to the computer's COM port. As the LPC2148 is having the internal ISP feature which enables the programmer write the code directly into the microcontroller without using any extra device.

The additional software tools used for implementation of this system is uC Flash. This is also a programming tool for 8051 microcontrollers but it is very specific to a programming device of that particular manufacturer. We are not giving much description about this tool because of the programming device is chosen by the user availability and the tool will changes according to the device used.

V. WORKING DESCRIPTION

The ZigBee based menu ordering system starts working from displaying the menu items available in the restaurant on graphical LCD connected to the LPC2148 microcontroller at every table in the restaurant. The users can choose any of the item by simply tapping the corresponding item icon on the touch screen. The touch screen will send the corresponding instructions about the selected item to the LPC2148. The LPC2148 will processes the item details and adds the table number to the data and send it to the order/billing section through ZigBee device. The billing/order section will get the items along with the table number on it's display with a buzzer sound to alert the attenders at that particular place. After completion eating or delivery of the items of one table, the customer can request for bill by tapping on the 'Finish' button on the touch screen. Then the bill will be calculated by the AT89S52 in billing unit and sent to the customer section to the corresponding table. The bill amount will be displayed on the graphical LCD then the customer can know the bill and they can pay it.
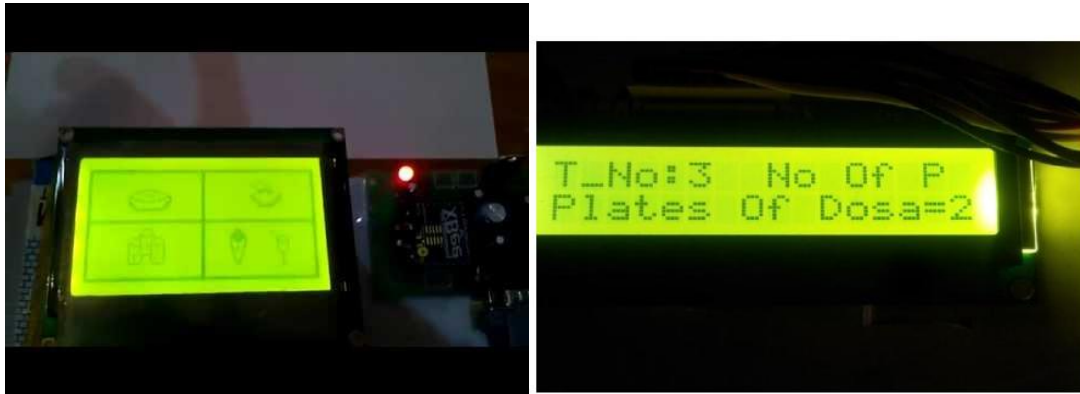
VI. RESULTS

The above picture shows the experimental results of the implemented system

VII. CONCLUSION

The implemented system of restaurant menu ordering system is a modern and smart solution for menu ordering methods in any kind of restaurant. The system will reduce the manual efforts and also gives more accuracy in calculating the bill for each individual table.It is also a low cost alternative to be used by middle and low level restaurants also.

REFERENCES

[1]. Mikko Kohvakka, Mauri Kuorilehto, Marko Hannikainen, and Timo D. Hamalainen, "Performance analysis of IEEE 802.15.4 and ZigBee for large-scale wireless sensor network applications," Proc. the 3rd ACM international workshop on Performance evaluation of wireless ad hoc, sensor and ubiquitous networks, ACM Press, 2006, pp.48-57, doi: 10.1145/1163610.1163619.

[2]. ZigBee Alliance Document 053474r06, ZigBee Specification,Version 1.0, 2005

[3]. Liu, C. L, Layland, J, "Scheduling algorithms for multiprogramming in a hard real-time environment," Journal of the ACM, vol. 20,

[4]. Hangci Zhou, Guangwen Wu, "the programming based on embedded real time operating system,"Beijing: Beihang University press, 2006.

AUTHOR DETAILS

	B. SHABARI, Pursuing Mtech (ES) from Visvesvaraya College of Engineering and Technology (VCET), M.P.Patelguda, Ibrahimpatnam, RangaReddy, Telangana, INDIA. Her area of interest includes embedded systems interrelated with different types of microcontrollers.
	B. ASHOK NAYAK,working as Assistant Professor from Visvesvaraya College of Engineering and Technology (VCET), M.P.Patelguda,Ibrahimpatnam, RangaReddy. She has morethan five years of Experience in Teaching Field.