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Touch Panel Based Restaurant Automation System using Zigbee

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Abstract: ***Communication is purposeful activity of exchanging information and data across a time and space. Communication we use in our day to day life to exchange information which requires sender, receiver, message and medium. Also the automation is growing very drastically where it tends to bridge between mechanical and electronic parts. Due to the automation there is lot of advancement is happening in industry like bottle filling plant, railway ticket booking etc. On the other hand touch screen technology is also going ahead in implementing tasks easily and quickly. In today's world due to advancement of this kind of technologies we require to serve people user friendly and as quick as possible. So taking the advantages of these technologies we can implement the system in restaurants which can overcome the disadvantages of ordering food in conventional method. In conventional method we have to wait for waiter to take order which tends to wasting of time and human errors too. So using advantages of Zigbee as a wireless device one can implement automated ordering system in restaurant with reducing human power need.***

Keywords: Touch screen, Zigbee, Automation, Wireless communication

1. Introduction

Currently, the restaurants are facing the problem of time which is consumed by the typical process of order placing. The customer goes into the restaurant, then he does not know whether there is seat available or not. After that, moreover, the waiter will come then order will be placed this process is totally carried out by waiter so, it can cause any human errors.

The customers are more concerned about the service and hospitality of restaurants. This is one important aspect where it can impact on business transaction.

As from the observation, now a day, some restaurants are providing phablets to the customer table. But this system still needs human power and there is only one phablet so its time consuming.

The flaw in the current restaurant system is highlighted by this paper. This paper highlights the traditional menu ordering system compared to the proposed touch screen menu system.

2. Principle

The system is mainly divided into three parts, viz. table unit, kitchen unit and control unit which is at reception.

2.1 Working principle

The customer can place the order from the table using touch screen display where the menu is displayed. Customer can select the items which are displayed on menu. For authentication purpose, the customer needs to have RFID tag with him. The RFID tag is provided at the reception. Once the items are selected, the order will be send to the central unit via Zigbee module.

At the same time, the placed order will also be displayed on the LCD at kitchen side

The central unit is generally a PC with a Zigbee module where the data has been saved. Basically, for the data base we are using the MATLAB coding for making a front end. At the central unit, the account information of the customer will be processed and the central unit will send back al the information regarding the billing and account status to the customer.

When the placed order will display in the kitchen on LCD, at the same time buzzer will sound to alert chef. The LCD will show the items which are demanded by the customer along with the table number. When the order will accept at the kitchen, the message will be displayed at the table screen to acknowledge the customer that the order has accepted. Once the order gets completed then another message will be displayed indicating that the order is ready.

As the account information is processed by the central unit, the process information will be displayed to customer at table screen and printing of bill will be commanded by central unit. The bill also be printed using the thermal printer and the payment of bill will be taken from the customer's account.

All the transmission and reception will be carried out by Zigbee module which is acting as primary communication media in this project.

2.2 Principle Diagram

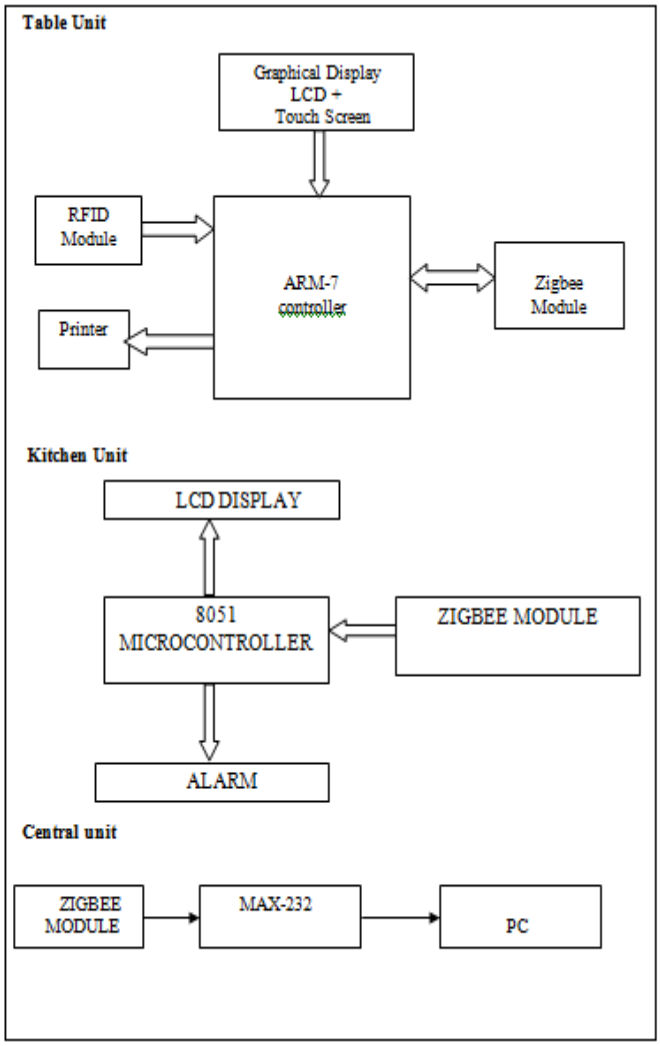

Figure 2.1: Block diagrams of Restaurant automation system

3. Hardware Components

3.1 Zigbee Module

This system has been implementing by using Zigbee CC2500 module as shown in fig. The CC2500 is very low cost 2.4 GHz transceiver designed for very low power wireless application. The RF transceiver is integrated with a highly configurable baseband modem.

Zigbee is based on an IEEE 802.15 standard. Though its low power consumption limits transmission distances to 10–100 meters line-of-sight, depending on power output and environmental characteristics. Zigbee has a defined rate of 250 kbit/s, best suited for intermittent data transmissions from a sensor or input device.

3.2 ARM7 LPC 2138

The LPC2131/32/34/36/38 microcontrollers are based on a 16-bit/32-bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, that combine the microcontroller with embedded high-speed flash memory ranging from 32kB to 512kB. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at the maximum clock rate. For critical code size applications, the alternative 16-bit Thumb mode reduces code by more than 30 % with minimal performance penalty.

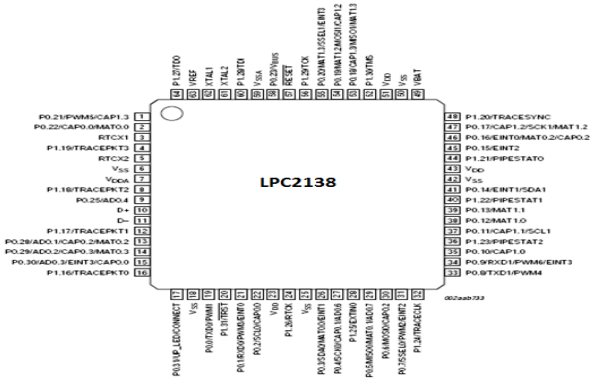

Figure 3.1: Pin Diagram of LPC 2138

3.3 RFID

Radio-frequency identification (RFID) is the wireless use of electromagnetic fields to transfer data, for the purposes of automatically identifying and tracking tags attached to objects. The tags contain electronically stored information. Some tags are powered by electromagnetic induction from magnetic fields produced near the reader. Some types collect energy from the interrogating radio waves and act as a passive transponder. Other types have a local power source such as a battery and may operate at hundreds of meters from the reader.

3.4 Microcontroller 89C51

The AT89C51 is a low-power, high-performance CMOS 8-bit microcomputer with 4Kbytes of Flash programmable and erasable read only memory (PEROM). The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry-standard MCS-51 instruction set and pinout. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel AT89C51 is a powerful microcomputer which provides a highly-flexible and cost-effective solution to many embedded control applications.

3.5 LCD 16x2

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.

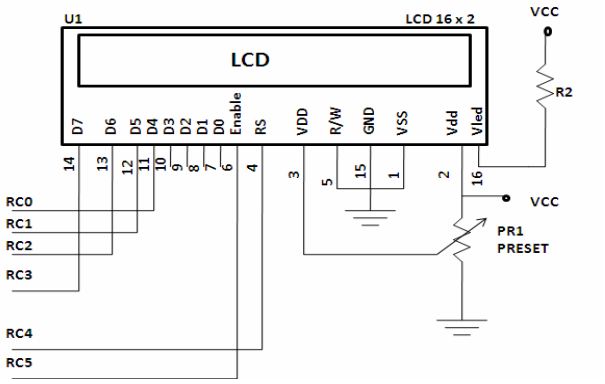

Figure 3.2: LCD Pin Diagram

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. The data is the ASCII value of the character to be displayed on the LCD.

3.6 Resistive Touch Screen

Resistive touch screens are touch-sensitive computer displays composed of two flexible sheets coated with a resistive material and separated by an air gap or microdots. There are two different types of metallic layers. The first type is called Matrix, in which striped electrodes on substrates such as glass or plastic face each other. The second type is called Analogue which consists of transparent electrodes without any patterning facing each other. As of 2011 analogue offered lowered production costs. When contact is made to the surface of the touch screen, the two sheets are pressed together. On these two sheets there are horizontal and vertical lines that, when pushed together, register the precise location of the touch. Because the touch screen senses input from contact with nearly any object (finger, stylus/pen, palm) resistive touch screens are a type of "passive" technology.

Resistive touch screens typically have high resolution (4096 x 4096 DPI or higher), providing accurate touch control. Because the touch screen responds to pressure on its surface, contact can be made with a finger or any other pointing device.

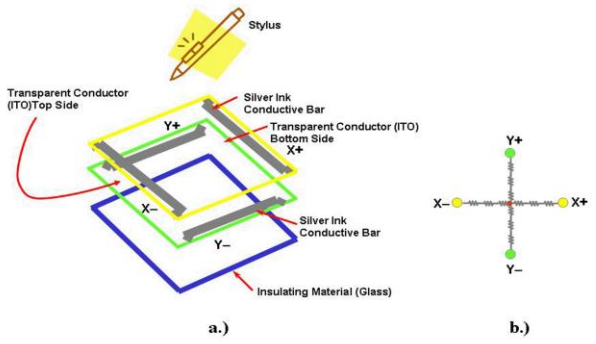

Figure 3.3: Resistive touch Screen

4. Software Design

The programming of LPC2138 ARM controller is with embedded C language using Keil software. Keil software is a great platform for developing embedded C programming for ARM controller. The system flowchart is shown in figure.

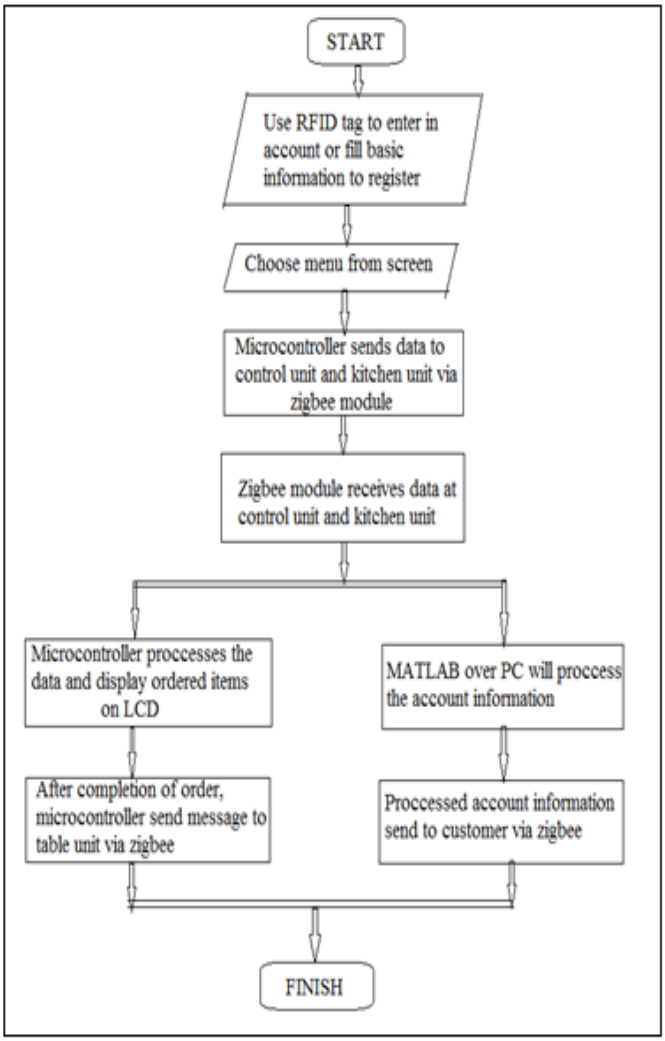

Figure 4.1: System Flowchart

As per figure, Firstly customer would have to register/sign in himself at the table unit using RFID tag which will be processed by ARM controller. At the table side user will select the item from menu using the touch screen. The ARM controller will process the information and will send it to the control unit and kitchen unit at the same time via. Zigbee module. The control unit will process the account information as per the order placed by customer. Also at the same time ordered item will be processed by kitchen unit microcontroller and it will display ordered item on LCD. After the completion of order kitchen unit will send the message to table unit about completion of order and also control unit will send updated account information to table unit.

5. Results

5.1 Control Unit

Figure 5.1: Front Panel

Figure showing the front panel for the system where we can check the customer ID, name and account balance. This result arises when a user check the balance after login or after deduction in debit of account due to placement of order.

5.2 Table Unit

Figure 5.3: Table unit after login

Figure shows different options for customer after login. Customer can choose the options like Menu card, Balance check and Recharge.

5.3 Kitchen Unit

The item that is ordered and the table number where from it ordered shown in figure. Here we have displayed numbers for food instead of name because of lack of space on display. It also shows the table number from where the order has been placed.

Figure 5.6: ordered item and table no. at kitchen unit

6. Future Scope and Conclusion

Many improvements can be done in the proposed system like the resistive touch screen can be replaced by more responsive capacitive touch screen. Also the one can provide provisions to accept different types of payments like checks, credit cards, debit cards, tips etc. The system can be further extended to register and link multiple restaurants to enhance the dining experience of customers.

The project is aimed to provide a less human effort in restaurants by distance communication using Zigbee. This will make a smart usage of data transfer by reducing the time and man power. This can be used at restaurant, Cinema hall etc.

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