Design of the Restaurant Self-Ordering System Based on Zigbee Technology. (Using ARM cortex microcontroller and color GLCD)

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Abstract

The project mainly aims in designing completely automated menu system in restaurants with the help of touch screen sensor, speech recognition module and a color graphical LCD to provide a user-friendly environment. There is no need of a person to take the order from the customer's table. The menu will be displayed automatically on the customer's table and we can directly order the menu with the help of either touch screen sensor or speech recognition module. The user can also request the order even through speech commands using speech recognition module. Touch screens provide fast access to all types of digital media, with no text-bound interface getting in the way. Using a touch interface it can effectively increase operator accuracy, reduce training time, and improve overall operational efficiencies. Transmission of data is through Zig-bee which is a wireless technology developed as an open global standard to address the unique needs of low-cost, low-power, wireless sensor networks.

Introduction.

This project involves developing a prototype for customer self-ordering system in restaurants. Ordering is a process of the customers specifying what they want, so that the order can be recorded by using a note form, or computer system and many others, followed by passing it to the relevant department for processing and finally the delivery of services or products to the customers based on the order.

Self-ordering system is very successful when applied in different restaurants in many countries and it is proven to benefit most of the investors. This system cuts down the manpower for taking the order from the customer.

Existing System.

In the existing system, order is taken from the customer manually by a written note or by an i-pad which needs a person to go near the table, show the menu card and ask for the order. After placing the order, the person will pass the information to the concerned section and the order is delivered accordingly to the customer.

Proposed System.

In the proposed system, Zig-bee is used to transmit the data from transmitter to the receiver. There are two ARM Micro-controllers each at transmitter (customer table) and receiver (kitchen). Whenever a customer comes to a table, they can select their order with the help of a Graphical LCD with touch screen provided. This GLCD displays MENU items with its corresponding images or pictures, so the customer has the choice of selecting the item with its picture. As soon as the customer selects the item, it will be displayed on the LCD provided in the receiver section. A person can also make his selection of the item through voice where the transmitter is provided with a Mic.

Hardware Description.

The following is a schematic of transmitter section of Design of Restaurant Self-Ordering system based on Zig-bee using ARM.
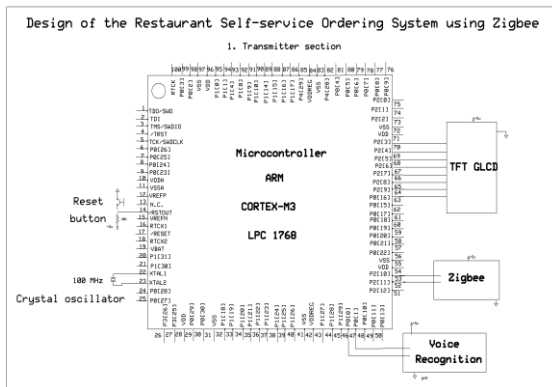
Figure : Schematic of transmitter section of Design of Restaurant Self-Ordering system based on Zig-bee using ARM.

ARM Cortex-M3.

The ARM Cortex-M3 32-bit micro-controller has been specifically developed to provide a high-performance, low-cost platform for a broad range of applications, including micro-controllers, automotive body systems, industrial control systems and wireless networking. The Cortex-M3 processor is a 32-bit processor, with a 32-bit wide data path, register bank and memory interface. LPC 1768 has 512 KB flash memory and 64KB data memory.

GLCD.

GLCD is a colored TFT graphical LCD with a touch screen module which enables the customers to select their option through touch. It has 100MHz frequency, 64KB of SRAM and 512KB flash.

Zig-bee.

Zig-bee is a wireless device which communicates between transmitter and receiver.

Voice Recognition Module.

The VRBot module is designed to easily add versatile voice command functionality to the project. The VRBot can be powered by anywhere between 3.3 and 5.5V, and typically consumes 12mA of current in operation. The VRbot module provides users with 26 built-in Speaker Independent commands that allow basic control of robot movement straight out-of-the-box.

The following is a schematic of receiver section of Design of Restaurant Self-Ordering system based on Zig-bee using ARM.
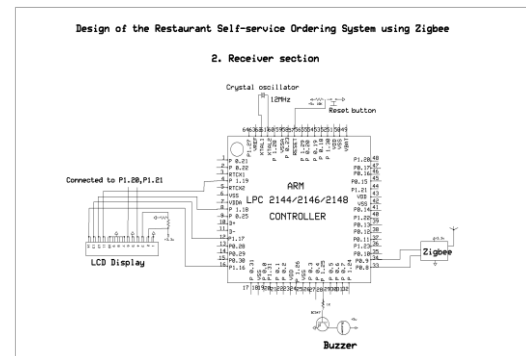

Figure : Schematic of receiver section of Design of Restaurant Self-Ordering system based on Zig-bee using ARM.

ARM LPC 2148.

ARM LPC2148 is a 64 pin Micro Controller which comes under ARM 7 version of ARM processors. It comes under the processor core architecture ARM7TDMI-S. It is a 32 bit Micro Controller .This is intended for high end applications involving complex computations. It follows the enhanced RISC architecture. It has high performance and very low power consumption. It has serial communications interfaces ranging from a USB 2.0 Full Speed device, multiple UARTS, SPI, and I2Cs. Various 32-bit timers, dual 10-bit ADC(s), single 10-bit DAC, PWM channels and 45 fast GPIO lines with 9 interrupt pins. 32 + 8 kB of on-chip static RAM and 512 kB of on-chip flash program memory.

LCD.

One of the most common devices attached to a micro controller is an LCD display. Some of the most common LCD's connected to the many microcontrollers are 16x2 and 20x2 displays. This means 16 characters per line by 2 lines and 20 characters per line by 2 lines, respectively. The LCD requires 3 control lines as well as either 4 or 8 I/O lines for the data bus. The user may select whether the LCD is to operate with a 4-bit data bus or an 8-bit data bus.

Buzzer.

Basically, buzzer works on the sound source of a piezoelectric sound component. To interface a buzzer the standard transistor interfacing circuit is used. Note that if a different power supply is used for the buzzer, the 0V rails of each power supply must be connected to provide a common reference.

Working Procedure.

In this project, there are two sections
  a) System with user or customer
  b) System with responder or service provider

a) System with user:

Design of the Restaurant Self-service Ordering System Based on Zigbee Technology using ARM cortex microcontroller
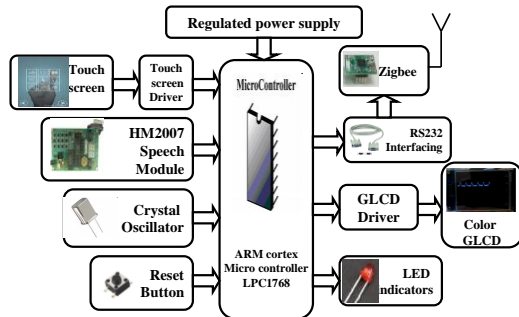1. Transmitter

Figure : Block diagram of transmitter section

When we switch the controller board initially we get the display of food items images on the TFT graphical LCD along with food item numbers. There are two selection enable options at the below end of the TFT graphical LCD. In this system, there are two ways to provide the order. The selection option is used to select whether the input is from voice mode or touch mode. When the user enables the voice mode option, then this project mainly selects the input based upon the speech commands given by the user. So, it is mandatory that the user's voice is to be given clearly and correctly near the microphone. Since the main objective is to transmit the data to the receiver section. When the user is done with the giving of selected item input, the word number corresponding to it is displayed their as confirmation and the same input is transmitted to the receiver section using wireless communication zigbee module.

When the user selects the touch mode then the touch screen module is enabled and when the user selects the food item on the image displayed on TFT graphical LCD, then the item numbers is displayed on it. The corresponding item number selected by the user is transmitted using zigbee module. The intermediate communication module is Zigbee module which makes the communication between the user or customer system at the table end and system at responder or service provider at receiving department.

b) System with the service provider/ responder:

Design of the Restaurant Self-service Ordering System Based on Zigbee Technology using ARM microcontroller
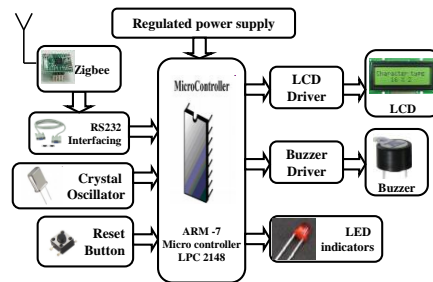2.Receiver

Figure : Block diagram of receiver section

The Zigbee module present in this system also receives the word that is transmitted by the Zigbee module present in the system with user. As soon as it receives the word, it sends it to the microcontroller. The ARM LPC 2148 micro controller which is at the receiver section takes the responsibility to display the menu items on the LCD. At the receiving end the selected items will be displayed on LCD with user table number.

Result.

The project "Design of the Restaurant Self-service Ordering System Based on Zigbee Technology" designed a completely automated menu in restaurants with the help of touch screen sensor and a color graphical LCD to provide a user-friendly environment. The user can also order hi/her requests through speech commands also using speech recognition module. The system uses zigbee wireless communication to transmit the data from the user to responder section.

Conclusion.

Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced IC's with the help of growing technology, the project has been successfully implemented. Thus the project has been successfully designed and tested.

Future Scope.

The main draw back of the system is it does not give the feed back of the requests to the user. This can be eliminated using GSM modem which sends the SMS messages about the requests to the manager when the responder does not respond to the requests of the user.

The system can also extend using smart card technology through which the bill payment can be done based on the smart ATM debit or credit cards directly. The printer can directly issue bills to the customers at tables only. This provides a time saving process and avoids a cash counter for it.

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