Smart Menu Ordering System in Restaurant

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Abstract—Automation plays a very important role in every field of human life. This paper contains the proposal of a fully automated menu ordering system in which the paper-based menu is replaced by a user-friendly touchscreen-based menu card. The system has PIC microcontroller which is interfaced with the input and output modules. The input module is the touchscreen sensor which is placed on GLCD (Graphical Liquid Crystal Display) to have a graphic image display, which takes the input from the user and provides the same information to the microcontroller. The output module is a Zigbee module which is used for communication between system at the table and system for receiving section. Microcontroller also displays the menu items on the GLCD. At the receiving end, the selected items will be displayed on the LCD and by using the conveyor belt, the received order will be sent to the particular table.

Keywords: PIC Microcontroller, Conveyor Belt, GLCD, Touch Screen.

I. INTRODUCTION

In the past 10 years India as a country has developed significantly. Standard of living of people has also improved. Now more and more people are willing to spend money on food in restaurants, so they expect a sophisticated system, because of which competition in the catering industry is becoming increasing very fast. These industries need to update with some new innovative ideas or else they will find themselves lagging behind the others in our society. Also India is an overly populated country; very often people find themselves standing in long queues to place their orders in fast food restaurants. Having placed their order, the customer waits near the counter until their order is ready for collection.

In order to solve this issue, here there is an idea of touchscreen-based ordering system for restaurants. Our goal is to develop a user-friendly touchscreen-based menu card which will be placed on every table at the customer side. Now the customer will need to select the menu items by pressing on items displayed on GLCD.

The order is then received by the receiver section (kitchen section) and by using the conveyor belt; the ordered items will be supplied to the customer. After the whole order is placed, bill is displayed in the billing section.

II. PROGRESSION SURVEY:

A. Other Available Ordering System:

Moreover, starting from the time when it was realized that hospitality, service has great impact on restaurant business transactions, many new ordering and serving schemes have been proposed up till now. These menu ordering techniques are as follows—

1) Paper-based menu card.
2) Self-service food ordering technology.

B. Traditional Ordering System (Paper-Based Menu Card)

It is the method in which customers specify their desired menu to the waiter who takes the order on a paper. Personally, he then takes the order to the kitchen department and then supplies the food item to the customer. So it was a time-consuming process. It leads to wastage of paper and also it requires reprinting of all menu cards. Also, in many cases for small change to be making in menu card, it is not convenient to print all menu cards again and again. Simply saying that the menu card once printed can’t be changed. After some days the menu card lost its worthy look and attractiveness.

C. Self Service

Self-service or self-ordering systems in restaurants refer to the restaurants taking order from customers using technologies such as the internet, kiosks etc. Usually, the users prefer self-service because of speed and convenience in making order and transaction while minimizing the miscommunication. The advantage is that there are no money related issues as the transactions are done online. The disadvantage is that high installation cost, authorization cost, and the development of custom software.
II. RELATED WORKS

The previous method involves the study about the wireless technologies in the market, alternatives for display methods and also about the bill processing. There are various wireless technologies available in their category of communication ranges. While choosing a communication technology for our implementation, the first concern to make the need of communication ranges. The communication technology to be used should always be capable of providing the range of communication as per the application needed and the frequency band should be carried by the hardware.

The next concern is to choose the less expensive technology which will also satisfy the frequency range. Apart from this, one more concern is about the modulation technique using in the communication technology. The modulation technique will affect the service quality in data exchange.

The next step of research is about the interface/display technologies, the interface which involves in displaying the menu items on any output device. Since our proposed system consists of a portable device for menu display at every table. It should be less expensive and user friendly[1]. The portable interfaces can be used with PIC microcontroller are having the choices like alphanumeric LCD display, that it will display alphanumeric characters on it with the help of inbuilt microcontroller in it.

The next stage from alphanumeric LCD’s is graphical LCD; it will display the monochrome images along with the alphanumeric characters. The next step of research about the billing methods in restaurants is all manual billing method which is done by monitoring the items issued to a particular table, but in our proposed system bill will be calculated by the processor and displayed in PC.

III. PROPOSED METHOD

A. Comparison with other System

Traditional system of catering is a very time consuming and is prone to mismatch of orders due to human errors. The problem with this system is that self-service restaurants are more popular in metro cities. So the developing cities or underdeveloped cities are mostly lagging from this technology. Many times these self-service systems take unreasonable amount of delays to deliver the order.

B. Block diagram

![Fig 1.Transmitter Block Diagram](image1)

![Fig 2.Receiver Block Diagram](image2)

![Fig 3.Billing Block Diagram](image3)

![Fig 4.Serving of Food via Conveyor Belt](image4)
C. Project scope:

There is a major scope in enhancing the visual experience by replacing paper menu with electronic menu card. To avoid delay in ordering process, wireless communication can be used here to replace the waiter who manually delivering the order to kitchen. Currently due to a increased literacy, awareness of advance communication technology among people, they are crazy about the latest technology and they are eager to automated their routine tasks. So introducing new technology and new approach in conventional food ordering system will lead to improved experience of a customer.

V. SYSTEM DEVELOPMENT

A. PIC Microcontroller

8051 is Complex instruction set based old Microcontroller. Some instructions require more than 1 cycle. But PIC is a reduced instruction set and most of the instructions execute in a single cycle. So PIC is faster than 8051 and it is rich in peripherals, consume less power, smaller pin count. So here in the proposed system PIC18F452 is used as the main processor for transmitting and receiving sections.

The heart of the system is the PIC Microcontroller. The 40pin dip is used to control the activities of all other sections. PIC Microcontroller was selected due to its good features of being cheap and readily available in the market and it has inbuilt ADC port, PWM and different kinds of serial interface, such as USART, SPI, I2C, etc. Its operating voltage is 5v. This PIC Microcontroller will monitor & control all the peripheral devices or components connected to this unit.

B. Touch Screen

A four-wire resistive touch screen panel consists of two flexible layers uniformly coated with a transparent resistive material and separated by an air gap. Electrodes placed along the edges of the layers provide a means for exciting and monitoring the touch screen.

Dimensions of touch screens are 55mm x 70mm and thickness is 1.5mm. This touch screen has various layers inside. Whenever any person touches this resistive screen, then it gives a variable analog voltage. Touch screen used in this project gives output using serial communication protocol and it is in terms of X, Y and Z coordinates. So here X is length parameter, Y is the width parameter and Z is the pressure with which touch is applied to the touch screen. Whenever customers come to their table then they will select the desired order menus from the touch screen.

C. Graphical LCD

In this project 128*64 pixel graphic LCD is used. This graphical LCD provides the user a simple serial interface to a full range of control.

The GLCD shows the picture of the menu items. As the touch screen interfaced with GLCD the item displayed in the GLCD will be selected by pressing the touchscreen. The specifications are as follows:

- Voltage: 6v-7v DC
- Current: 220mA

D. Zigbee Module

Zigbee is a wireless technology developed as an open global standard to address the unique needs of low cost, low power, wireless sensor networks.

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 the band usage is required.

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 of restaurant geographical measurements.

VI. WORKING

A. Transmitter Section

The transmitter section consists of a PIC18F452 microcontroller, touch screen along with GLCD and Zigbee module. Transmitter section will be placed on each table. The Zigbee module makes the communication between the system at the table and the system at the kitchen section. The Zigbee module covers up to 75m. According to the user’s requirement, they will select the menu item and quantity which is available in GLCD.

B. Receiver Section

The receiver section consists of the PIC microcontroller, LCD, Zigbee module and a relay circuit. The Zigbee module receives the ordered information from the transmitter Zigbee and it is displayed on the LCD along with a user table number and then by using the conveyor belt the selected item will be supplied to the particular table. If the ordered items are not present in the kitchen, then the chef will leave a message, whether the item is present or not.

If the ordered items are available in kitchen then the items will be supplied through a conveyor belt to the particular table.
C. Billing Section

The billing section consists of Zigbee and a PC. After completing the orders by the user the bill will be calculated in the receiver section and it is sent to the billing section via Zigbee. The Zigbee in the billing section receives it and display the bill in the PC.

D. Flow chart for Proposed Methodology

The USART, GLCD and ADC are initialized in the beginning. Menu is displayed on the GLCD and then the program waits for the selection of menu item. If the menu is selected and the quantity is greater than 0 then the order is transmitted to the receiver section.

On the receiver side only USART and LCD modules are initialized. If the order is received, then it is displayed on the LCD in receiver section along with the table number. If the ordered menu is not available in the kitchen, then the respective button in the menu will be pressed, which will leave a message whether the menu is present or not.

The hex file of the program is then burnt into the PIC microcontroller using programmer.

E. Algorithm

1. Initialization of peripheral devices like LCD module & touch screen.
2. Initialization of serial port of UART of microcontroller at 9600 bit/sec.
3. Touchscreen & LCD module with calibration Logical division of touchscreen into 9 locations.
4. Wait till user tapping.
5. Get tapping coordinate X, Y & resolve the location that has tapped.
6. Generate a code for command based upon location & send to serial port.
7. Repeat the above all steps.

VII. CIRCUIT DIAGRAM

Fig 5. Transmitter Section

Fig 6. Receiver Section
VI. IMPLEMENTATION

The software used for writing the program in PIC Microcontroller is MPLAB IDE-CCS COMPILER.

Here in the proposed methodology implementation in the transmitter section is done using interfacing touch screen with GLCD were menu icons are shown in GLCD which can touched using touchscreen interfaced to it and this is connected with the PIC microcontroller processor. Here Zigbee is used as a wireless communication device. Two switches are used in the transmitter section where the user have to press the red colour switch for placing new orders and another green colour switch must be pressed after placing the orders. After pressing the switch the selected orders will be sent to the kitchen section through the Zigbee module which attached to it. The touch screen, GLCD, Zigbee and the 2 switches are connected to the PIC controller. This connected kit will be placed in user table. Then in the receiver section, Zigbee is used for wireless communication by receiving the information from the Zigbee used in the transmitter, LCD is used for displaying the orders in the kitchen section with the table number, relay circuit is used for controlling the movement of the conveyor belt in forward and reverse direction. Here 4 switches are used in a separate board where the chef has to press the switch if any ordered items are not present. These switches are used here because of demonstration 4 items are taken. Then the ordered items will be placed in the conveyor belt and sent to the user table. Then in the billing section Zigbee is used for receiving the bill which is calculated by the PIC microcontroller present in the receiving section. The received bill will be display on the PC.

VII. CONCLUSION

Integrating all the hardware components used has been developed in it. The presence of each and every module has been reasoned out and placed here very carefully, thus contributing to the best and efficient working of the unit. Secondly, using very highly advanced IC’s with the help of up growing technology, the project has been successfully developed and implemented. This project provides an efficient device that helps to all people, especially dumb/illiterate to communicate easily and also it is a user friendly device. This is our proposed system which reduces the cost of running the restaurant as it does not require any waiters. This project also helps in transforming the whole catering industry in the world. This system will help in reducing the waiting time of customer in the restaurants. It will also reduce manual service given by waiters and serving staff, and also eliminating the human mistakes.

Zigbee used in this project provides a range of 50m, using a high power Zigbee module range can be extended up to 1.3km. Using Zigbee only text can be sent but by using IR/RF transmitter and receiver audio and video signals can also be sent. But Zigbee provides better data security and range is also more when compared to IR. And another thing to be noted is Zigbee works in license free bands. Zigbee is most preferable, where data security is more important than others. Further enhancements yet to be made in the field of Zigbee.

The future scope of our project is to replace the resistive touchscreen by capacitive touchscreen.

VIII. REFERENCES