International Research Journal of Innovations in Engineering and Technology (IRJIET)

Volume 1, Issue 1, September-2017

Advanced menu ordering system in restaurants

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Abstract *- **Smart Restaurant is a concept of automation of menu ordering system in hotels and restaurants. Instead of a person has to attend manually and enter the order placed in each table, the proposed system brings an ordering system with electronic menu. With this type of restaurant, the kitchen people can obtain orders from each table wirelessly. This system comprises of a transmitter section at customer table and receiver section at kitchen table. In this design an electronic system collects orders from each table with electronic menu card and transmits through wireless communication. Using a matrix keypad the items to be ordered can be selected. These ordered details are received by a wireless receiver in the restaurant kitchen and items list is displayed in a display unit so that the people in the kitchen can supply those ordered items after preparing them. Thus the time delay experienced by the customer usually during arrival of bearer to collect the order and pass to the kitchen is reduced drastically. The system is built using PIC16F877 microcontroller, Liquid crystal display and 2.4 GHz open band wireless transceiver modules for communication. The whole system can be operated within a range of 30m indoor.***

Keywords**:** Touch screen, RF transceivers, Smart Restaurant, PIC16F877, Menu Ordering.

I. INTRODUCTION

a) Background

The restaurant industry has lived through many years with many changes. But still anyway this area of customer support and interaction method has not improved so much since several decades of years. The way we do everything has changed almost but still most of them are untouched although most of them have various disadvantages, which can be significantly improved by this digital approach. The proposed digital based menu ordering systems for restaurants which can aim to improve this situation. Today's consumers are all adapted to interact with technology and computer system in many other day to day life aspects. Most of the times technology is preferred than traditional systems because they help to provide a convenient and fast service especially.

b) Motivation

Customer service and satisfaction is obviously the most import areas of restaurant industry. The most challenging task for the majority of restaurant managers is to engage in a friendly way to the service staff and customers. And it is also hard to motivate every day people because customer service in most of the restaurants will be very stressful. Most of this kind of stress occurs in conditions when one customer service member has to take care of too many customers at the same time. Thus this article aims to support the technology needed for a restaurant staff which can allow them to focus on the important and friendly customer service. By adapting this methodology in a restaurant will definitely improve the overall experience of the customer in appositive way and support to return for the next trip. Providing kitchen organization, business process of invoice management and processing of order is the main focus of this article. Also this system provides as digital means of management for every process in a restaurant.

II. LITERATURE REVIEW

Jingjing Wang [1] presented the design and achievement of wireless ordering system for foods. This system presents an in-depth technical operation of 4*4 matrix keyboard to realize data input from the electronic menu ordering.

N. M. Z. Hashim *et-al* [2] proposed Bluetooth device based smart ordering system which utilizes a small keyboard to choose orders and Bluetooth module for data transmission.

Prof. Sagar Soitkar *et-a l* [3] presented a touch screen based digital menu ordering system with AVR microcontroller. This paper describes the method of low cost, efficient and easy to access the system for digital ordering system for food menu in restaurants.

Asan, N. Badariah *et-al* [4] developed a smart ordering system based on zigbee. This method of ordering system proposed here uses hand tools and notepad to make an order in restaurant.

Bhanu Siramshetti *et-al* [5] took one step ahead later on and further extended the service with E-menu ordering system based on zigbee. The electronic menu order platform is designed and developed with a ARM7 based mother board . The broad spectrum radio communication system based on zigbee technology is implemented.

III. PROPOSED SYSTEM

When used for few minutes of time a kind of stress can take place on human finger. Touch screens can also suffer from the problem of fingerprints to be imprinted on the display. Additionally the user has to be in close to the screen compared to an external keyboard for accessing the menu function. In highly illuminated areas the user has to cover the screen by

hand which is an annoying problem and a great problem for the illiterate people [6]-[9].

To promote a most cost effective system that can work in small restaurants that could inspire those who are not willing in investing huge amounts of funds in this types of systems. Also this system will provide a convenient, cost effective and faster customer service for selecting and ordering of items that are possible through the keypad menu which are displayed in a PC monitor provided in the restaurant kitchen.

a) Block Diagrams

i) Transmitter section

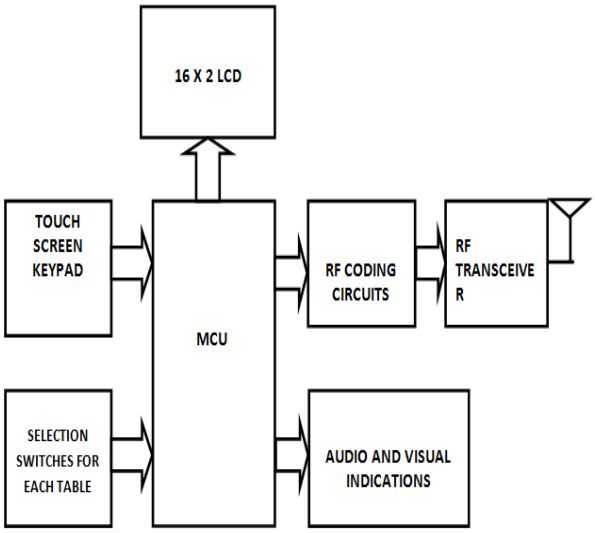

Figure 1: Transmitter Block

ii) Receiver section

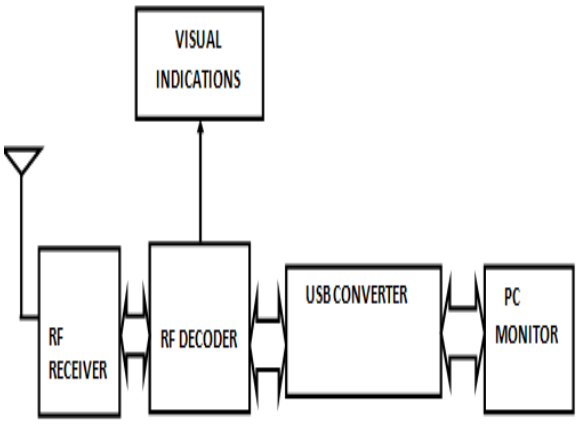

Figure 2: Receiver Block

b) Working Principle

To overcome the limitations and drawbacks in the currently followed systems of restaurants, a digital menu card based ordering system is designed. This system can provide an automatic, fast and efficient care for each customer on table by allowing them to choose the orders directly to the kitchen using the electronic menu card at each table.

i) Transmitter section:

At the transmitter end at each table an electronic menu card is provided which consists of a MCU, keypad, encoder, LCD and a RF transmitter. The food items are displayed in the LCD screen with their price list by the MCU. The customers can choose the list of items by using INC and DEC buttons. After selecting the items to place the order they have to press the SEND key. The data from the keypad is read by a microcontroller which gives corresponding digital output to an encoder. The encoder encodes the active bits from the input pins to a binary coded output signal. The RF module operates in a radio frequency from the range of 30MHz to 300GHz according to the module type. Here a 2.4GHz band RF transceiver module is used. This frequency is usable for RF signals to travel through larger distances without any attenuation even there is any obstacle between the transmitter and receiver. Also this RF module is most reliable with low power consumption and can connect to multiple users.

ii) Receiver section:

A receiver unit will be placed in the restaurant kitchen which consists of an RF receiver module along with a RF decoder. This system is connected to a PC display and visual indicator through microcontroller. The coded binary information from the RF transmitter is received by the RF receiver and given to the decoder. The decoder decodes the receiver input and provides a four bit digital binary data at the output. The PC screen displays the received food menu selected by the customer at the screen using a special software program installed. Visual indication and alert to the kitchen people also provided with an audio and visual alert.

IV. HARDWARE REQUIRMENTS

a) Microcontroller Unit

PIC16F877A microcontroller is used here which acts as the heart of this system. It integrated the inputs from keypad to the LCD screen and RF modules. It is a low power CMOS device which can perform better with low power usage and fast instruction execution. It is most commonly used due to its advanced features and high number of available input output pin count. A wide range rang of hardware interface is supported by this 40-pin microcontroller. It has a high program memory of 4kb and RAM of 256 bytes. It also has a serial interface port allowing communicating with PC or laptop devices through serial communication.

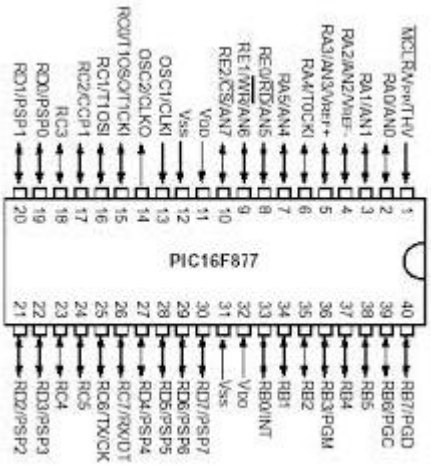

Figure 3: Microcontroller PIC16F877A

The operating range of PIC microcontroller is down from 2v to 5.5v as maximum. The flash memory can be programmed up to 1000 times. Inbuilt ADC can be used to interface resistive touch screens and also keypad interface easily.

b) Liquid Crystal Display (LCD)

The LCD used here is a HD 44780 liquid crystal alpha numeric display. Basically it is a 16x2 dot matrix display module with a high quality LCD panel, dual LCD driver IC, 16 character and 2 lines support along with backlight to make visibility clear in both day and night time usage. It consists of a data memory Ram and a character generator ROM which generates text and numeric data corresponding to the data bits receive. This LCD can be interface in either 8bit or 4bit mode for reducing pin count. It can be easily interface with any type of microcontroller or microprocessor.

c) Buzzer

A buzzer is used for producing audible alert to the restaurant people. Here we use a peizo electric type buzzer. It has an inbuilt driver and oscillator circuit for producing sound frequency signal and drive the diaphragm of the buzzer. This buzzer has high gain and a wide range of operating voltage from 3v to 24volts which makes it suitable for almost all varieties of applications.

d) Touch Screen Panel

A resistive touch screen panel is used here which composes of several layers of thin film resistors separated in micro level space with two thin electrical layers. These resistive layers face each other with a small gap between them. When user touches the surface the layers below the screen come into contact with each other reducing the resistance between the layers at that position.

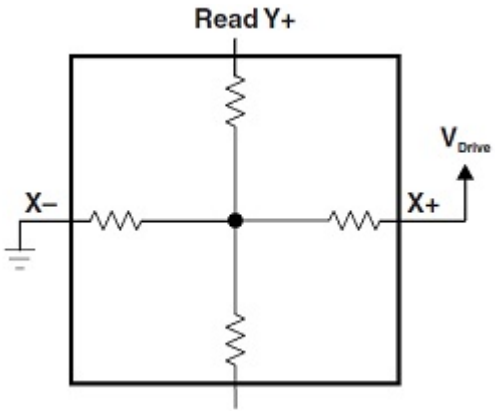

Figure 4: Touch Screen

The screen in the top surface has a coating underside and beneath it is a same type of resistive layer on top of the substrate. One layer also has connections along its sides to the other layer along top and bottom. One layer applies the voltage and the other receives the voltage. When an object like stylus tip or finger tip presses down the top outer surface, then the two layers will came in contact with each other at the connection point. The connection points are arranged ina row by column like a matrix array. The resistive panels behave like a pair of voltage dividers with sensing one axis at a time. The point of pressure on the screen can be read by the rapid switching of the layers which produces change in output voltages from the X and Y-axis of the two panels. The main benefit of this type of touch screen is it comes at low cost; withstand rough use and long life.

e) RF Module

Figure 5: RF Transceiver

The RF transceiver module used here is CC2500 Zigbee module which is cheaper and has a operating range of 30 meters with a onboard high gain patch antenna. It provides a high speed communication speed of up to 48000bps of uplink and downlink data. It also has an inbuilt serial interface chip which makes it ready to use with UART of any microcontroller or other serial communications devices. It also has security features for data protection and has network capability to for connecting to multiple devices. The operating frequency is 2.4GHz which provides higher bandwidth for data.

V. SOFTWARE REQUIRMENTS

a) Flowchart

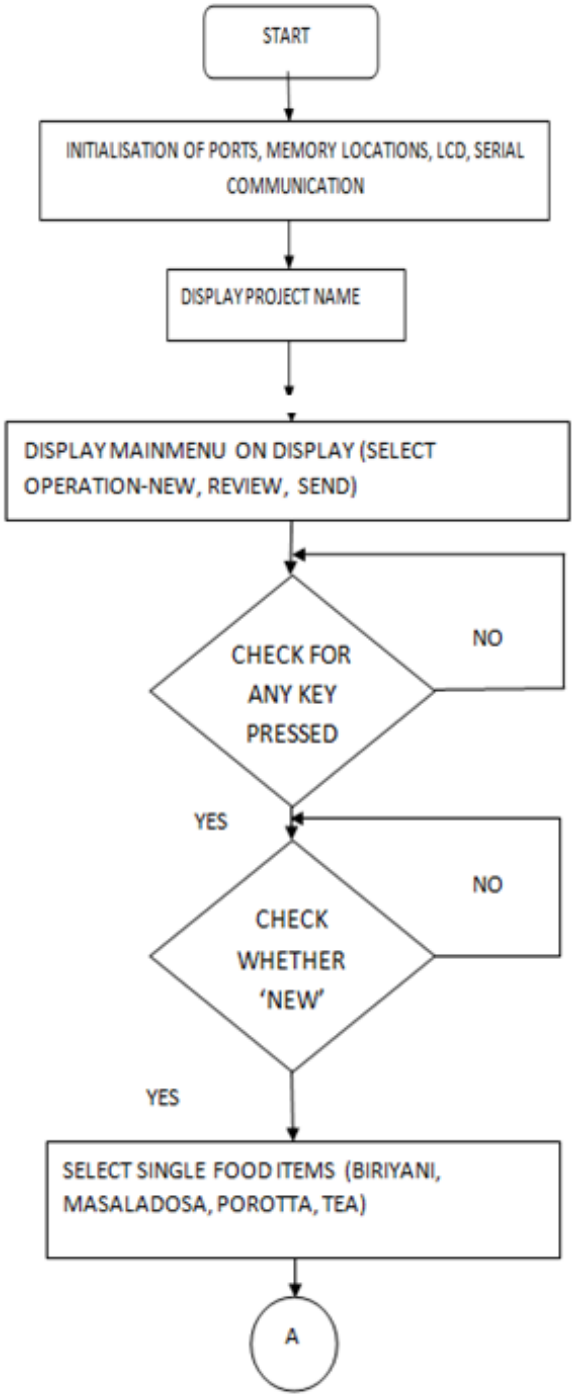

Figure 6: Menu Display Flowchart

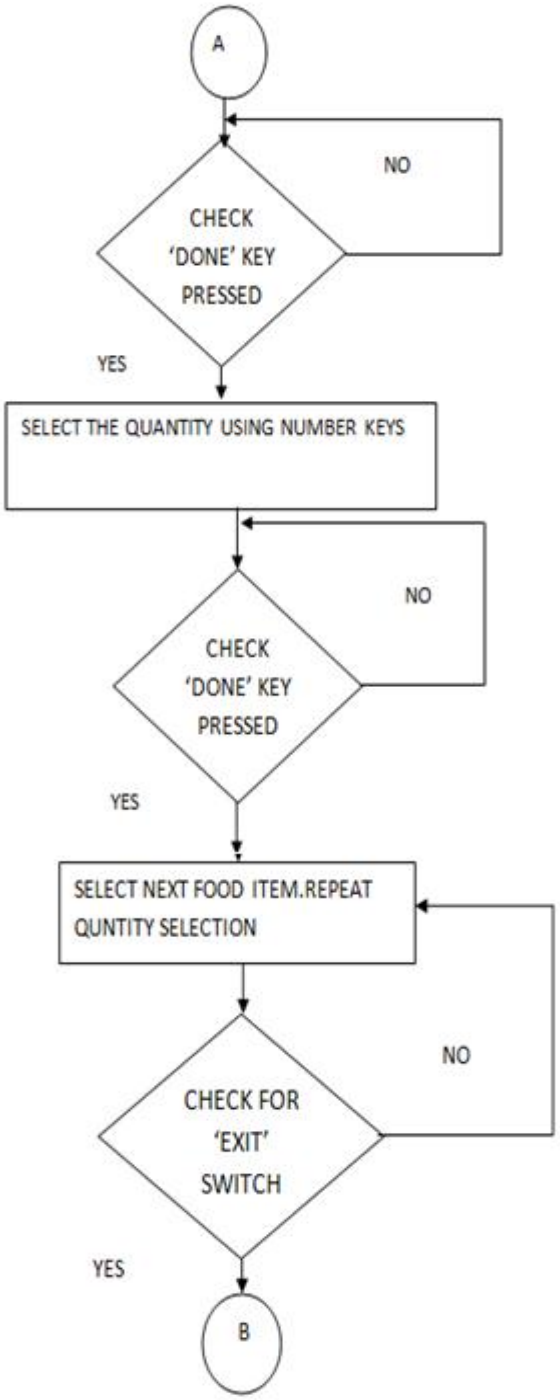

Figure 7: Menu Selection Flowchart

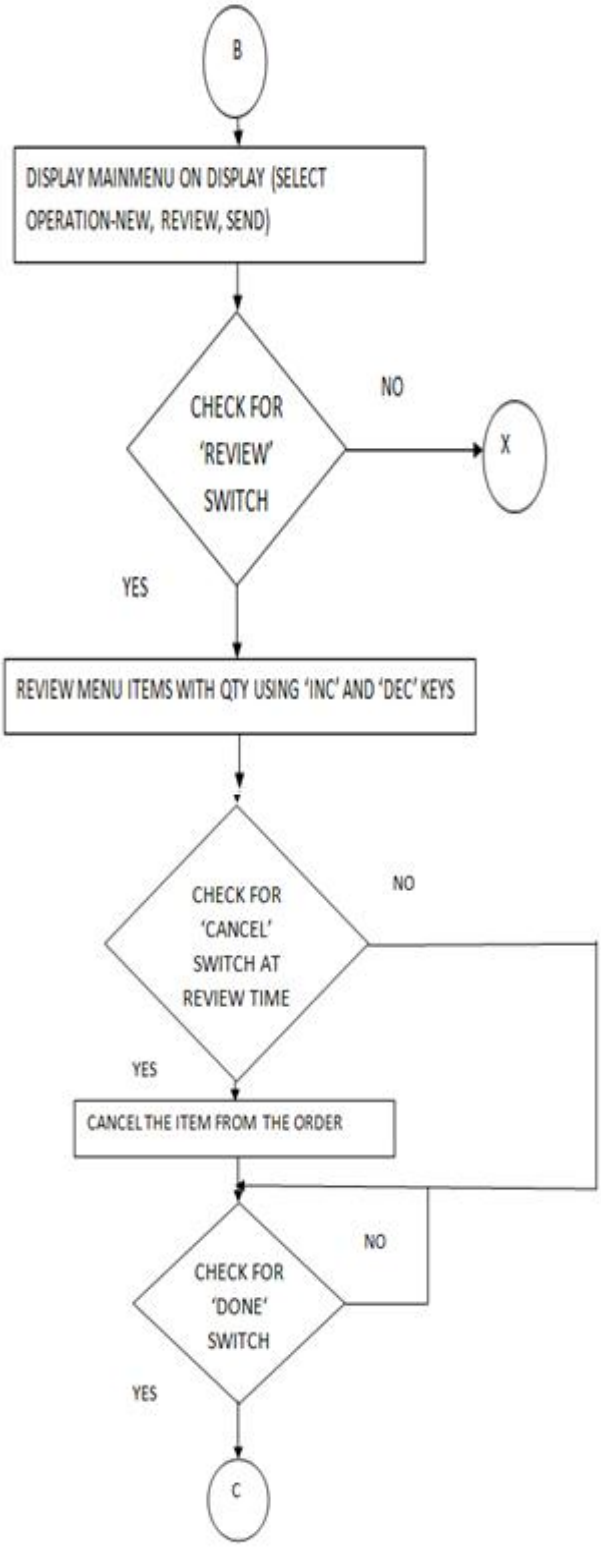

Fig 8: Menu Selection Review Flowchart

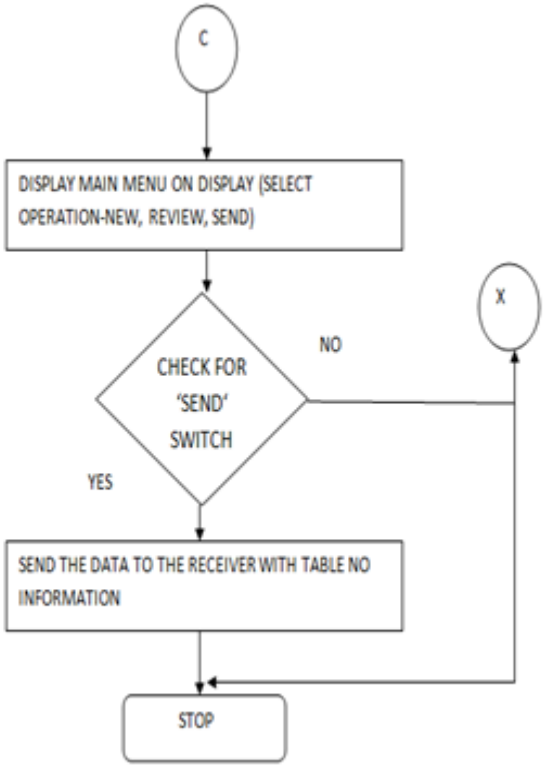

Figure 9: Order Send Flowchart

VI. RESULT

The hardware prototype is designed and tested with a touch screen menu along with LCD display be placed on each table. Now the list of menu items and price is displayed on the screen. When the user selects the menu the receiver gets menu order and alert in a PC software display placed in kitchen. According to the customer use the menu can be selected, ordered and also be cancelled using 'INC' and 'DEC' functions in the touch screen.

Figure 10: LCD Outputs

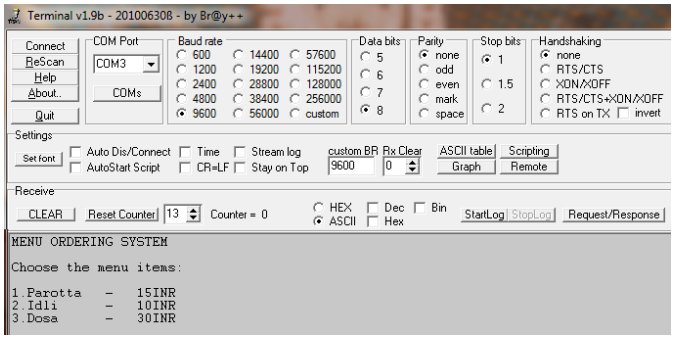

Figure 11: Output of Monitoring Screen

In the receiver side placed in the kitchen a software window display the orders chosen by the customer along with the table number.

VII. CONCLUSION

The practical implementation of the electronic menu card system will be helpful for the people in restaurants to choose the food items needed to them using an easy touch interface. The hotel people may access the ordered menu items from the same place and also the billing is made easy since the list of menu and delivered food items are stored in the computer software along with the table number. This system will be very useful for hotels, resorts and restaurants to make their wok fast and handle more customers with fast consumer service. Due to economical design this prototype hardware can be designed for real time usage with minimum investment for all range of small business organizations.

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