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Digitalized Restaurant Menu Ordering System Aiding Contactless Dining Environment

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Abstract: When visiting a restaurant, there are different kinds of waiting times encountered by a customer. Out of those, the time of awaiting his/her order to be taken and time is taken for smaller intermediate requests like calling the waiter or request to process the bill can easily be eliminated by having an appropriate system in situ. Whereas waiting times like the time taken by the chef to arrange the dishes cannot be avoided. Many solutions are proposed to enhance the scenario. This project is again one attempt within the same direction. during this project, we discuss the automation of the ordering system. Here, we use components like Arduino, TFT display, and 433 MHz RF Transmitter/Receiver Module to try and build a prototype of the Smart Restaurant project. Here the transmitter section consists of an Arduino Uno, TFT display, and an RF transmitter. This setup is accessible for the purchasers to flick through the menu and choose their choice, and place their order. It also consists of additional options like "call waiter", "process bill" for the customer to use just in case unavoidably. The receiver section consists of an Arduino Uno, LCD module, RF receiver, and a buzzer, which can be installed within the restaurant kitchen to trace the order that has been placed and by which table.
Keywords: TFT module, RF Transmitter, Arduino Uno, LCD module.

I. INTRODUCTION

The conventional system of taking customer's orders at restaurants has always been, waiters approaching customers at their tables and noting down their choices on a piece and then handing the piece of paper to the kitchen for the food to be made. This method is not only time-consuming but also may leave the possibility of error open.

In this project, we attempt to minimize and also eliminate all the redundant waiting time. The customer directly selects the dishes of his/her liking and places an order by using the TFT (Thin Film Transistor) display attached to the table [6]. As soon as the order is placed by the customer, the buzzer in the kitchen goes off indicating an incoming order whereas the LCDs the table number from which the order was placed followed by the order. This project aims to achieve this by making use of Arduino Uno and RF transmitters and receivers.

The Arduino Uno is an open-source microcontroller board and the controlling device of the whole prototype is an ARDUINO controller. The TFT is a graphic screen that is most commonly used. This project is to make the restaurant more time-efficient while increasing a positive customer experience.

II. EXISTING SYSTEM

A. TRADITIONAL ORDERING SYSTEM:

More often than not a restaurant's operation involves customers waiting for the waiter for his order to be taken, after which the waiter notes down the order of the customer on a piece of paper and hands it over at the restaurant kitchen for the food to be made as depicted in the figure 1.

However, this method of working may give leeway to a lot of errors such as the waiter may be busy taking orders from other tables which may lead to delay in giving the previous order to the kitchen or, there may also be situations where the waiter notes down the wrong order or misses out a few details in the order. These kinds of manual errors decrease the working efficiency of the restaurant and also customer satisfaction. This organizational structure also increases the workload on waiters as they have to take the orders but will also have to keep track of which tables are empty and also the progress of the orders that are already taken, which will again increase the chances of errors. These may lead to inaccuracy in billing [1],[7].

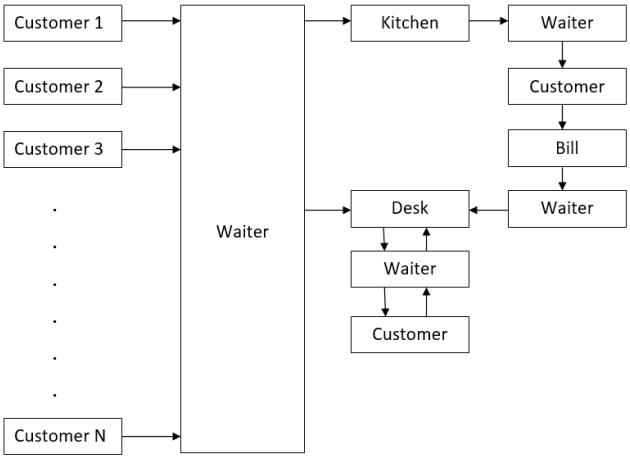

Figure 1: Block representation of traditional ordering system

B. SELF-SERVICE

In smaller business units such as cafes, the ordering system is the self-service ordering system wherein the customer himself is expected to go to the counter and place his/her order and then collect the prepared food item by him/herself. This may reduce the time the customers wait at the table for a waiter to come and not down their order but the time Customer spends in the line for his turn to order is it still existing. This style of ordering reduces the errors in orders but there is still a chance of errors and this style of ordering system expects the customer to place the order him/herself [3],[7].

Just as every sector is progressing with the help of technology, so is the restaurant/food sector. The use of wireless transmission and wireless technologies to transfer orders directly from the customer to the restaurant's kitchen has made placing orders easier. Other technologies like the use of robotics and robots to serve food to customers have increased customer experience by manifolds [2].

III. PROPOSED SYSTEM

To overcome the challenges faced by the existing systems, we propose this integration of touch technology in restaurants based on TFT technology. A TFT LCD touch screen is used to display the items on the menu. These TFT screens provide the feasibility for the customer to place his/her order without any waiting or delay.

A. HARDWARE

Components used are as follows:

i. Arduino Uno

The Arduino Uno is a ATmega328 based microcontroller. It features 14 digital I/O pins, among which 6 can be used as PWM outputs, the rest of the pins include 6 analog inputs, a 16MHZ crystal oscillator pin, power jack point, USB connection port, an ISCP header pin, and a reset button. It can be powered either by using a USB cable or with an AC- to -DC adapter or a battery. Though this board can accept voltages between 7 to 20 V, its operating voltage is 5V. This board can be programmed using an open-source software tool Arduino IDE. It has 32 KB of memory which is used for the bootloader, 2 KB of SRAM, and 1 KB of EEPROM.

Figure 2: Arduino Uno

ii. 2.4-inch TFT Touch Shield

The TFT module here stands for Thin Film Transistor. It is an Arduino compatible LCD shield. It also contains a built-in microSD card connection. This TFT display is big, bright, and colourful with individual pixel control. It is composed of 240x320 pixels. It has more resolution when compared to an ordinary black and white 128x64 display. Additionally, it has a resistive touch screen inbuilt already which makes it easier to detect finger presses anywhere on the screen. It can be operated in two modes either in 8 - bit or SPI. It can be operated in two modes either in 8 - bit or SPI and at an operating voltage of 3.3V. It can be directly mounted on an Arduino UNO board [4].

Figure 3: TFT Touch Shield

iii. 16x2 LCD Module

LCD stands for Liquid Crystal Display. The LCD screen is an alphanumeric electronic display and it has various applications in different fields. This display is a very basic module and is most commonly used in devices and circuits. A 16 x 2 LCD means it can be used to display a maximum of 16 characters per line, and there are two such lines. Each character in this LCD is displayed in a 5x7 pixel matrix format. The alphanumeric display is capable to display 224 various characters and symbols in two modes like 4-bit and 8-bit. It consists of 16 pins. This can be operated between 4.7 V to 5.3 V [7].

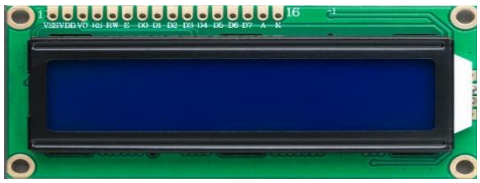

Figure 4: 16x2 LCD Module

iv. RF Transmitter and Receiver

An RF module operates at Radio Frequencies. The frequency range varies between 30 KHz& 300 GHz. The digital data in this RF system is represented in the terms of variations in the amplitude of a carrier wave. It uses a modulation technique known as Amplitude Shift Keying (ASK).

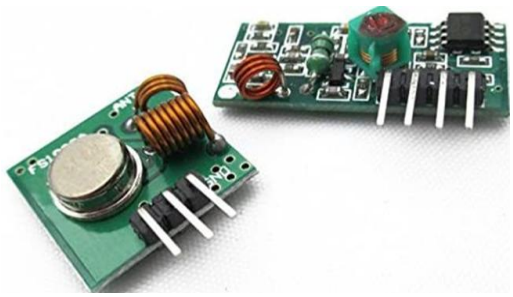

Figure 5: RF Transmitter and Receiver

This RF module is made of both RF Transmitter and RF Receiver. They both operate at a frequency of 433 MHZ. The transmitter receives the serial data and transmits the data wirelessly through an RF antenna. The transmission of data occurs at the rate of 1 Kbps to 10 Kbps. Whereas, the receiver receives the data transmitted from the transmitter end and operates at the same frequency as that of the transmitter. They operate at a voltage range of 3V to 6V. The transmitter has 3 pins and the receiver has 4 pins.

v. Buzzer

A buzzer is a mini electronic component that provides an audio signal in a circuit where it is used after applying a certain voltage to it. It is developed in many different forms such as mechanical, Electromechanical, and Piezoelectric. It has two pins i.e positive and negative for Vcc and ground respectively. It operates within a voltage range of 4 - 8V DC and the rated voltage is 6V DC. It comes in a small and neat sealed package.

Figure 6: Buzzer

B. SOFTWARE

The software used is Arduino IDE. The Arduino IDE (Integrated Development Environment) is open-source software and a cross-platform application that is written in the programming language Java. It is useful in writing and uploading programs to Arduino Compatible Boards. The Arduino IDE software supports c and c++ languages by following the special rules for code structuring. It can be implemented within the Windows, Mac, and Linux operating systems.

The components are mainly written in JavaScript for easy editing and compiling. The main advantage of using this software is writing codes for Arduino. But several other features are worth noting. The software is equipped with a means to share any details easily with other stakeholders of the project. The internal layouts and schematics can be easily modified by the user when required. Some guides are helpful during the process of installation [5].

Figure 7: Arduino IDE

Libraries used are:

- RH_ASK.h,
- SPI.h
- Adafruit_GFX.h
- Adafruit_TFTLCD.h
- TouchScreen.h
- LiquidCrystal.h

III. WORKING

The working of this project can be divided into two modules as follows:

A. TRANSMITTER SECTION

Figure 8: Block Diagram of Transmitter Section

1.User Interface Unit:
As shown in figure 8, the TFT module (Thin-film Transistor) is used to provide a user interface to display the items provided by the restaurant and also helps the customer to choose the items via touch screen. Additionally, we also provided options like - Ordering water, call for a waiter, and acknowledgment of processing the bill.

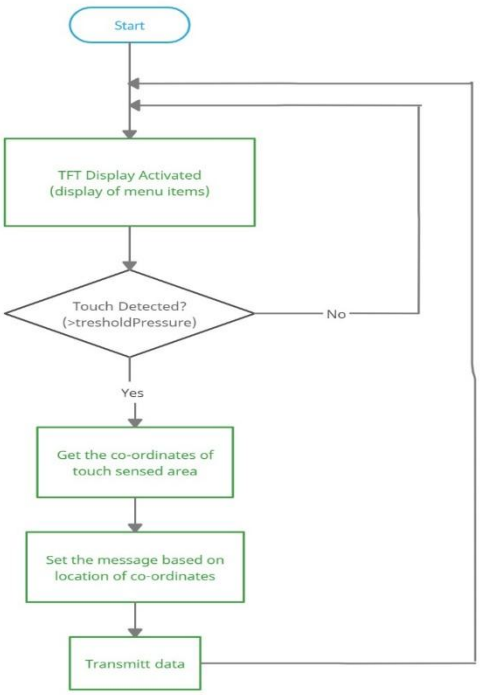

Figure 9: Flow of working of the transmitter section

2.Processing Unit:
Arduino UNO is the crucial part of the transmitter section which helps us to process the data received from the user interface unit i.e., the TFT module. Besides this, Arduino UNO is connected to the RF transmitter for data transmission. Arduino UNO controls the data communication between transmitter and receiver sections.

3.Data Transmission Unit:
RF transmitter takes up the responsibility of transmitting the data processed from the transmitter section (by Arduino UNO) to the receiver section. It receives the data from Arduino UNO in serial data format and the transmission is done via RF antenna wirelessly.

B. RECEIVER SECTION

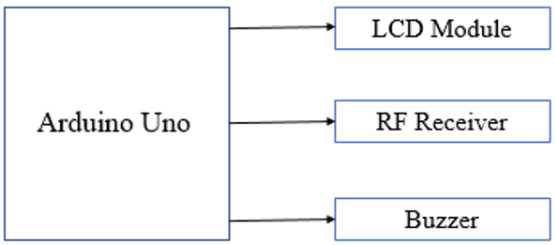

Figure 10: Block Diagram of Transmitter Section

1.Data Receiving unit:
The Rf receiver obtains the data through the RF antenna and is sent to the Arduino UNO in serial data format.

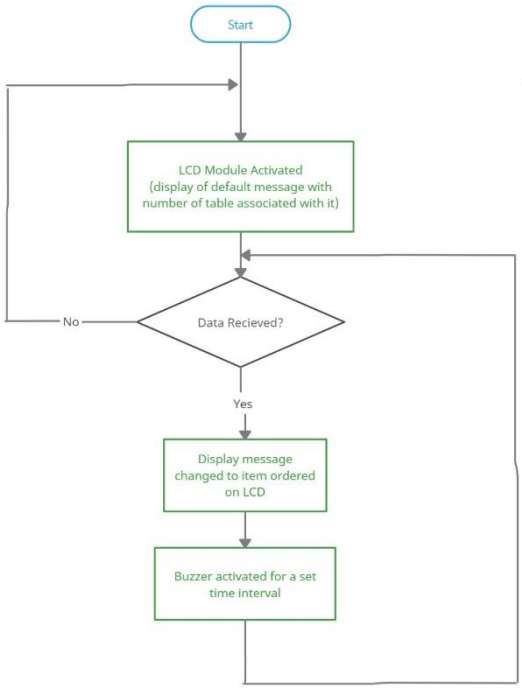

Figure 11: Flow of working of the transmitter section

2.Processing unit:
Receiving section also has Arduino UNO as its fundamental part for control over this section. It processes the input received from the RF receiver and processes it for further functioning. It is connected to Buzzer and LCD Display for notification purposes.

3.Notification unit:
This unit comprises two components - LCD Display and Buzzer as shown in figure 10. LCD is used to notify the person in charge about the orders being placed from the respective tables. It displays the details of the menu item chosen and the table number. A Buzzer is activated whenever an order is placed.

IV. RESULT

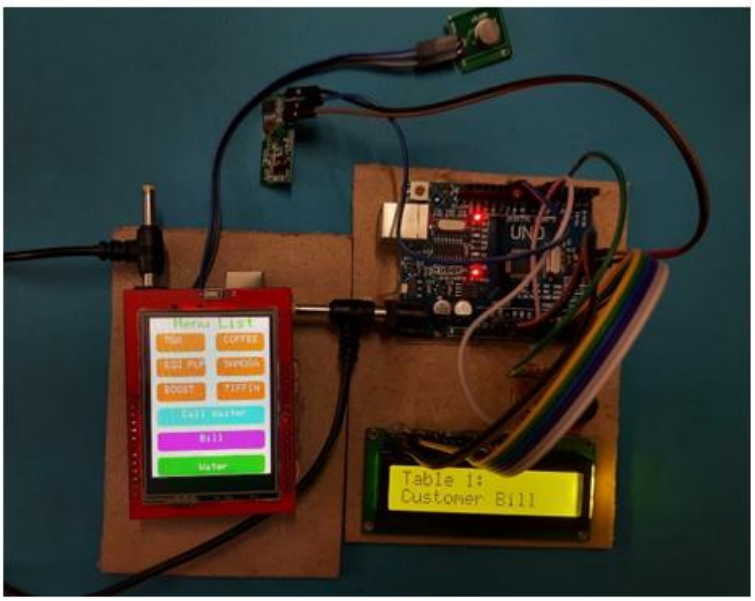

Figure 12: Prototype of the project

V. CONCLUSION

This paper proposes, "Digitalized Restaurant Menu Ordering System Aiding Contactless Dining Environment", which atomizes the process of ordering food in restaurants wirelessly. There is a great advancement in technology due to its features like low cost and ease of use. This technology allows us faster and more convenient access to the world. In addition, this system reduces the manpower in the restaurants by avoiding waiters for taking orders from customers. The mistakes done by waiters while taking orders can be reduced using this system. A Menu can be updated every time based on the availability of food present in the kitchen. This is an effective system to improve the performance of the staff of the restaurant. This will also change people's perception of dining and increase customer satisfaction. Finally, we can conclude that this system will work perfectly and efficiently by solving all issues faced by restaurants and customers these days.

VI. FUTURE SCOPE

The Billing section can be added to pay the bill at the dining table itself by scanning the QR code which is displayed on the touch screen. An additional feature like customers giving feedback by rating the service provided at that restaurant. Robots can be used to replace humans to serve the purpose of tasks such as serving food, cleaning tables, etc Allow customers to customize their orders. A future where the customers can check the live order status can also be added.

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