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Wireless Two-Way Restaurant E-Menu Food Ordering System

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ABSTRACT:

Through technological integration into dining services, the hospitality industry is at a critical point of its evolution where it has become necessary. This paper proposes Wireless Restaurant E-Menu Food Ordering System in seeking to make restaurant ordering process user friendly. The menu can be viewed digitally by customers and direct ordering can be initiated from the table directly through a touchscreen interface. The orders are delivered to the kitchen wirelessly, in real-time hence obviating allotment of services to waitstaff as well as minimizing human error. The system enables a two-way communication that facilitates order status updates, real-time menu customization. It is a cost effective and scalable solution applicable to different categories of establishment in the food service. The system increases customer autonomy, lowers the time spent on processing orders, and increases accuracy of the service, All of which improve the customer's experience when eating. This implementation will enable restaurants to respond more speedily to service turnover, reduce labor costs, and enhance customer engagement – and is a valuable innovation for modern food service environments.

Keywords: Raspberry Pi, Touch Screen LCD Display, SD Card

1. Introduction:

More and more, the lap of luxury is being bestowed upon us by automation which is utilized in the day to day activities and which improves efficiency in all fields of endeavour from home appliances to industrial systems. The restaurant industry has to deal with the challenge of fast and accurate service when its number of customers continues to increase. Conventional ordering systems are labor-consuming, and physical menus are expensive and ineffectual. This paper describes an automated system for ordering in the restaurant which makes a digital menu and simplifies the ordering procedure. Customers can, using a touchscreen interface, view the menu and select items and have the order instantly sent wirelessly to the kitchen through a Raspberry Pi setup. This cuts down waiting time, minimizes mistakes by human beings and enhances general efficiency in service provision. The system improves customer experience by providing them with more convenient, digital solution, while at the same time decreasing the dependence on the traditional methods. Through the integration of automatic systems, restaurants can experience less miscommunication and the long waiting times hence delivery of service faster and more reliable.

2. Literature Review:

A comprehensive overview of past research was carried out to give perspective on current methods of restaurant automation systems. Some articles from national and international journals were read to get a clear picture of the challenges and those already being practiced in restaurant food ordering systems. One of the interesting works, "Automation of Restaurant Food Ordering System", done by Shiny, Ashok Kumar M., Nanthagopal V., and Raguram R. introduces a complete model for restaurant automation. Their system covers main functions of dining ranging from welcoming guests to accepting orders to delivering food and processing payments. It is laid out in terms of three key elements: Food ordering and delivery, as well as billing. The authors used an LCD screen and keypad at each table so that customers could place orders autonomously. This method reduces staff involvement and increases service speed and effectiveness.

Another pertinent research presented by Mahendra Chouhan, Ankit Tiwari, Neha Agarwal, Priyanka Patkar, Namrata Kumbhar and Prof. P. S. Kulkarni is "Automated Table Ordering System" which is based on improving the experience of ordering with the help of the user-friendly and intuitive system. Customers use a touchscreen device to order from the menu and the orders themselves are transmitted wirelessly to the kitchen. Kitchen personnel can inform servers when the orders are ready thus easily coordinating and enhancing error in terms of omission. This system will highlight the ability to move fast, do things with the same degree of perfection, and the awareness of less manual input is needed.

In a companion paper titled "Automatic Menu Ordering System", by B.P. Desai, Suman Chandrakant Mane, Priti Kailash Nishad, Rekha Anil Mane, and Rohini Tukaram Tavare, a simple method is presented that involves tables-embedded buttons for customer interface. It's easy for customers to order

dishes, change the sizes of portions or cancel the chosen one. Although the system works in a one way communication mode, it saves time in automating core ordering tasks and streamlining the process as compared to a conventional system, which is a better alternative.

These research findings, in total, demonstrate the increase of automation within the restaurant industry. Despite the fact that several systems focus on automating ordering, there is still some place for enhancing information flow from diners to culinary teams. Leading the way in regards to using wireless tech, digital displays, as well as mobile solutions increases accuracy and increases efficiency. Building on this development in these studies, the proposed system will help to establish a reliable two-way wireless network, increase operational efficiencies, and sharpen customer projections. Also in the paper, "Automatic Menu Ordering System," by B.P. Desai et al, a simple system is proposed that uses table-embedded buttons. It's easy for customers to order dishes, change the sizes of portions or cancel the chosen one. Although the system works in a one way communication mode, it saves time in automating core ordering tasks and streamlining the process as compared to a conventional system, which is a better alternative.

3. Working Principle:

The Digital Dining Experience: Wireless E-Menu Ordering Solution utilizes modern digital technologies such as touch-screen interfaces, wireless communication, and real-time data processing to automate and streamline the food ordering process in restaurants. The system is designed to enhance customer service, reduce errors, and increase operational efficiency. The working of the system can be broken down into the following key components:

1. Customer Interaction:

The customer begins the process by interacting with a touchscreen display or a tablet provided at the table, where the digital menu is shown. This interface allows diners to browse food categories, view descriptions, and select items directly. According to Chouhan et al. in their "Automated Table Ordering System", touch interfaces improve user experience by reducing manual input errors and speeding up the ordering process. The system provides a user-friendly way for customers to place their orders with minimal assistance from waitstaff, thus enhancing both speed and convenience.

2. Order Transmission:

Once the diner places an order, the information is promptly and remotely passed to the kitchen by using the Wi-Fi network. With wireless communication, the order details can be passed quickly and reliably from the front end to kitchen without the mediation of physical handovers. The same kind of technology has been applied in system such as the "Paperless Restaurant System" by Hari Krishna et al who used Wi-Fi to automate the order transmission process eliminating cases that the traditional wired systems faced and contribute to efficient and dynamic processing of orders.

3. Kitchen Processing:

Upon receipt of a meal order by the kitchen, the kitchen staff are notified in real time and receive key details of the meal order on an in-kitchen monitor. A backend server, that is, having equipment like Raspberry Pi, manages the processing and display of this data. The kitchen section of Desai et al.'s "Automatic Menu Ordering System" receives the order data over an integrated display, which allows the preparation of food by kitchen staff more efficiently. The real-time updates, sent to the kitchen, support the prevention of errors and speeds up the service process.

4. Feedback and Payment:

As soon as customers leave the service, they are able to provide feedback or pay using the interactive touchscreen. It allows for real-time feedback as well as smooth payment transaction at the same time. Hari Krishna's et al integration of feedback in the system shows this aspect by raising both customer service and satisfaction.

5. Menu and Admin Management:

Administrators can take care of the digital menu, set prices, and approve promotional offers instantly, through the system. As Chouhan et al entrench, this kind of system enables the administrator to update menus online so as to minimize reprinting of the same physically and increase the restaurants capability in meeting the customers preferences and promotions. Restaurant administrators are able to track and develop customer feedback; the restaurant is thus in position to respond to customers' desires quickly.

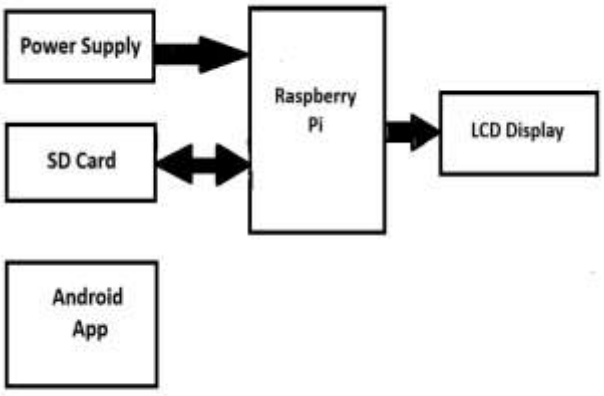

Fig.1Block Diagram of Wireless Two-Way Restaurant E-Menu Food Ordering System

4. Proposed Methodology:

Through the use of wireless technology, a two-way system of ordering food promotes smooth flow of our information between customers and the kitchen staff for efficient and prompt order taking and updates. normally this approach includes table-top touch screens for ordering by the public, an overall server system that will coordinate orders, and a display screen in the kitchen for the staff to be kept informed.

1. **Customer Interaction**:

Touch Screen: Customers can view the menu and send their orders via the use of touch screens which availed at each table. Wireless Transmission: The order information is wired to the central server.

2. **Server Management:**

Order Compilation: The server collects and arranges the orders from customers occasionally; sometimes, sorting them helps to speed up kitchen services. Real-time Status Updates: The server uses the output to pass the order status messages (e.g. "Preparing", "Ready") to the customer at the table as well as to the kitchen display screen.

3. **Kitchen Staff Operations**:

Kitchen Display: Kitchen employees receive the orders displayed on screen so that they can monitor what needs to be prepared. Order Confirmation: Once the order is completed, the staff at the kitchen circles it as done, notifies the server and then tells the server that it is available for the table where the customer is seated. Delivery Notification: When the order is ready, a waiter is signaled by a setup like a PDA, and the message advises that the meal is awaiting him.

4. Wireless Technologies:

Wi-Fi: One of the most common methods for transferring data wirelessly between such devices as tables, servers, and kitchen display screens. Zigbee: An alternative form of wireless communication that has a common application to smaller restaurant-based networking environments.

5.Materials:

Hardware Requirements:

1. Raspberry Pi 3A+
2. SD card
3. Touch Screen LCD Display

Program Requirements:

1. Python Programming Language
2. Raspbian OS
3. MySQL Database

4. VNS Viewer

Raspberry Pi 3A+:

Published in November 2018, the Raspberry Pi 3 Model A+ is a small expensive single-board computer developed by the Raspberry Pi Foundation. This model is a scaled down version of the Raspberry Pi 3 Model B+ in terms of cost and power saving for applications in embedded systems and IoT, while still supporting the required performance.

Technical Specifications

Processor:

Broadcom BCM2837B0, quad-core ARM Cortex-A53 (64-bit),

1.4 GHz

RAM:

512 MB LPDDR2 SDRAM

Wireless Connectivity:

802.11 b/g/n/ac Wi-Fi (dual-band 2.4GHz and 5GHz)

Bluetooth 4.2, BLE

Ports:

1 × USB 2.0 port

HDMI output (Full-size)

3.5mm analog audio-video jack

CSI camera connector

DSI display connector

Micro-USB for power

Storage:

MicroSD interface to install the OS and save the user files.

GPIO:

40-pin GPIO header (fully backwards-compatible)

Power Requirements:

5V/2.5A DC via micro-USB

Physical Dimensions:

65 × 56.5 mm

LCD Display:

A Touch Screen LCD unit involves an integrated display unit and touchscreen so as to enable users to interact with the screen image without an input device. Consumer electronics, industrial controls, medical devices and embedded systems are common places where such displays are used.

Technical Specifications (Example: 7" Capacitive Touch LCD)

Display Size: 3.5 inches

Resolution: 320*480 (can vary)

Touch Type: Capacitive

Interface: Options are HDMI or DMI (Display), USB(Touch).

Power Supply: 5V

Viewing Angle: 160°

Brightness: ~250 cd/m²

Operating System Support: Linux, Windows, Android

SD Card:

SanDisk, a product of Western Digital, is the leading supplier of microSD cards, a popular non-volatile small, portable memory storage device used in mobile hardware, embedded systems, cameras and single-board computers like the Raspberry Pi. SanDisk microSD cards are appreciated for their reliable performance, high speeds and wide system support.

Technical Specifications

Form Factor: microSD

respond answer

microSDXC (Extended Capacity, 64 GB – 1 TB)

Storage Capacities: The cards are sold with storage from 2 GB to 1 TB, with options depending on the model.

Speed Classes: Standard Speed Classes: Class 2, 4, 6, 10

Ultra High Speed (UHS): UHS-I U1, UHS-I U3

Application Performance: A1, A2 Video Speed Classes: V10, V30, V60 (for high-res video) Read/Write Speeds:

Read: Extreme and Extreme Pro series available at speeds of 160–200 MB/s.

Write: With regard to write speed, the cards are capable of 90 – 140 MB/s though this could vary with type and class of the microSD card.

Bus Interfaces:

Default SD

UHS-I (majority of modern cards)

File Systems: FAT32 (for 4 GB–32 GB cards)

Durability:

Water-resistan

Shockproof

X-ray proof

Magnet proof (in select models)

Power Requirements:

It only needs low voltage supply that is, between 2.7V and 3.6V as required by standard SD needs.

Compatibility:

Works with Android devices, cameras.

6.Advantages:

1. Essentially, the use of this technology automates the collection of customer orders, hence there is no need for additional staff.

2. In comparison to traditional restaurant procedures, this system leads to faster and more satisfying service to customers, as well as improved team work and less room for staff error.

3. The upshot is that the business owner experiences enhanced financial returns.

4. Comparatively, this solution provides substantial cost savings in comparison with existing hotel ordering options.

5. Communications among devices are facilitated either by Wi-Fi or local server; an open international standard targeting low costs and reduced energy usage wireless sensor systems.

7. Applications:

1. Quick Service Restaurants
2. Fine Dining Restaurants
3. Casual Dining Restaurants
4. Cafes and Coffee Shops
5. Food Courts and Malls
6. Hotels and Resorts
7. Food Trucks and Festival
8. Catering Services

8. Result:

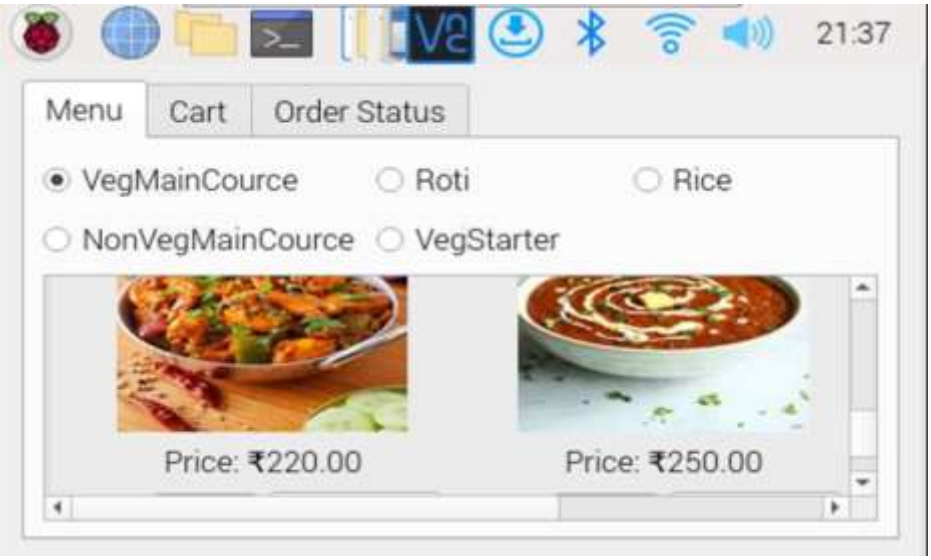

Fig 2.Digital Menu Interface

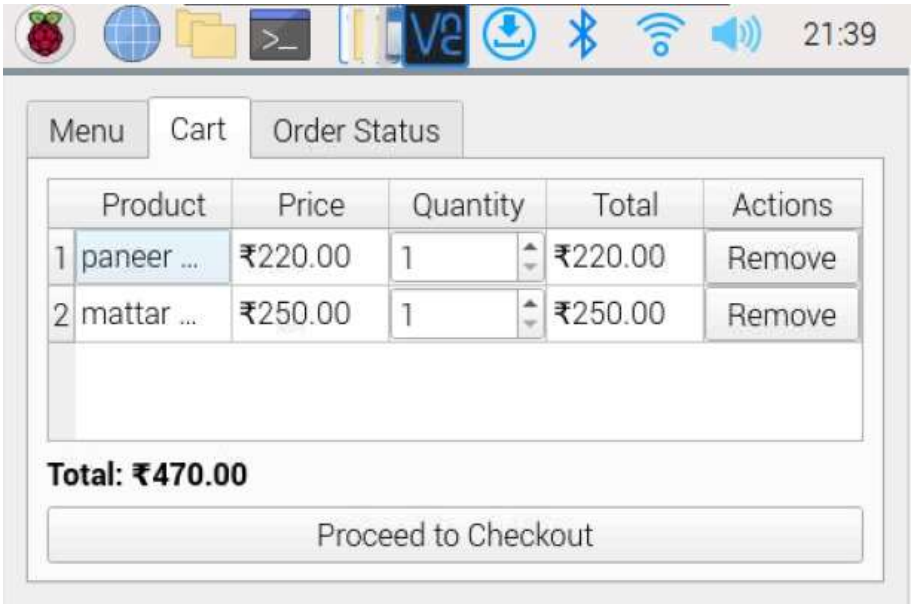

Fig 3.Food Order Cart GUI

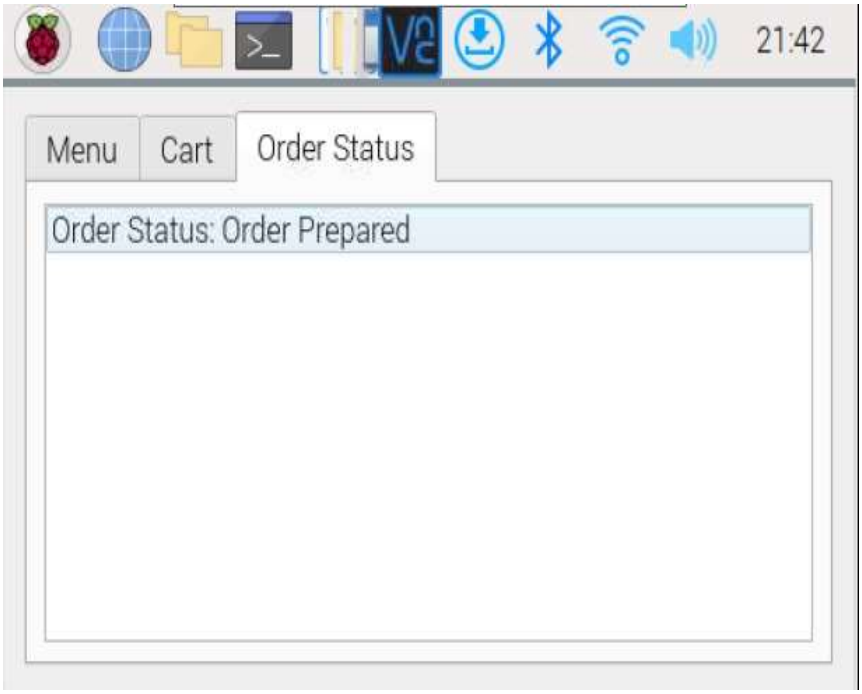

Fig 4.Order Status of GUI On Rsapberry pi

9.Conclusion:

The Wireless Two-Way E-Menu Food Ordering System is developed to enhance and update food service processes at restaurants. There is no issue of customers maneuvering the menus and customizing orders as they wish to do in addition to immediate interaction with the kitchen staff. The system makes restaurant work flow more efficient, reduces errors, and guarantees that guests receive a more efficient and convenient service. By applying a rigorous design, reliable development regimes, and constant refinements, the system will improve the management of restaurants and customer satisfaction

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