

Smart Restaurant Automation System

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Abstract: In the last years, the restaurant industry has lived through many changes. Anyway, an area was not improved since several decades. The main aim of the project is to provide automation in the restaurant by using QR Technology and Internet of Things to replace the traditional restaurant system in which there exist various people for doing different works. "Smart Restaurant Automation System" will accomplish the goal that only the administrator will be able to control the whole restaurant environment. The restaurant ordering system will be replaced with Wi-Fi Connectivity, QR Technology and Internet Portal by which the customer will not have to wait for the waiter to take orders. The restaurant will be equipped with LED Board at the administrator side which helps taking the order and providing with precise bill. The restaurant will also be equipped with Gas sensor for leakage detection, Voltage sensor to monitor daily voltage ratings and fluctuations and humidity sensor, which will help maintaining the room temperature accordingly.

Keywords: Restaurant automation, QR Code, Light Emitting Diode (LED), Wi-Fi connectivity.

I. Introduction

Automation is the technology by which a process or procedure is performed without human assistance. Automation or automatic control is the use of various control systems for operating equipment such as machinery, processes in factories, boilers and heat-treating ovens, switching on telephone networks, steering and stabilization of ships, aircraft and other applications and vehicles with minimal or reduced human intervention. Some processes have been completely automated.

Automation covers applications ranging from a household thermostat controlling a boiler, to a large industrial control system with tens of thousands of input measurements and output control signals. In control complexity, it can range from simple on-off control to multi-variable high-level algorithms. People are rapidly moving towards a smarter world, with implementation of smart cities, smart classrooms and smart phones. At present, information and communication technology has been brought to a number of business models in order to make the operation more convenient and effective. Restaurant management can be more efficient with the help of smart technology. In India, though there is a trend for moving towards a smarter society.

Every simple table will be replaced by unique QR code so customer can order the food online by connecting restaurant server. The customer once enters the restaurant will need to connect to the restaurant Wi-Fi network, and then scan the QR code. After connecting and scanning the customer will be provided with the access to Internet portal which will help in the food ordering process. Once the order has been placed, the administrator cum chef will receive the order on the LED board present at the workstation. LED's will glow on the board according to the item and its quantity. Once the order has been cooked and is ready for delivery the chef will press the reset button, which will complete the order and notify the customer to collect the order and pay the bill and proceed.

The restaurant will also be equipped with monitoring features like gas leakage identification with gas sensor, voltage fluctuation monitoring with voltage sensor and humidity monitoring to maintain the room temperature.

The proposed system overcome some of the circumspection confront by the restaurant staff. It provides a legitimate workflow for restaurant staff to manage restaurant operations digitally, from ordering to billing precise. The system could conceivably improve the overall restaurant efficiency, reducing labor cost, and providing quality of service and augment customer-dining experience.

The paper is organized as follows: Section II provides the review of studies that make use of smart technologies in restaurant automation system Section III describe architecture of smart restaurant automation

system. Software and hardware requirements for the implementation of system are described in section IV. Section V discusses the result of the system. Section VI gives future scope of the system. Section VII concludes the manuscript.

II. Literature Survey

Khairunnisa K.[1] proposed the application of wireless food ordering system. This work presented in-depth on the technical operation of PDA based Wireless Ordering System (WOS) including systems architecture, function, limitations and recommendations.

N. M. Z. Hashim[2] presented an approach to develop a system by introducing the integration of Bluetooth technology as the communication medium and Peripheral Interface Controller (PIC) as the hardware which implemented faster ordering system.

K. A. Wadile[4] developed a control system for autonomous mobile robots used in Hotel management. Mobile robot having minimal centralized control was developed. The work focused on the development of two basic motion control algorithms, namely a GOTO algorithm and a FOLLOW algorithm, for use in a master-slave system. These robot motion control algorithms would have wide applicability in hotel operations.

The system proposed in paper [5] was a basic dynamic database utility system, which fetches all information from a centralized database. The tablet at the customer table contains the android application with all the restaurant and menu details.

Kiran Kumar Reddy, B. Naresh[8] employed combination of Bluetooth technology along with android phone. An android application was designed containing food item details in restaurant. The input device was Smartphone or tablet and output section was PC. Cloud-based server for storing the database was used which made it inexpensive & secure.

Asan, N. Badariah in the research paper [9] introduced Smart Ordering System, which was also a fast way to order food at a restaurant. The system used a small keypad to place orders and the order made by inserting the code on the keypad menu. These codes came along with the menu. The signal would be delivered to the order by the Zigbee technology, and it would automatically be displayed on the screen in the kitchen.

III. System Architecture

Each table in the restaurant will be provided with a Wi-Fi network details and a fixed static QR code. The QR code will be encrypted with an Internet portal address containing food menu details at that restaurant. All the components present in the system will be connected to the Wi-Fi and will be connected with each other over a server.

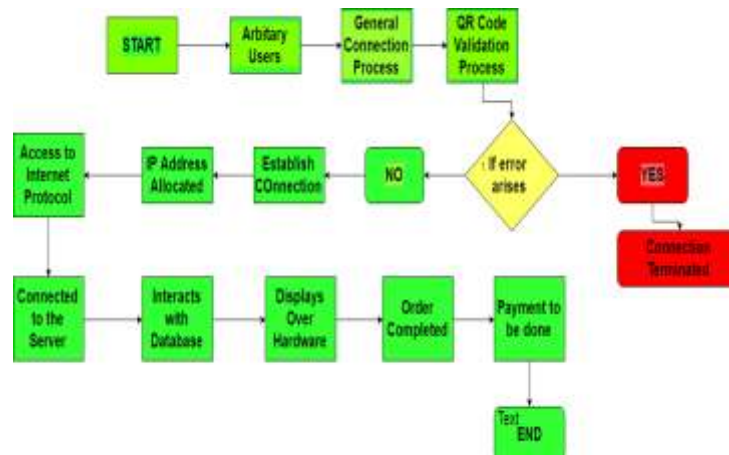


Figure1. System Model

The working of the system includes steps as follows:

1. Enable the Wi-Fi on Smartphone/tablet on which the customer wishes to place the order and connect to the restaurant Wi-Fi network.
2. Make use of a QR code scanner application and scan the QR code, which is fixed over the table.
3. It includes browsing to the Internet Portal address, which has been obtained to through the QR code after scanning.
4. The online ordering menu of the restaurant with all its dishes can be observed.
5. As we tap on the items present over the portal the ordering procedure will start.
6. After entering the valid order of food the internet portal then forward the request over to the LED board, which is present at the chef/administrator end.

7. The LED Board will then show the items ordered and their quantity by glowing respective LED's.
8. Once the chef/administrator receives the order he/she will start to prepare it and once it has been done he/she will tap over the reset button to complete the order.
9. Once the reset button is tapped the order is complete the customer is notified to receive the order and continue with the billing and proceed with the food.

IV. Software And Hardware Requirements

A. Software Requirements

1. Arduino IDE ver 1.8.5: The Arduino integrated development environment is a cross-platform application that is written in the programming language Java. It originated from the IDE for the languages Processing and Wiring. It includes a code editor with features such as text cutting and pasting, searching and replacing text, automatic indenting, brace matching, and syntax highlighting, and provides simple one-click mechanisms to compile and upload programs to an Arduino board. It also contains a message area, a text console, a toolbar with buttons for common functions and a hierarchy of operation menus
2. XAMMP ver7.2.7: XAMPP is a free and open-source cross-platform web server solution stack package developed by Apache Friends, consisting mainly of the Apache HTTP Server, MariaDB database, and interpreters for scripts written in the PHP and Perl programming languages. Since most actual web server deployments use the same components as XAMPP, it makes transitioning from a local test server to a live server possible.
3. IBM Watson AI Tool: Watson is a question-answering computer system capable of answering questions posed in natural language, developed in IBM's Deep Q & A project by a research team led by principal investigator David Ferrucci.
4. Notepad++: Notepad++ is a source code editor. It features syntax highlighting, code folding and limited auto completion for programming, scripting, and mark-up languages, but not intelligent code completion or syntax checking. As such, it may properly highlight code written in a supported schema but whether the syntax is internally sound or compliant cannot be verified.
5. QR-Code Scanner: (Android or IOS Based) QR code scanner software is software that is designed to take a picture, scan and decode the data in a variety of different kind of barcodes. QR code scanner can also work for mobile phones, connect a mobile user to a physical object, and receive any numerous kinds of data. QR code scanner software can also be used with pc computers, smart phones, or other mobile scanning devices.

B. Hardware Requirements

1. Node MCU – ESP 8266: Node MCU is an open source Lua based firmware for the ESP8266 wifi SOC from Espressif and uses an on-module flash-based SPIFFS file system. Node MCU implemented over C and is in layers on the Espressif NON-OS SDK. The firmware was initially developed as is a companion project to the popular ESP8266-based Node MCU development modules, but the project is now community-supported, and the firmware can now be run on any ESP module.
2. Micro USB Cable: Micro USB is a miniaturized version of the Universal Serial Bus interface developed for connecting compact and mobile devices such as smart phones, MP3 players, GPS devices, photo printers and digital cameras.
3. Connecting Wires: Connecting wires allows an electrical current to travel from one point on a circuit to another because electricity needs a medium through which it can move.
4. Bread Board: A breadboard is a solder less device for temporary prototype with electronics and test circuit designs.
5. L.E.D's: A light-emitting diode is a two-lead semiconductor light source. A p-n junction diode emits light when activated.
6. Personal Computer: A computer or laptop, which is compatible to run XAMPP and other needful software of the system.
7. Sensors: Sensor work to help get a outcome over particular medium by applying appropriate sensor.

V. Result And Discussion

Smart restaurant automated system is a fully automated restaurant system using QR technology and Internet portal and to equip the restaurant with features of iot to monitor various aspects related to the restaurant environment like humidity, temperature sensing, and gas leakage alarming.

A. Features

- 1) General Connection: User connects to the Restaurant Wi-Fi, and then scans the QR code with a general scanner application.
- 2) QR Code Validation: After the QR code is scanned, it is checked for errors and connection is established accordingly.
- 3) Access point creation: Users device connects to the server and then he or she is provided access to the internet portal.
- 4) Booking Process: User interacts with the internet portal, which is connected to the database & hardware.
- 5) Conclusion Process: Administrator (Chef) will prepare the order and reset the system to notify user about the payment and order delivery.

B. XAMPP: XAMPP is a free and open source cross-platform web server solution stack package developed by Apache Friends, consisting mainly of the Apache HTTP Server, MariaDB database, and interpreters for scripts written in the PHP and Perl programming languages. XAMPP stands for Cross-Platform (X), Apache (A), MariaDB (M), PHP (P) and Perl (P). It is a simple, lightweight Apache distribution that makes it extremely easy for developers to create a local web server for testing and deployment purposes.

C. General Connection: The customer enters the restaurant and then further connects to the Wi-Fi network present in the restaurant; later the customer will scan the fixed, static QR Code with the QR scanner application in Android, IOS, or windows mobile devices. The Wi-Fi connectivity of the restaurant will be provided by a peer-to-peer connection to give every customer same bandwidth of internet network.



Figure2: QR code

D. QR Code Validation: A QR (Quick Response) code is a unique barcode like code, which is encrypted with the numbers, text, binary values etc. After the QR-code is scanned, then it is checked for errors and connection is established if no error is occurred. If there is an error in the connection, the connection is not established and the administrator is notified about the error.

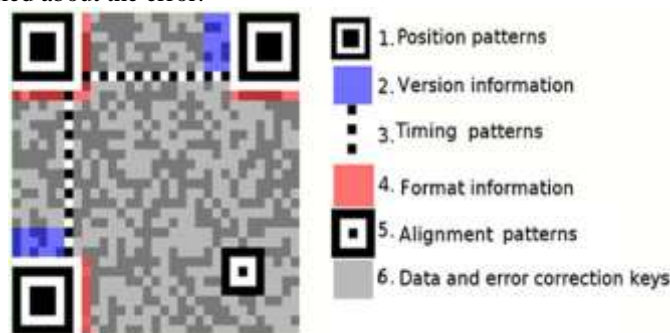


Figure3: QR Code Validation

E. Access point creation:Users device connects to the server and the user’s IP address is then forwarded and stored into the server. As soon as the IP address of the user is stored the server then provides the user device with the web address of the Internet Portal is shown in fig.4.



Figure4: Access point creation

F.Booking Process: User interacts with the internet portal, which is connected to the database & Hardware. The hardware used in this module is Node MCU – ESP 8266 which is a Wi-Fi based module which works on the cloud computing platform and creates its own network through which it interacts with the user's devices, monitoring sensors, and LED's.

G.Conclusion Process : Administrator (Chef) will prepare the order and reset the system to notify user about the payment and order delivery.

Node MCU is a Wireless Module which works over Wi-Fi and has its own cloud base which can connect to devices wirelessly.

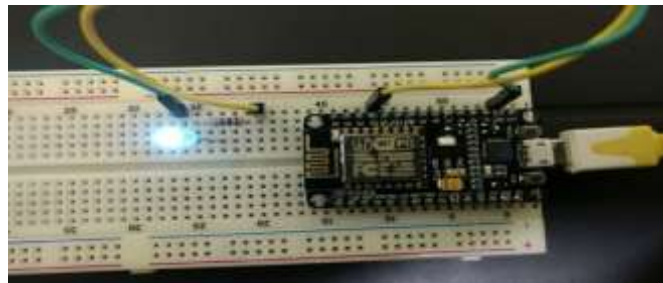


Figure5. Node MCU

With the help of the Node MCU we have now successfully created a module integrated with the help of QR Code and Internet portal which demonstrated about how the ordering process through the internet portal will be possible. The GUI for placing the orders was made with the help of HTML & Bootstrap.

VI. Future Scope

The system can also be implemented with Graphical LCD for displaying the menu as we have used android phone. However the system becomes more bulky and delicate to handle because each table is going to consist of such module for ordering. This system can be implemented for the complete food outlet and can be administrated by a single person. We can even add tablets and mobiles on the table so that customer has no worry to hassle around and can even order quickly.

VII. Conclusion

Smart restaurant automation System replaces the current restaurant environment of placing an order with a waiter and wait for the waiter to attend our order. It builds a fully automated restaurant system, which minimizes human work, & capital, which includes hiring and paying for waiters. It inculcates a new scenario within a restaurant environment where there will be only one person who will be responsible for administration of the whole area.

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