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Restaurant food ordering method using NFC technology

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ABSTRACT

Mobile apps of various kinds continue to emerge as smartphones become more popular and mobile telecommunication matures. NFC is the most common wireless technology used in smartphones presently. It is used in mobile devices having built-in NFC to allow consumers to input payments, receive messages, and do nearer device recognition, among other things. The paper proposes the NFC technology-based food ordering system for all the customers who want to have food at their residence only. The results show that the application works properly in finding the nearby restaurants and completing the food order without any hustle.

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1. INTRODUCTION

Many high-standard level restaurants or resort and cafes make an application to enhance the quality of restaurant and service of their management to the attraction of people to a restaurant. By usage of such applications and services to captivate the customers or guests and make membership of them. By using such an app customers can give feedback or rating to the service of a restaurant. Nowadays membership can be done on mobile by scanning the QR code at the restaurant and guests can use the benefit of membership. But sometimes QR scanning takes a long time to scan and while scanning there may be an occurrence of mismatch with code and burring. To avoid such problems there is new near-field communication (NFC) technology that is time-saving and affordable to everyone and this technology needs NFC-enabled smartphones [1]. To place an order of food in a restaurant or cafe NFC technology is used because it provides more security and order are maintained properly in the database. Customers have to first download the app and see all menu details and chose one food item and place the order. And while giving bill payments the owner can observe the service and management provided by that customer and take mails and contact numbers of guests so that they will get notification of offers for the increased sale of restaurants or resorts. Changes like if any new member comes for a job for a specific role and any new item launch then these changes can be done by admin manager. Guest can pay their bills using a debit card or pay online by scanning a QR code or also installing a bill at the receptionist [2].

The objective of the proposed work is that today, the wireless transmission technology that smartphones include most often is NFC, which is implemented in handsets enabled with NFC with which users can do the payment, and see notifications of the message, for example. More restaurants give coupons to their customer after dinner when they are going to leave so guests gain benefits and combo offers and

discounts next time, and more customers fail to remember to carry coupons with them or by mistake coupons are lost by them so to cover such situations using this technology such application designed.

We proposed a system to order food in a restaurant using NFC technology, this application will allow the customers to download the application by scanning (QR code) at any restaurant and browse the food items as many times as they wish. Guests can see the ideas for a particular menu food stored by the organization. Guest can pass their information at the time of bill payment. This will easier for the Restaurant landlord to observe the management and can inform the guest about different offers via messages or emails. The Restaurant landlord can post different mixing of menu items on the application. Admin manager can make changes like edit, add, and remove menu items. At the time of checkout, the customer can pay inside the application using any of the card payments like a credit card, debit card, etc., or he can generate a bill and pay at the counter.

The rest of the paper has been organized as follows; section 2 depicts the previous work done on food ordering systems and NFC technology, section 3 describes the proposed methodology, section 4 explains the NFC technology and its implementation strategy for food ordering systems, and section 5 depicts the results and discussion of the proposed methodology and finally, section 6 concludes the paper.

2. LITERATURE SURVEY

This section depicts some of the related research carried out on food ordering systems. Kousalya *et al.* [3] presented an automatic restaurant food ordering menu card. The present time is called to be the technological world. More hard work has been grasped by restaurants landlord also to accept records and details and transmission technologies such as PDA, wireless LAN, and expensive various-touch screens. to improve dining meet. This paper focuses on some of the restrictions of the standard paper depend and PDA-depend menu placing system and suggested the affordable touchscreen-enabled Restaurant organization using an NFC enabled android Smartphone or tablet as an emulation. The method contains a smartphone/tablet at the guest counter containing the android application with all the menu information. The guest tablet and kitchen show link directly with each other via Wi-Fi. Booking put by the guest will be immediately connected to the chef center.

Bhargave *et al.* [4] author explained the digital ordering system for restaurants using Android. In today's period web services machinery is mostly used to combine heterogeneous methods and create fresh applications. Here an application of a combination of restaurant organization methods by a web services scheme is visualized. Restaurants Management combines many methods of the restaurant industry such as ordering system kitchen order ticket (KOT), payment system, and guest relationship management system (GRM). This combined emulation can mix or extend restaurant software methods in any size of a restaurant atmosphere.

Jagdale and Singh [5] author described a Zigbee-based hotel menu card and ordering system. Newly structured technology of cafe menu card and booking method implemented to every scoping restaurant is suggested in this document. The 802.15 Zigbee mechanisms are used as wireless connections modern in this document. There is no requirement for the worker to ask for a booking of food from the counter guest as per to method suggested in this document. The suggested method will have two columns; one column is the guest column where the guest and the other is the payment or providing section. In the guest, column guests will view for menu and place a booking of food by viewing its menu. In payment and providing column booking will be observed on their screen. The interaction of guest column to payment and providing column will be accomplished by ZigBee. The suggested method is easy to store and provides a standard atmosphere for the hotels or restaurants.

3. PROPOSED METHOD

The proposed methodology has been described here. This section concentrates on developing the system architecture, modules, and their descriptions. System structure design-recognize the total database design for the WebApp structure design is knotted to the aims created for a WebApp, the elements to be shown, the consumer who will look up, and the way to find the philosophy that has been developed. Content structure targets how content elements and structured for description and negotiation. WebApp architecture, tells how the application is designed to control user communication, manage the processing of internal tasks, effect map reading, and current elements. WebApp structure is defined within the manner of the established atmosphere where the application is to be applied. The system architecture of the proposed work is shown in Figure 1.

Role of admin, admin means manager, he can add, edit, and delete the options from support user, category, and items. He can also change the password if he wishes to change it for security. Logout and Login are also done by the admin.

Role of support user, support user can enter and login to the page, after login user can see the details of food items which is already ordered which makes user easy to understand to place food to the proper customer. If the support user wishes to change the password, then the user can do it and log out from the page after completion of work.

Role of an android reading app, after tapping the NFC tag, it will display menu items so viewing the menu options we can select our favorite item food. On the menu display page there is an option for the suggested item and total amount and rating and finally logout. So, after ordering an item we can view the bill amount or details of bill amount, whatever things you have ordered and on the email address which we were given there, bill details sent on mail id. After doing this there is a logout option so we can log out from there.

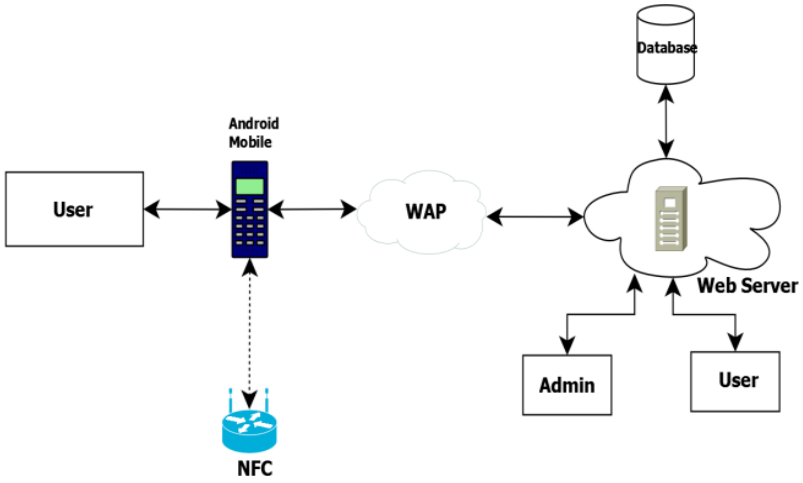

Figure 1. System structure

3.1. Modules and description

3.1.1. Web application module

In this module, there are two actors, the admin and the support user. Admin can able to add support user's data, admin has the power to edit and drop-out support user's record. Admin can able to add categories of the food menu and items of a particular food menu. Support users have to login with the user key and password, he will see the particular table orders and the total amount is calculated, after bill payment he can able to clear the table order details.

3.1.2. Near field communication tag data read and write module

NFC creates radio frequency identification (RFID) systems by permitting two-sided interaction between last points, whereas nowadays technology such as a smart card for contactless was one-way only. Forasmuch as helpless NFC "tags" can also be studied by NFC devices, it is also capable of substituting currently one-way applications.

3.1.3. Writing data into near field communication card module

In this module, the hotel admin has to write the table number and customer PIN into the NFC card. Before writing content into the card, do the XOR operation for securing the content of card data.

3.1.4. Near field communication tapping process module

The customer has to register first with the user id and password, in the time of registration, the web server generates a PIN for every customer, the customer has to enter the user id and the customer has to tap the NFC card which is issued by hotel management. If the scanned PIN matched with the NFC PIN, customers directly enter into hotel menu options and can select whatever items they need. After ordering they can see the total amount of ordered items.

4. NFC TECHNOLOGY AND IMPLEMENTATION

This section describes the NFC technology used for the food ordering system and overall implementation strategy.

4.1. Near field communication technology

The mobile phone enabled with NFC functions almost has smart cards for contactless that are utilized globally in credit cards and also in tickets for transit systems [6]. The general concept of NFC has been described in Figure 2. NFC-enabled mobile phone offers enhance reliability; allow the consumer to save the secure application via features of the device user interface [7].

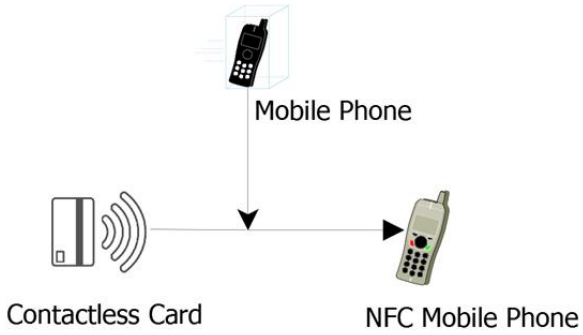

Figure 2. Concept of NFC

4.1.1. Near field communication applications and their protocol standard

NFC is used in different kinds of fields kind as in mobile payment service, NFC Ticketing, and also NFC challenges are mentioned below. The NFC technology challenges are [8], [9], NFC merged with mobile communication has an important point of view handset specific is the specification of mobile NFC applications. Service suppliers and mobile drivers require restrictions to maintain a test and develop a unique application for a device enabled with NFC. Particular issues of a network may be merging to the variety and difficulty of applications. Unbiased technology stand needs to be utilized that can keep secret specifies or issues of different mobile gadgets to make NFC mechanism more handset self-sufficient. The newly modified operating modes are supporting only one application professional model. Only one application running on that chip (which stores business applications) even though technologically it would be able to organize multiple applications.

4.1.2. Information related to NFC NTAG213 tags

It's a compact chip that can vanish internal data, which we may write a few individual features. Label of NFC uses the NFC mechanism, which has the benefits of more safety, fast certification connection, medium scale cheap, high bandwidth, and low power absorption. It is mostly used in social media, healthcare, gaming, electronic consumers, and gaming. The general NFC front view is as shown in Figure 3

Figure 3. Front view of NFC tag

Details of NFC are as; *Common Specifications*, model number: RRHFNFC01, material: label, diameter: 25mm, color: white, mechanical specifications, temperature: -12°C to +60°C, industry standard identifier: NFC type 2, frequency: 13.56 MHz high frequency, memory: 180 bytes, IC: NTAG213, protocol: ISO14443A

4.1.3. Characteristics of NFC technology

No pairing is needed unlike Bluetooth, which means it is instant. It is based on magnetic coupling. Due to low proximity and secluded bandwidth, there is low interference from devices. No need for training and the card will act as a passkey. By different kinds of protocols, NFC technology is secured. It swaps away details at the rate of 106/212/424kbps and functions at a frequency of 13.54MHz. It consumes low power and energy produced by magnetic coupling used by NFC.

4.1.4. Applications

Protected NFC application for credit shift among mobile devices [10], [11]. It shows that, at the same time, both technologies are used. It also describes the suggested mobile money fetching applications addressed with their result analysis and evaluation. A Google recommends a companion NFC application programming interface (API) and therefore transfer of credit is possible. Records exchange between two supportive NFC devices supported by API. To communicate between two devices there is a need for NDEF with a generic control RTD, A NDEF message was created and it permits the identification of applications in every device. Train ticketing application using NFC technology [12], [13]: An electric digital document simply utilized to fetch ticketing is known as an e-ticket. It is in the field of online trade which is detrimental. Improving service quality and reducing operational expenditure is the main focus of e-tickets [14]. The application of NFC also is classified into three forms:

i) Emulation of cards; devices that support NFC to act like contactless cards, such as smartphones which enabled NFC used for transit and payment.
ii) Writer/Reader; NFC tags support systems to play the role of writer/observer and also communicate with NFC tags. For example, a smartphone supporting NFC is used to read smart posters.
iii) Peer-to-Peer; NFC supportive devices to interconnect with one another e.g., laptops and printers having NFC enabled support share photos between camera and television.

Research reveals some negative responses or cons of NFC technology [15]

i) NFC advantages are not tested even though NFC technology is in the development stages.
ii) The cost of starting infrastructure is very high it necessary to exchange previous technologies.
iii) To complete or finish a task, NFC requires the use of 3G connections and use of Wi-Fi.
iv) NFC-enabled devices are very less available in the market.
v) More industries and corporations have to accept that it wills processes long-lasting.
vi) NFC payments are different from debit cards, which makes merchants unpaid when an update of NFC payment is overnight.

Data modification; by using a jammer, we can destroy or remove all information or data in it. To protect from such a situation, there is no other option [16]. Lost property; when any handset such as mobile-enabled with NFC or NFC RFID card missing, then it will accessible openly to some finder and it will work as a unique component authenticating the body. An option to finish a threat of lost-property needs a large number of safety concepts which includes a very physical independent authentication factor.

Eavesdropping; using a patch loop antenna, we can put a receiver near the main focus and discuss it. It is very similar to flipping through of ATM and in this, it is necessary to close the location, and no need to contact with device or reader.

Relay attack; relay attacks mentioned are reasonable on NFC and it is because devices enabled with NFC always include ISO/IEC 14443 protocols. Due to this attack advisor need to send a request reader to the suspect person (victim) and get back its answer in real-time to carry out work by pretending to be the owner of the suspected person of smart card.

4.2. Testing and implementation

4.2.1. Software testing commencement

Software analysis is the activity utilized to assist recognizes the exactness, accomplishment, and superiority of created computer software. Software analysis is the procedure made used to calculate the superiority of created software. Testing is the operation of emulation of a program with the aim of finding bugs. Software testing is always mentioned for confirmation & limitation.

4.2.2. Clarification for software development life cycle &STLC

The software development life cycle (SDLC) is an ideal architecture that makes use in project administration which represents the levels including in record system created project, from starting possibility observation via sustaining of the whole application [17], [18]. Stages of software development are, necessary testing, progress or code, sustenance, analysis, and software designing: i) Necessary testing; the necessities of preference software things are taken out. Based on the occupation view the software requirement specification (SRS) portfolio is made in this stage; ii) Designing; proposals are put out worry about the physical creation, apparatus, operating methods, programming, connections, and safety issues for the software. The design stage is responsible with making confirm the software methodology will join the necessities of the item; iii) Analyzing; assessing the software to test for the consumer necessities. Here the software is estimated with aim of noticing bugs; iv) Sustenance; when the fresh system is up and processing for some time, it should be completely utilized. Sustenance must be put forward harshly at every time. Customers of the method should be put exact details worrying about the present fluctuation and operation.

4.2.3. Quantity of analysis

The quantity of analysis utilized in the project is conducted based on these following considerations:

i) Unit analysis; make-ready testing is the first stage of active analysis and is first the authority of creators and later that of the analyze engineers. The unit analysis is presented after the desired test output is met or variations are explainable/adoptable [19], [20].
ii) Integration analysis; every section which creates an application is analyzed. Integration analyzing is making confirms that the communication of more than two or two elements fetches output that satisfies the operational requirement.
iii) System analyzing; to analyze the total method in a condition of productivity and non-productivity. Analyzing a black box, represented by the Test Group and at the beginning of the method analyzing the total method is aligned in the controlled atmosphere.
iv) Alpha analysis; this analysis is the final analysis before the software is published to the ordinary public. This analysis is organized at the creator site and in a handled atmosphere by the last client of the software.
v) Beta analyzing; the beta analysis is organized on more than one client site by the last consumer of the software.
vi) Functional analysis; the delivery connections from every page for a particular state under observation. Test every inner connection. Test connections bouncing on similar pages. Verify for the backout values of areas. False date to the section in the forms [21].

5. RESULTS AND DISCUSSION

The result is the last outcome of functions or organizations presented qualitatively or assessed ability. The presentation test is exceptional testing and is a bundle of foundation quantitative links between the presentational quantities. The hardware specification required (minimum specifications) for this method is RAM (4GB), Pentium IV 2.4 GHz, and a hard disk of 500 GB. The software used in the proposed model is Servlet, JSP, JBDC type 4, windows (XP/7/8), SQL, Android Studio, Java, and Eclipse. The results from the applications are:

i) Home page; this page shows the home page, it shows starting web page that contains admin login, support user login, and also menu details. Admin login section indicates username and password and it can run only admin and also in support user login, to enter page there is the use of username and password The home page has been shown in Figure 4.
ii) Add support user details; this page adds details of new support users. When any new member joins the restaurant for work then the admin adds details of that member like name, age, role, email, password, contact number, and address for the security of the restaurant as shown in Figure 5.
iii) Support users; this page shows details of support users and also from this page admin can make changes to the details of the support user. The support user's page has been shown in Figure 6.
iv) Category details; the following image shows the category of food items. If want to add any category of any specific type of dish then there is an option to add and also want to remove any category, we can do it and also make changes. The category details page has been shown in Figure 7.
v) Item details; following page shows details of food items and also their price. Admin can edit, add and delete any specific food item as per trend and chef. The item detail's view page has been shown in Figure 8.

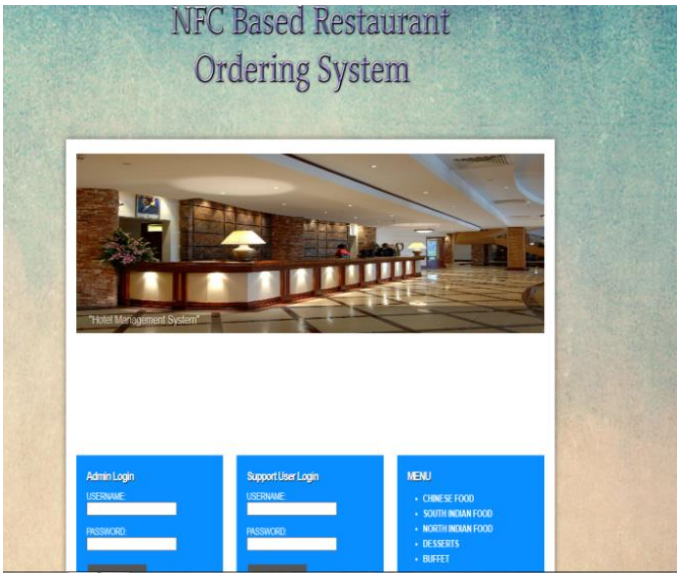

Figure 4. Home page

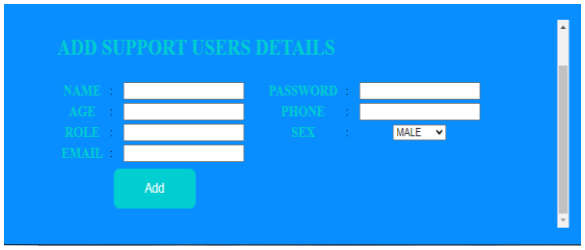

Figure 5. Add support user's details

Figure 6. Support users

Figure 7. Category details

Figure 8. Item details

6. CONCLUSION

Nowadays people use mobiles everywhere they go and mostly everyone does half of their work from mobile hence android mobile phone is must in the present scenario. The paper depicts the NFC-based food ordering system using a smartphone. Ordering food in a restaurant or café by using NFC technology is the best because it gives more security and order are maintained properly in the database. By scanning the QR code, the guest has to first download the application and present the ideas for a specific menu dish generated by an application. Guest or user can pass his\her records at the time of payment of bill so the owner of the restaurant analyzes the management and by using message or emails customer gets notification of offer. This will help the guest or customer and increase sales. All changes like adding, editing, and deleting regarding the restaurant are done by the admin. When the customer is going to check out at that time, they can pay inside the application using any of card payments like credit card and debit card. or pay bill at the counter.

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