Smart Queue Management for Banks using IoT

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Abstract— Due to increase in the number of users and population, queue management is getting complicated and difficult to manage. Nowadays, it is not uncommon to find the kiosk for paper ticket collection, which is supposed to be a ”self-service unit” but they are not very efficient and proved to be insufficient enhancing user experience and helping improve customer satisfaction. This project report demonstrates how the paper tokens can be digitalized. It further demonstrates how a registered user can obtain the estimated waiting time directly on his respective Android application using RFID for customer identification. Hence, he can make efficient use of his time by leaving the premises and returning in time to avail the service.

Key words: Internet of Things, Queue, RFID, Banks

I. INTRODUCTION

Long queues for availing the desired services are seen in most of the banks. We cannot aim to eliminate queues completely but we can manage them. Managing a particular queue leads to increase in customer satisfaction and hence, improves the customer satisfaction. The RFID tag which is provided to each bank customer is embedded to the user's passbook or bank card. After the user enters the bank, he can proceed to the place where the RFID reader system is located. He can hover his passbook or bank card. After this, he can select his desired service to be availed at the bank. The user will receive the estimated waiting time on the Android application after this process. The estimated waiting time (EWT) will get updated dynamically. The advantage of this system is that user can leave the premises and return in time to avail the service. IoT comprises of three fundamental components namely intelligence, sensing and wireless communication. In the project, intelligence is achieved by the calculation of the EWT. The sensing is done by the RFID and the communication is achieved by the Android application.

II. LITERATURE REVIEW

Barclays Electronic Queue Management System (EQMS) The EQMS system is designed to manage queues at all the Barclays branches. It enables to improve the user experience. In this system, the kiosk dispenses tickets with a four digit number and customer has to wait to be called up for a particular service.[9] The tickets generated in this case are paper based .Also the user cannot leave the premises which proves to be a major disadvantage for this application.

Restaurant Queuing Model The queuing model is developed for managing the services given to the customer in a restaurant. It focuses on quality of service. It calculates the data on a daily basis. It calculates the frequency of the customers on weekend and weekday aspects where the weekday would have lesser customers leading to less waiting time and weekend to have greater waiting time. As the results are based on mainly assumptions and approximation, the system cannot predict accurate data leading to a disadvantage[7].

III. PROPOSED SYSTEM

The proposed system aims at effective queue management, enhancing customer experience, and ease of acquiring services. In the proposed system the registered user uses the RFID tag embedded on the passbook or the smart card to validate himself onto a unit placed in the service premises. This unit is mounted with RFID reader to scan the label and a LED display to show the alerts. The RFID reader detects the RFID tag and generates queue. This passbook embedded with the RFID label is assigned to each customer when they register themselves at the very beginning. When the RFID is detected and the verification is successful then the server machine displays a list of services for the customer to select. The android mobile application retrieves the updates from the server and counter. The estimated waiting time is displayed on the application and the time is updated dynamically.

A. RFID verification:

The RFID tag has been used to provide better authentication to end user. We have used the EM-18 reader module which helps us to read the tag. The RFID database consists of all the RFID keys and the account numbers of the registered bank customers. According to the figure below, user scans the pass-book embedded with RFID tag on the EM-18 module. When the scan is successful and a matching entry of the RFID tag is found in the database, the list of services is displayed. The user selects the desired service he wants to avail. The serial number, RFID and the service ID is sent to the web server.

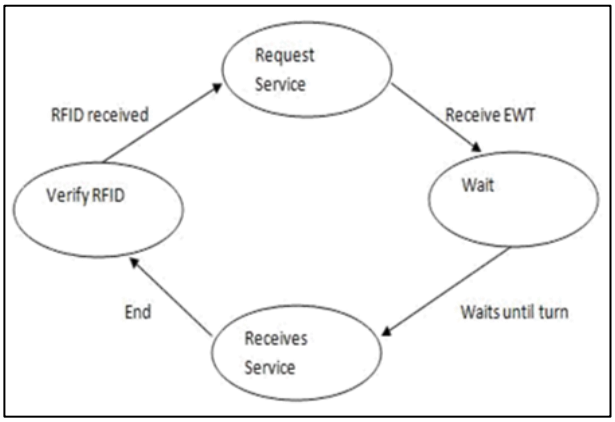

Fig. 1: Lifecycle of User in the proposed system

B. Queue management:

On the web server, a queue is generated. Each service will be allotted a predefined service completion time based on its complexity. In our proposed system for banking, each service has a specific time of completion. So when a user enters the queue, the estimated time is calculated considering the arrival of others users and the services. After the data has been sent

to the web server, the system will calculate the Estimated Waiting Time(EWT) using the predefined Service Completion Time. The Estimated waiting time(EWT) will be updated dynamically depending on the number of customers and the time allotted for each service. The system uses the FIFO queue discipline to manage the queue.

C. Queuing:

After the time is estimated, the EWT is sent to the users Android application via Internet. Apart from the estimated waiting time, the user is also informed about the counter number which he has to go to in order to process his request. The entire system is a web of things were different units are connected to each other via the Internet. The system is idle until the RFID tag is detected and processed. After the detection, the cycle of en-queuing begins, as the hardware detects the RFID tag and sends it over the server to store at the database. Also when the customer acquires the service then the system starts a de-queuing cycle. In the de-queuing cycle, the server updates the database and removes the customer which has already received the service, this queue is updated

IV. IMPLEMENTATION

The main idea of this project is to enhance customer satisfaction and allow users to utilise their time that they spend standing in bank queues in order to wait for their turn on counters to avail the service.

Three Phases of Proposed System are:

Server Side(Kiosk): Customer will have to hover the RFID provided by bank in the form of RFID label on users passbook. After RFID is received by the system it displays a pops-up window showing the available services. Every service will be identified by the system through the service ID defined .It calculates the total waiting time using the pre-defined completion time of each service in the system. After customer selects the service, the data consisting of the RFID, service ID and total waiting time will be sent to the second and third phase of the system

Client(Counters): The data is received from Server side through Internet which consists of the data needed for a person to know the user and service demanded by him/her. The data received will be displayed on the screen in the form of queue arranged in First In First Out(FIFO) manner. Person in-charge on the counter will have to call the customer by clicking on the call button. After clicking on the call button the customer will be removed from the queue and the next customer in the list will be selected automatically in FIFO manner.

Mobile Application(Customer): The Estimated Waiting Time and Counter number from Server Side and Counter Side respectively are fetched and displayed on the Android Application.

V. RESULTS

The result of the proposed system will be discussed in this section.

At the initial state the power supply will be provided to hardware unit leading to system initialization. Consider the fig(2).

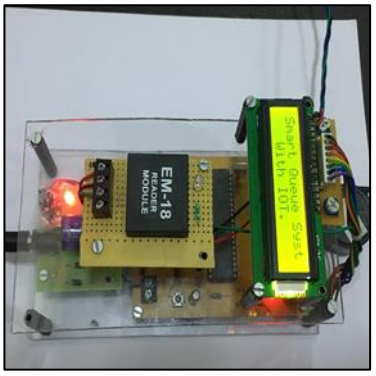

Fig. 2: RFID Unit Initialization

When the RFID tag is hovered against the RFID reader embedded unit, the system starts to boot leading to a series of buzzer beeps. Consider the fig(3).

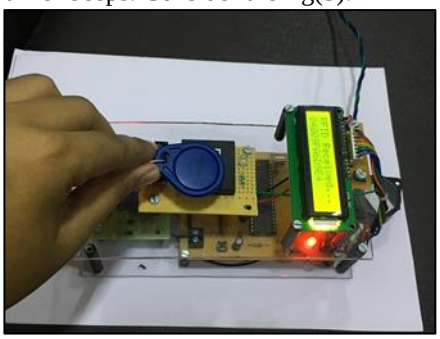

Fig. 3: RFID Hovered

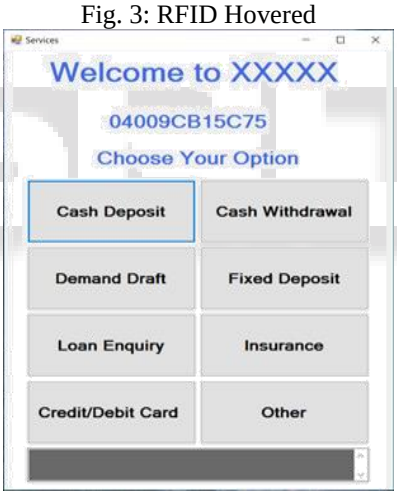

Fig. 4: Service Choice Options

After the RFID has been validated a pop up screen emerges onto the server kiosk containing list of services. This interface contains the RFID tag ID number .From this list the user can select the desired service as shown in fig(4).

Fig. 5: Port connection status

As the user hovers the RFID tag onto the EM-18 Reader module embedded unit, a message is sent to the web server of the successful verification. The verified RFID leads to the a successful connection between the transmission ports and the hardware unit. A system message pops up on the server machine interface of the connection status. The figure(5) shows as the RFID tag is flashed a system message is received, and port is connected for data transmission.

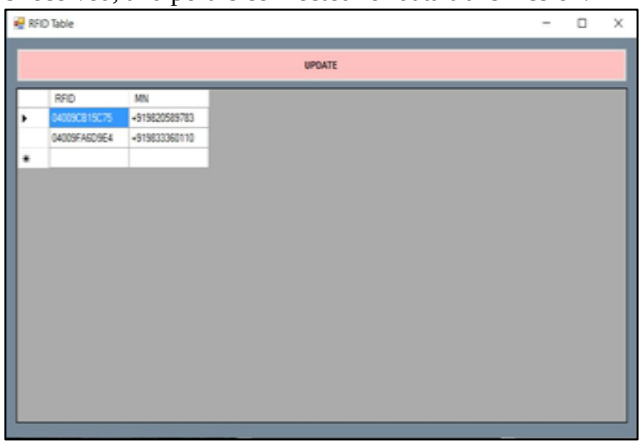

Fig. 6: RFID queue

The fig.(6) shows the queue as per which the RFID's are recorded with the RFID number and user's contact details In this window the RFID's are displayed in descending order according to their initialization time.

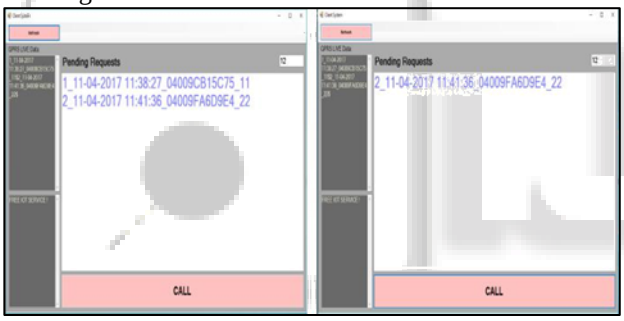

Fig. 7: En-queuing and De-queuing Cycle

As the user count increases, the queue is incremented. When a user is done acquiring the service then the respected RFID detail and its slot in the queue is cleared and made ready for another user to fill in.

The first user is removed indicating the cycle has been completed by availing the service .This operation is the update operation where the current status of the queue is displayed after the queue is refreshed.

Fig. 8: Mobile application snapshot

The above image shows the mobile application snapshot at the time of the notification arrival. This notification contains the estimated time which determines in what time the customer will receive the requested services. The time here is represented in Minutes. It also contains the counter number which will provide the specified service. This notification is refreshed accordingly to update the latest time remaining for service acquiring.

VI. Conclusion

In this paper, we have shown how Smart Queue Management System can be utilized to enhance customer satisfaction and help customer utilize their time productively. Specifically, using the calculated waiting time from server side, we inform this waiting time to the customer in advance so they can come to the counter in time without having to stand in queue. It reduces the whole waiting time of physically being present in the queue for their turn. We inform the waiting time to the customer using the mobile application and later the counter number when the customer is called. From all of the above work done we conclude that using the Smart Queue Management System we can help the queue management efficiently in banks and also it is beneficial for enhancing customer satisfaction. It makes it easier for customers to use the services provided by bank.

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