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CENG 407

MOBILE LIBRARY RESERVATION SYSTEM

LITERATURE REVIEW REPORT

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Abstract

In today's world, mobile applications are one of the most used technologies with the widespread use of smartphones. Mobile applications accompany our lives in many areas such as shopping, education, gaming, entertainment, finance, communication and health. Time is very important for people in the daily flow. Mobile applications accelerate our operations with facilities that almost everyone has easily available such as the internet and smartphones. You may have seen queues in front of public libraries and university libraries, students looking for a place to study, especially during exam times. Whereas it would be nice if there was a mobile application and they could see if there was a space for them before they arrived. This project aims to prevent the users from waiting in the library queue by making a reservation in advance and to enable them to choose the table they want to work on. In addition, a QR code is created on the mobile application specifically for each reservation. In this way, users will not need to use a library card. Users' compliance with the reservation time will be checked by the QR codes that they read to the QR code reader at the entrance and exit of the library.

With this literature review, we aim to learn how to design an innovative system, to identify the difficulties we may encounter along the way, to define the different aspects from other applications in order to develop the most useful mobile application, and to present a summary of previous studies.

Keywords: Online Library Reservation, Online Library Booking, QR Code, Mobile Application

Özet

Günümüz dünyasında akıllı telefonların yaygınlaşmasıyla birlikte mobil uygulamalar en çok kullanılan teknolojilerden biridir. Alışveriş, eğitim, oyun, eğlence, finans, iletişim ve sağlık gibi birçok alanda mobil uygulamalar hayatımıza eşlik ediyor. Günlük akışta insanlar için zaman çok önemlidir. Mobil uygulamalar, internet ve akıllı telefonlar gibi hemen hemen herkesin kolaylıkla ulaşabileceği imkanlarla operasyonlarımızı hızlandırmaktadır. Halk kütüphaneleri ve üniversite kütüphanelerinin önünde kuyruklar görmüş olabilirsiniz, özellikle sınav zamanlarında çalışmak için bir yer arayan öğrenciler. Oysa bir mobil uygulama olsaydı ve gelmeden önce kendilerine yer olup olmadığını görseler güzel olurdu. Bu proje, kullanıcıların önceden rezervasyon yaptırarak kütüphane kuyruğunda beklemelerini engellemeyi ve çalışmak istedikleri masayı seçmelerini sağlamayı amaçlamaktadır. Ayrıca mobil uygulamada her rezervasyon için özel olarak QR kodu oluşturulur. Bu sayede kullanıcıların kütüphane kartı kullanmasına gerek kalmayacaktır. Kullanıcıların rezervasyon saatine uygunluğu, kütüphane giriş ve çıkışlarında QR kod okuyucuya okudukları QR kodlar ile kontrol edilecektir.

Bu literatür taraması ile yenilikçi bir sistemin nasıl tasarlanacağını öğrenmeyi, yol boyunca karşılaşabileceğimiz zorlukları tespit etmeyi, en kullanışlı mobil uygulamayı geliştirmek için diğer uygulamalardan farklı yönleri tanımlamayı ve önceki çalışmaların özet sunmayı hedefliyoruz.

Anahtar Kelimeler: Çevrimiçi Kütüphane Rezervasyonu, QR Kodu, Mobil Uygulama

Introduction

Today, mobile applications have been developed to meet many needs of people. With the help of an online library reservation system, our goal is to offer users an application that will save time and be easy to use in daily life.

Thanks to this application, the users will be able to register online in libraries without dealing with registration documents. With the online library reservation system, we aim to provide users with the most realistic information about the occupancy of libraries instantly. Moreover, the application has the capability of listing libraries in their cities using a user-friendly interface, to provide information about the library floor plans, table locations and the time slot when the tables are empty. Making a reservation before going to the library will prevent possible queues in front of the library and will provide users with the opportunity to reserve the table they want. Thus, time will not be wasted searching for a place in the library and people who are looking for a place will not bother working people. QR codes defined specifically for reservations via the mobile application eliminate the use of library cards, so scenarios such as users forgetting or losing their library cards at the entrance to the library are eliminated. We ask the users to read the QR code specially defined for their reservations to the QR code reader via the mobile application. In this way, we can observe whether the users comply with the reserved hours. For example, the invalidation of the QR codes of people who arrive 15 minutes late from the reservation time causes people to take this system seriously. In addition, with the data in the database, whether a user arrives on time or not, a reward-penalty system can be developed to ensure that users comply with the reservation hours. To the best of our knowledge, the reservations systems developed so far have not the penalty-reward mechanism. Some web-based libraries offer an online reservation system, but they do not have mobile application studies on this subject. Our project differs from those systems by adding a mobile perspective to the online reservation system.

We will be using React Native language for our project because this language supports both operating systems. Moreover, since its syntax is similar to JavaScript syntax, we think it may be easier and more understandable than other languages. We have experience in this field as we have practiced the JavaScript language practically from a lesson that we all take as a team. As a result, we chose the React Native language because its similarity to the language we worked on before may be more advantageous for us.

1) Background

a) Online Reservation System

Online reservation system is a software that enables reservations to be made online. It allows some facilities or organizations such as hotels, movie theaters, hospitals and bus companies to manage reservations more effectively. Online reservation systems can be developed by using web-based technologies or mobile applications. These systems, which can be used regardless of time and place, are easily taken care of after the user chooses the date, time and place. Today, we cannot imagine a modern life without the internet. It is important for businesses in every industry we see around us to have an accessible and online presence on the internet.

In our project, we will design a library reservation system in order to organize and manage facilitated access to the library and to avoid wasting time. People expect a quiet environment to work, so they prefer studying at the library. We have planned to develop such a mobile application in order to prevent many procedures to register to the library, to avoid waiting in the queue when entering the library and to eliminate problems such as forgetting or losing library cards, to learn the occupancy status of the libraries with a single click on mobile phones and not to waste time.

b) QR Code

QR code is a type of matrix barcode (or two-dimensional barcode) first designed in 1994 for the automotive industry in Japan. [1] Speed up the flow of information with the QR code. Moreover, it accelerates the sharing of information and provides easier access to information. Its use is simple, if you have a mobile phone with a camera and you have a barcode engraver bif application, it is very easy to read all QR codes. It provides convenience in many areas. For example, when we go out, we can pay with the QR code without a wallet. We have used these privileges in our application in order to reduce the use of cards and to enable people to enter the library easily.

c) Mobile Application Development

The languages most used in mobile application development are Swift, Kotlin, Dart and React Native. The oldest of these languages are the Swift and Kotlin languages. Since these languages are older than other languages, resources are abundant about mobile apps and languages related to them. Naturally, they provide great advantages for research. The disadvantage of these languages is that applications can only be made on a mobile operating system. Swift only allows application development on IOS operating systems, while Kotlin only allows application development on Android operating systems. Kotlin is very similar to the Java structure. While Kotlin is developed as an IDE on Android Studio, Swift can be developed as an IDE over AppCode. Dart and React Native are languages that are increasing in popularity today. The biggest advantage of React Native and Dart languages is that they provide mobile application development on both IOS and Android operating systems. The React Native is quite similar to the JavaScript structure. While Dart can be developed as an IDE on Flutter, React Native can be developed over Visual Studio Code.

d) React Native

React Native is the JavaScript framework used to create real and native mobile apps for IOS and Android. [2] There are many benefits that react native provides to us. We can update our applications remotely thanks to react native. It increases the speed to develop applications. The language that has been increasing in popularity since the first day of its release. Also, it allows development on many platforms after learning it once. Since we will implement our application on both IOS and Android platforms.Therefore, we chose react native to develop our project.

e) VS Code

Visual Studio Code is a source code editor developed by Microsoft for Windows, Linux and MacOS. [3] Includes debugging, embedded Git checking, syntax highlighting, smart code completion, snippets, and code reconstruction support. It is very fast and a good application for the usability of file management. It's very good at debugging. For example, you can set which computer you want to debug on your computer with more than one program installed. We decided to design our project on this platform because it provides convenience in many ways and is an ideal that we have used before.

f) Firebase

Firebase is a platform that adds new features every day by Google, and allows web and mobile applications to keep user inputs and data in real-time and synchronously without the need for the developer to deal with the server side. **[4]** A management panel is required where it can easily manage operations such as keeping recording session information, analyzing the usage data of applications, sending notifications to the user and testing the application at the same time to make new announcements. Firebase is a free-to-use platform that can meet all these needs.

2) Related Works

The article "Online Hotel Reservation System", one of the authors of which is Bemile Richard, mentions that people can make reservations quickly and easily through an online website. In this way, people will not have to look for vacancies from hotel to hotel in times of high demand and in congested times. **[5]** Taking the example from this article, we decided to make a mobile library reservation system where people can make reservations quickly and easily instead of looking for vacancies in libraries. Here, we are planning to fill this gap by developing our project as mobile instead of web based.

In the article "Development of an Online Bus Ticket Reservation System for a Transportation Service in Nigeria", which includes Oleyede M.O, people who prefer transportation with bus agencies today are asked to be able to book safely. **[6]** For this, it is aimed to make reservations easily, quickly and reliably from anywhere with internet and to provide access to correct information through the website. We aim to develop a library reservation system that is fast, easy, reliable and to minimize human errors by taking the example from this article.

According to what Fadi and Nael mentioned in their article "Students Attendance System Using QR Code", students' attendance to the class is checked in various ways. It is mentioned here that various authentications are made through face recognition, fingerprint sensor and bluetooth connection. QR code method is recommended to control the presence of students in classrooms. **[7]** This example sheds light on library entry and exit processes with the QR code we want to use in our project. We want to integrate this method with the reservation system.

We have researched projects that have the characteristics of our project, which is made in different countries of the world and for different sectors. We have observed that the project we will work on is similar in many areas. By examining these previous projects, we investigated what we can add to our project, the main ideas in existing projects and how we can continue these projects. You can see four main projects that are similar to our project below.

a) Hong Kong University of Science and Techology Library in China

With the mobile application made for the library of the Hong Kong University of Science and Technology in China, reservations can be made for study rooms in the library. **[8]** In addition, there are QR codes in the study rooms to control the occupancy rate of these study rooms. You can reach the video description of this mobile application by clicking the reference number. **[9]**

Similar aspects of the HKST library to our application are that you can make reservations from the library with the mobile application. The difference from our project is that qr codes are not personal. Since codes are specific to study rooms, they are not updated for every reservation. Moreover, in the HKST library application, there is no confidentiality of personal information, since when users scan the codes in their study rooms, they can see the information of other bookers. As a solution to this, we plan to increase the security by ensuring the confidentiality of personal information thanks to the QR codes to be generated in our project.

b) ODEON E-ticket - ODEON Cinemas in United Kingdom

ODEON is an application that offers e-tickets to major cinemas for online reservations. These e-tickets are currently available at ODEON Luxe Leicester Square and ODEON Metrocentre. The e-ticket booking confirmation page and confirmation email contain a 2D barcode (QR code), so you don't need to buy your tickets at the movie booth or ATM. E-tickets are easier and faster, so all the user has to do is print the booking confirmation or email and bring it to the cinema. Alternatively, the user can view their ticket via their phone's email or Apple wallet. By showing this to the staff at the guest service point, you can scan it and the user is accepted on the screen. The user can optionally buy tickets from the movie booth or ATM. **[10]**

Making reservations with qr code in the Odeon e-ticket mobile application and verifying this code by scanning on the phone is very similar to our project. The difference of this project from our project is that it was made for cinemas.

c) Hospital Reservation System in Turkey

It is a mobile application of "Central Physician Appointment System" offered by the Ministry of Health in Turkey. There are two different mobile apps available for IOS [11] and Android. [12] The name of the Android application is "MHRS Mobile" and the name of the IOS application is "CDAS Mobile". Both the application itself and making an appointment are free. All state hospitals in Turkey, the Ministry of Health, Oral and Dental Health Centers and Hospitals for citizens, provided they make an appointment with the doctor they want, and select the appropriate date. You can find out the date and time of the appointment and whether your doctor is working at the hospital that day, and you can cancel your appointments that you cannot go to.

The fact that the hospital mobile application has a personalized reservation feature is similar to our project. Its distinctions are that there is no QR code in the reservation and it is a special project for hospitals.

d) QR Code Train Ticket Booking in India

UTS is the official iOS mobile application for the Indian railways. With this application, they can make reservations on the trains of Indian Railways using the Smartphones of daily train travellers. [13] Some of the features of this application are the ability to book tickets, cancel tickets, protecting your profile and managing frequent travel routes. Passengers can book tickets with or without paper. Paper tickets must be purchased at the box office. Whereas in case of Paperless ticket user's location will be captured to determine he/she is present in a valid ticketing area. Passengers can directly show his/her ticket from his/her smartphone to the TTE. In addition, an alternative to location control at limited stations where a user can scan a unique barcode (QR Code) located on the station premises to reserve their paperless ticket. [14]

The similar aspect of the mobile reservation application made for Indian railways with our project is the generation of QR codes for reservations. The difference of this project from our project is that the reservation is made using the location information.

3) Conclusion

There are reservation systems for many different sectors in our country and in the world. In our project, we specifically based the online library reservation system because we think there is a need in this domain. The library is the most preferred place for people to study. We will develop a mobile library reservation system to make it easier for people to access the library. Nowadays, libraries are entered by reading cards. These cards are required to be removed periodically and sometimes the cards can be lost. In order to solve these issues, our system helps people to go to the library with a single click with the qr code sent to their phone after booking. Thus, by turning the card problem into mobile, we avoid a hassle. Thanks to this reservation system, people will not have to wait in line for hours to enter the library. Through the mobile application, reservations can be made from the desired hall regardless of time and place. We have added the reward system to our reservation system in order to prevent abuse. People can cancel their reservation or write a note in case of being late. In this way, we aim to save time and provide great convenience to users by integrating mobile application and QR code usage.

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