



FACULTY OF COMPUTER AND MATHEMATICAL SCIENCES

ITS 674

INTELLIGENT DECISION-MAKING SUPPORT SYSTEMS

PROJECT TITLE:

CAR PARKING APPLICATION SYSTEM

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CHAPTER 1: INTRODUCTION

1.1 Background of Study

Overcrowding of parking places is one of today's most common issues when one goes on a travel, no matter where anywhere surely car parking becomes one of the problems. The number of vehicles on the road continues to outnumber available parking spots, cluttering the roads. According to Dowling et al., 2017, researchers found that 30 percent of emissions from road transportation are produced by traffic congestion caused by individuals looking for parking. Due to the lack of car parking, it becomes violence when people park cars at will and not in the real place. Therefore, due to inhumane behaviour, violence because of overcrowding, deformed cars because of a space crisis, and overcharging for parking are just a few of the issues that arise. Congestion is the most significant effect of circulating automobiles looking for parking. However, it has become evident that just adding more parking places would not solve the problem of congestion.

Cities, businesses, and property developers have always attempted to balance parking supply to rising demand, but the problem of car parking is always an issue. Due to analyze the importance and problem of car parking, this study creates a system where this system can reduce the problem of car parking when one goes on travel. This car parking application system is known as 'Click 'N' Park'. This system innovation is to help the user in process of booking an available car parking spot, also to help the users able to get an available parking lot beforehand by using a system. Click 'N' Park is the application of new technology to the effective operation, monitoring, and administration of parking spaces as part of an urban mobility strategy.

This application can use anytime to help people from parking at will and not that should be parked. Users must spend more time hunting for available parking, particularly at peak hours and on weekends. Some of research said excessive time spent looking for parking has been highlighted as a substantial contributor to urban congestion and a considerable influence on destination choice, particularly when parking costs and convenience are not uniformly distributed in the city centre. So, this application can be used where people can book first before going to the place to reduce congestion when walking looking for parking. Users only need to book via

their smartphone only and do not have to take a long time. With the application to some extent can help the country, society, and yourself from the occurrence of hostility. At the heart of the Click 'N' Park concept is to access, collect, analyse, disseminate, and act on parking usage data.

1.2 Problem Statement

Every country, including Malaysia, sees an increase in its population on a daily basis, as well. Therefore, any rise in the population of Malaysia is accompanied by an increase in the number of vehicles on the road. As a result, it becomes more difficult for customers to locate a parking spot because the parking lot has a limited amount of available space. People who are having a difficult time finding a parking spot are most likely to be found at shopping malls or other locations with an access to parking lots. Bong et al. (2008) stated that it is not surprising to discover that car parks are always busy at these times because most customers drive to the shopping malls in their own cars especially during sales at a discount and during the season. Although many vehicles appear to be queuing at their favourite parking lot even though they must wait and search for a long period of time, this does not appear to be a discouragement for many drivers.

Kadar Hamsa et al. (2014) stated that the vehicles were typically parked for a long period of time (on average, more than 7 hours) at all stations, indicating that most users who parked their vehicles were travelling for work purposes. As a result, users must spend more time searching for available parking spaces because the parking lot has a restricted number of spaces, which also includes employees who work there. Moreover, they must compete with other people, particularly at peak hours and on weekends, such as on holiday days or pay weeks, or when all the stores are experiencing a flurry of activity.

The most common problem that users encounter when parking their cars is that they have a difficult time remembering where they parked their cars, and it is even more surprising that it will take approximately half an hour to an hour to search for their cars if they cannot remember the level of the parking lot where they parked their cars. Not only that, but they must also look up the number of parking spaces, which is an

issue because most shopping malls, such as Berjaya Times Square, have the most parking spaces, which are separated into three sections: central, east, and west.

As a result, our car parking application system will assist the user in being able to obtain an available parking lot in advance by using our system, hence reducing the amount of time spent searching for a parking spot. The application also aids the users in recalling the location of their vehicle in the parking lot so that they can recheck the location of their car in the application if they are unable to recall where their car was parked or if they are unable to locate their vehicle.

1.3 Objectives

1. To develop a car parking application system to ease the user to get an available parking spot before arrived at desired location.
2. To help the user in process of booking an available car parking spot.

CHAPTER 2: PROPOSED DECISION SUPPORT SYSTEM

2.1 User Requirement

User requirements are happened when the user selects an action from the system. It is usually being more readable, understandable and provide a better experience of the way the system works. The system must execute and perform as the users wants. The user requirements for Click 'N' Park system as shown below:

1. Login requirement – The new user must create an account in 'Sign in' section before using this car parking application system. The user needs to provide full name, username, email address, phone number and password. For user that already registered, they can login the system and proceed for the next step for finding the parking space.
2. Function buttons – The user can select any function buttons to proceed with, right after login the system such as 'Homepage' and 'Location'.
3. To book a parking space:
 - I. Location: The user needs to select their desired location of the parking facility.
 - II. Date and time: The user must choose desired date and duration time to park the car.
 - III. Parking spot: The user have to pick the level and check the availability of parking spot.
 - IV. Confirmation details: The user required to verify the details. The user also desired to fill in plate number and method of payment.
 - V. Receipt details: Receipt details will be displayed right after payment has been made.

2.2 Implementation Strategy

Implementation strategy is very important to create an efficient parking management structure that serves all users. The system is made more efficient as search time are significantly reduced due to the ability to book parking spot that provided by Click 'N' Park system. With the information provided, the user can avoid car park that are fully occupied. As one of the strategies, advertising through television commercial and internet advertisement might be help in promoting the new system to public since most of the people have their own device machine, and advertisement in visualization are able to attract more attention of the public. The system can be more accessible and friendly-user by enhancing parking availability, and can be accessed by other methods such as SMS or through website rather than installing the application. Not only focus on car users, Click 'N' Park system can empower parking system by expanding to various types of vehicles such as motorcycles and more. This strategy might be attracting more users in future that lead more convenience to the user.

CHAPTER 3: FUNCTIONALITY, PROCESS, WORKFLOW AND USABILITY

3.1 Functionality

This car parking application system benefits the driver by saving the driver time also reducing traffic congestion. The advantages of this application are safe to use to all users, simple application, easy to use and easy to understand also not too expensive charge compared to other parking application. Some of the car parking application is rapidly decreasing battery life with the increasing accuracy requirements because the application is use sensor and always need tracking from your smartphone. Given the importance of functionality in the design of a system, it must be applied to it. The following are the functional requirements for car parking application system:

- **Store the users' information in database.**

Users are required to register using their username to log in the application. The information then will be stored in the database.

- **Store the car parking booking information in database.**

All the information regarding the booking car parking such as locations, availability of parking spot, booking date and time, plate number and payment method will be stored in the database.

- **Store user receipt information in database.**

User receipt information such as name, location, date, time, duration, plate number, parking spot, and total amount will be stored in the database.

- **Update car parking booking date and time in database.**

Users are required to update their date and time in order to check in the car parking. The car parking details will be sent to the database and updated from time to time.

- **Retrieve results from database.**

The information about the car parking application can be obtained all when the user wishes to reuse elsewhere or at another time and date. The outcomes will be shown in the user interface.

3.2 Usability

Interaction between system and users are to achieve required goals. To do so, the system must provide a learnability, productivity and aspects of ease-to-use, that able to perform the tasks that as a key factor in determining the user experience. As for Click 'N' Park system, it can easily be installed since it supported by both mobile devices which are Android Operating System and iPhone Operating System (iOS). This car parking application system is created to ease for users to locate a vacant parking space that comparable with current technology. By that, it helps in decision making process since this car parking application system provide the information occupancy status such as to choose desired location, time and date, and the user able to book of the parking space before arriving at the location. It also helps the user in finding the location of the assigned parking space during exit. Hence, this car parking application system is very convenient and easy to use as it can be accessed by users anytime and anywhere of their preferences.

There are some processes that are considered to being implemented for usability of the system. It is involved navigation, visual clarity, consistency and efficiency. Effectiveness of navigation system must actionable guidelines and support search functionality as it is the main uses in every system. The navigation needs to come with simple and consists of colour contrast between background and content, so do for interface design, it must be created with clean design and readable for the user. In addition, the system have got to keep consistency of the content and efficiency result, as it is giving a strong information that required by user.

3.3 Process and Workflow

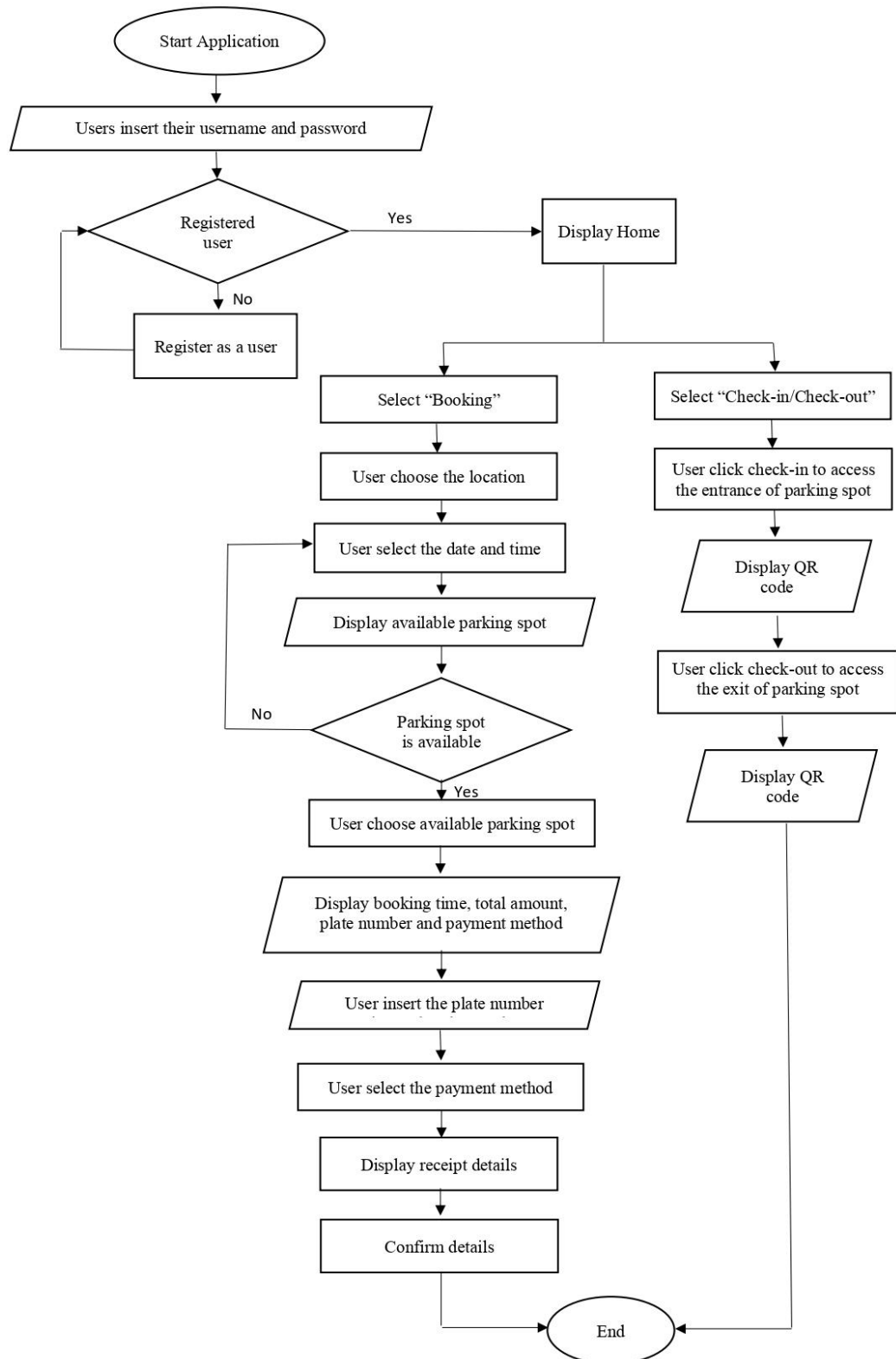


Figure 3.1: Workflow of the Car Parking Application System

Figure 3.1 illustrates the workflow of the system developed of car parking application system. Firstly, the user needs to register if the user still does not have an account of car parking application with insert their full name, username, email address, phone number and password. After user already registered, the user can use the application with sign in the system with insert the username and password. Once the system has identified the user as an existing user, the user will have the select a function from two options on the home page which are "Booking" and "Check-in/ Check-out". There is another option for user use in the homepage such as "Notifications" to get the messages that app developers can deliver to their application. Also, there are "Setting" and "Log Out" options for user use to edit data in the system. However, there is instruction of car parking application that display the information on the car parking system hence for user to understand how to use the system.

To book a parking spot, the user needs to click the "Booking" option. Firstly, user need to choose the location where the user needs to park. Then the user will have to select the date and time. Once the user has chosen their date and time, the system will display the available parking spot. If there is no parking slot available for the selected date and time, the user will have to choose another date and time for their booking car parking. Once the parking spot is available, users will bring for the next step for the booking details.

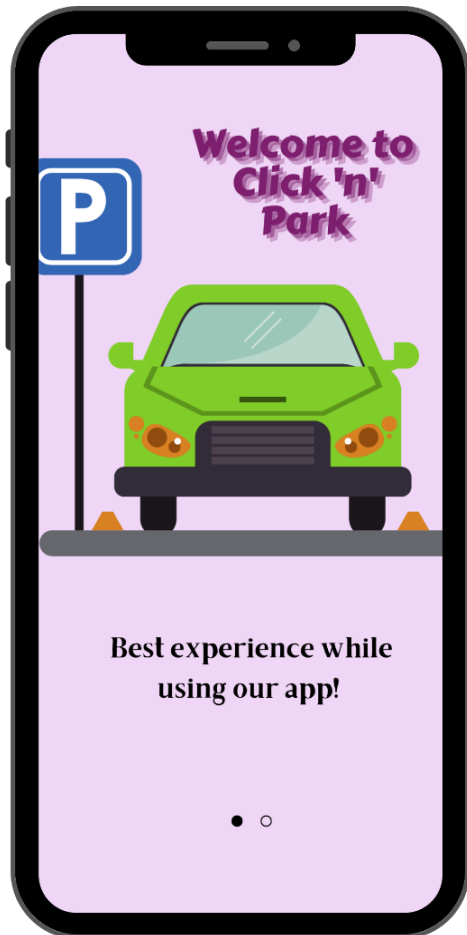
After the user has finished selecting an available parking spot to park their vehicle, the application will display the duration of the user's booking time, the total amount that the user is required to pay based on RM2.50 per hour, the empty space for the plate number, and the available payment methods. In the same page, the user must insert their license plate number to ensure that no mistakes occur, such as another vehicle park being booked at the same time as the user's reservation. After the user insert their plate number, they must choose the method of payment, which can be either credit card or online banking, and the system will automatically redirect the user to the bank's website to complete the payment. When the user confirms that all the transactions that need to be completed have been completed, the application will display the receipt details to ensure that there are no errors in the receipt, and the user can look at the receipt details at the "Booking" page in case if the user have forgotten where their car is located. The receipt will show a detail such as the receipt's reference number, the user's name, the location, the date, the time, the duration of time the car will be parked, the user's license plate number, the parking

spot that has been selected by the user, and finally the total amount of the booking. After reviewing the receipt, the user must click "OK" to complete the booking process.

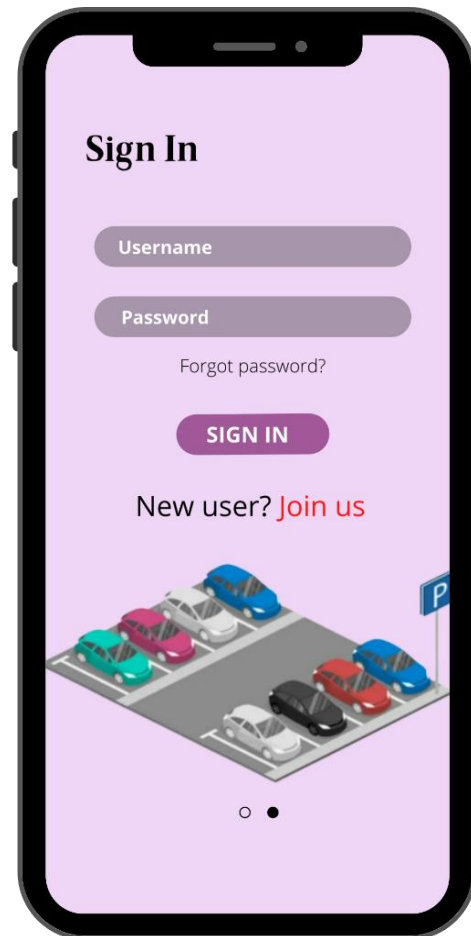
Prior to the day on which the user needs to park their vehicle, the user must first go to the "Check-in / Check-out" page and scan the QR code that has been sent to the user to gain access to the parking spot. Consequently, the first thing that happens after arriving at that page is that the "Check-in" button is displayed, and the user must click on it to access the parking entrance. To access the exit of parking after the user's car parking time has expired, the user must go to the "Check-in / Check-out" page, where the "Check-out" button will be displayed, and the user must click it to gain access to the parking exit. While a user has checked out of the application, the message "Thank you for your booking" will appear on the screen, signaling the end of the procedure for the user when using this system application.

CHAPTER 4: SOFTWARE IMPLEMENTATION AND ADAPTATION

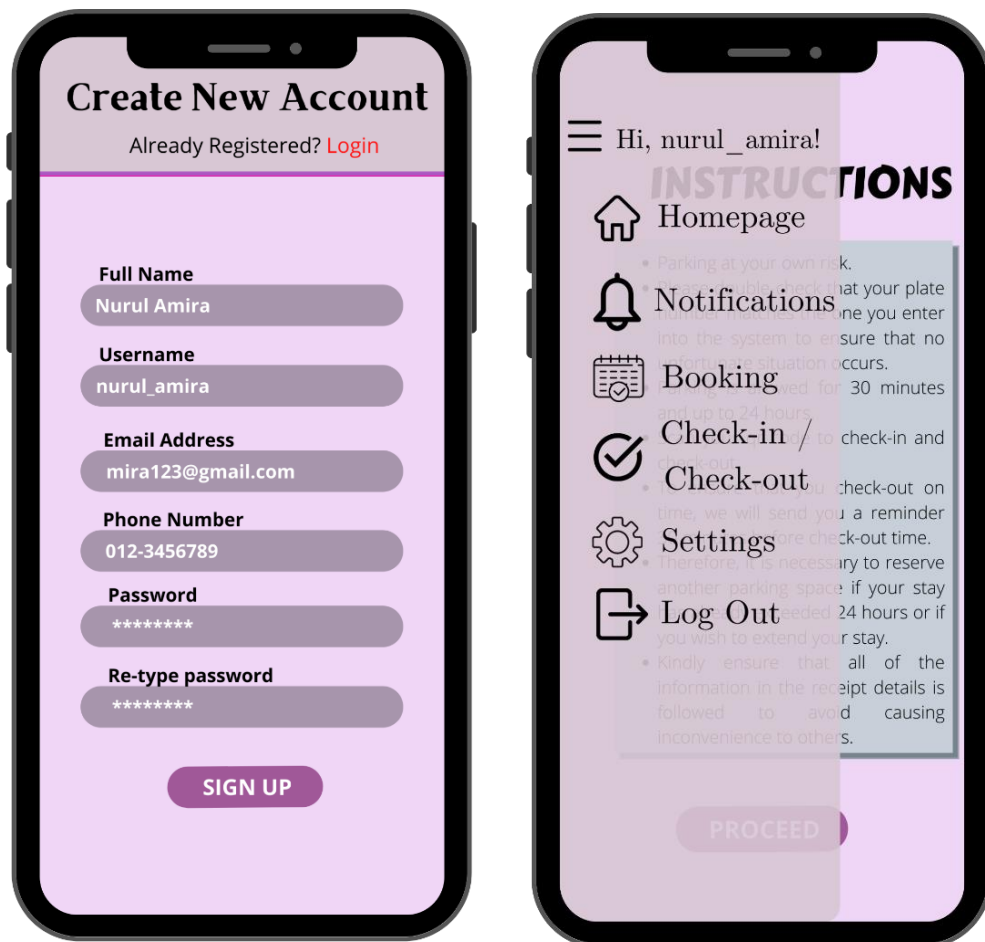
4.1 User-Interface



Front page of the application

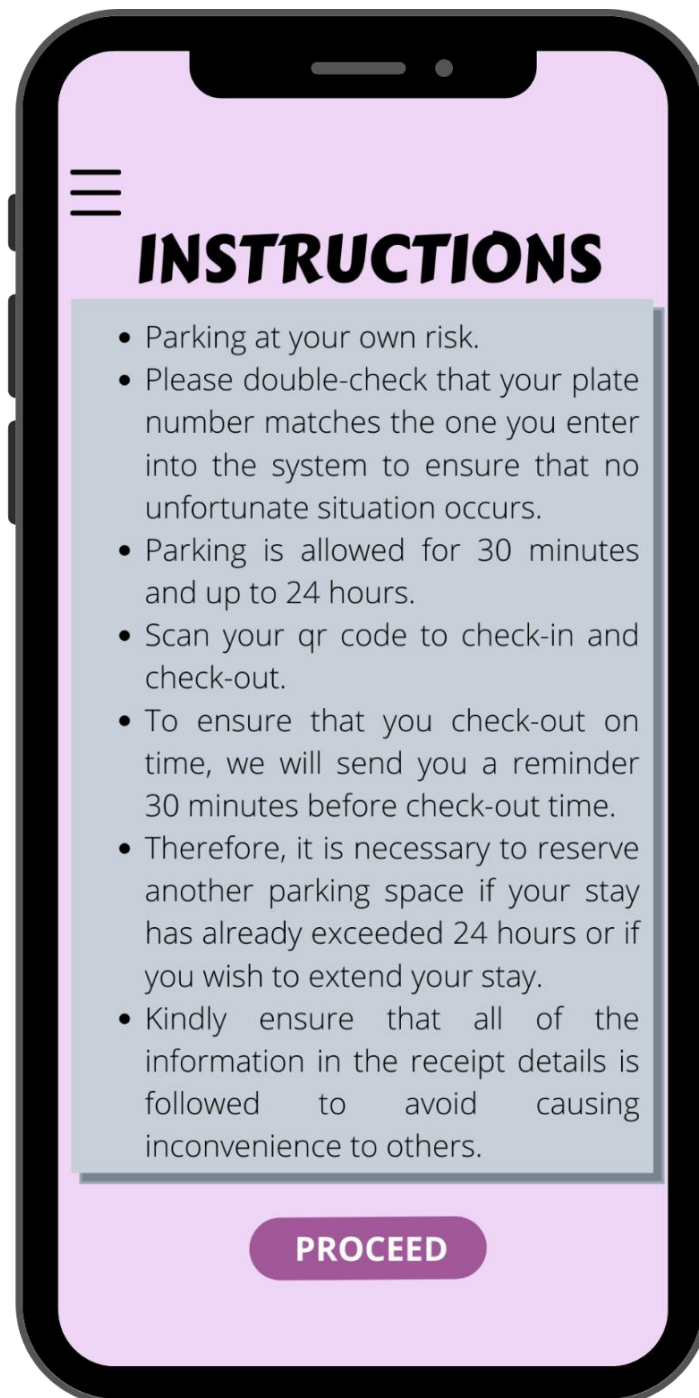


User login to the application

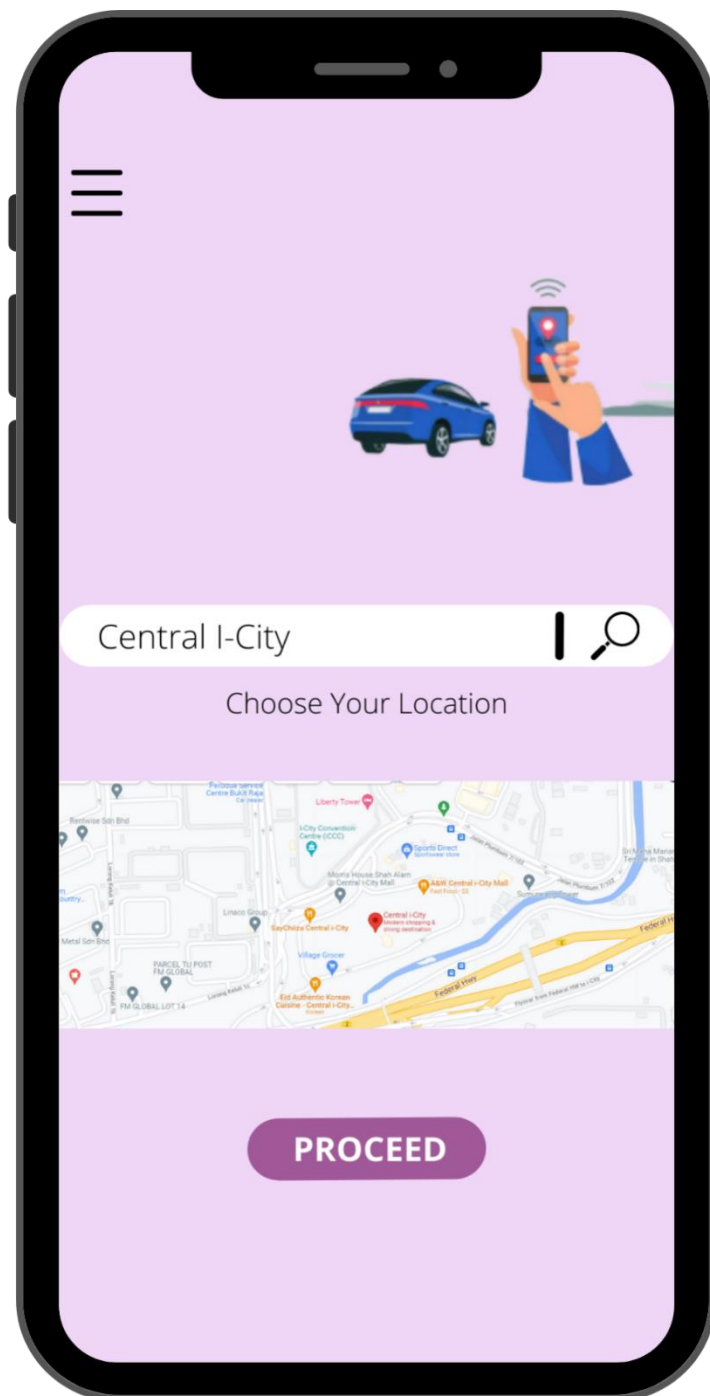


New user needs to sign up to use the application

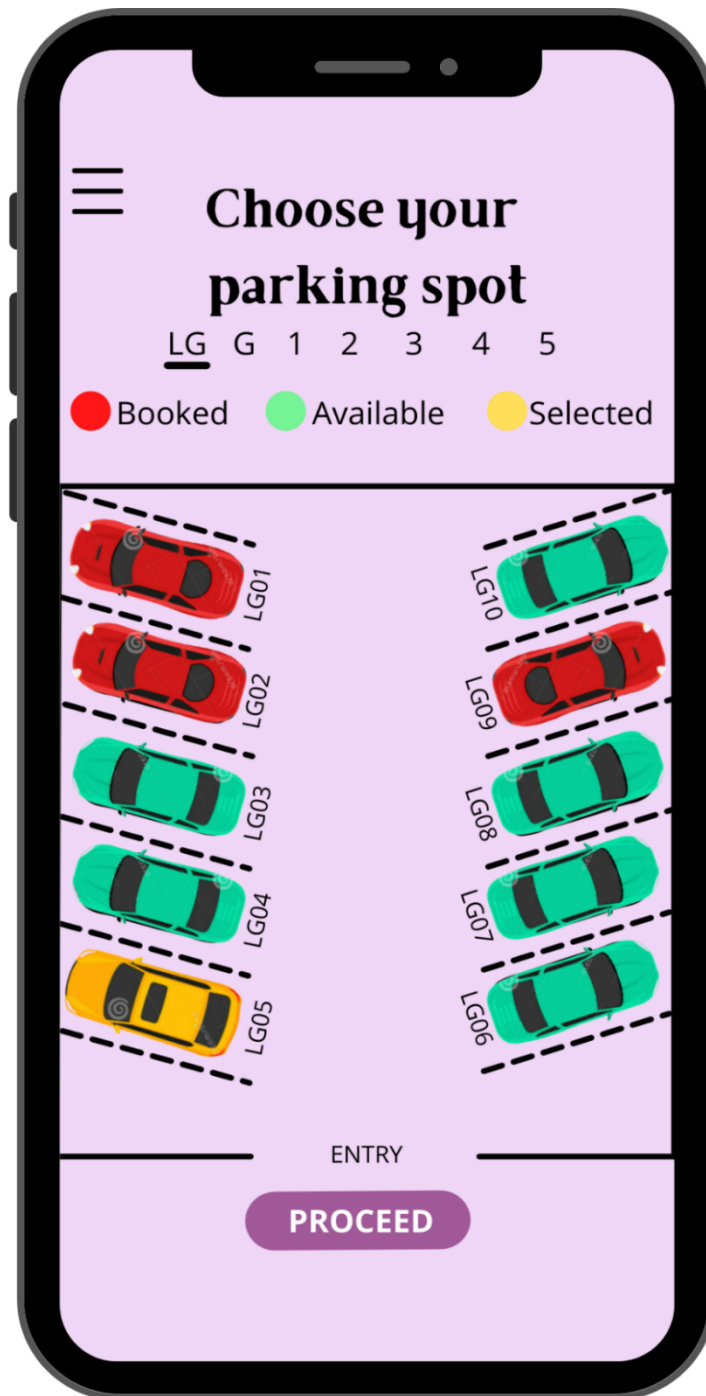
"Homepage" page of the application



Instructions for the user to understand more on how to use the application



“Booking” page of the application.
Users choose the location of the car parking



Users choose an available spot to park their car

A mobile application interface for selecting a booking date and time. The screen has a light purple background. At the top left is a hamburger menu icon. The main heading is "Choose your date and time" in a large, bold, black serif font. Below this, the word "DATE" is displayed in a smaller, black, sans-serif font. Under "DATE" is a white rectangular input field containing the text "17/01/2022" and a black downward-pointing chevron icon. Below the date field, the word "TIME" is displayed in a black, sans-serif font. Under "TIME" are two rows of input fields. The first row is labeled "FROM" in a small, black, sans-serif font, followed by a white input field containing "8:30" and a black downward-pointing chevron icon. The second row is labeled "TO" in a small, black, sans-serif font, followed by a white input field containing "16:30" and a black downward-pointing chevron icon. Below the time selection fields is a purple rounded rectangular button with the word "PROCEED" in white, bold, sans-serif capital letters. At the bottom of the screen is a horizontal banner image showing a stylized parking garage with numbered pillars (1-8) and several cars parked.

Users choose the booking date and time they want

☰

You are booking for....

8 HOURS

Total amount:

RM 20

Plate Number:

VEQ 6902 ✎

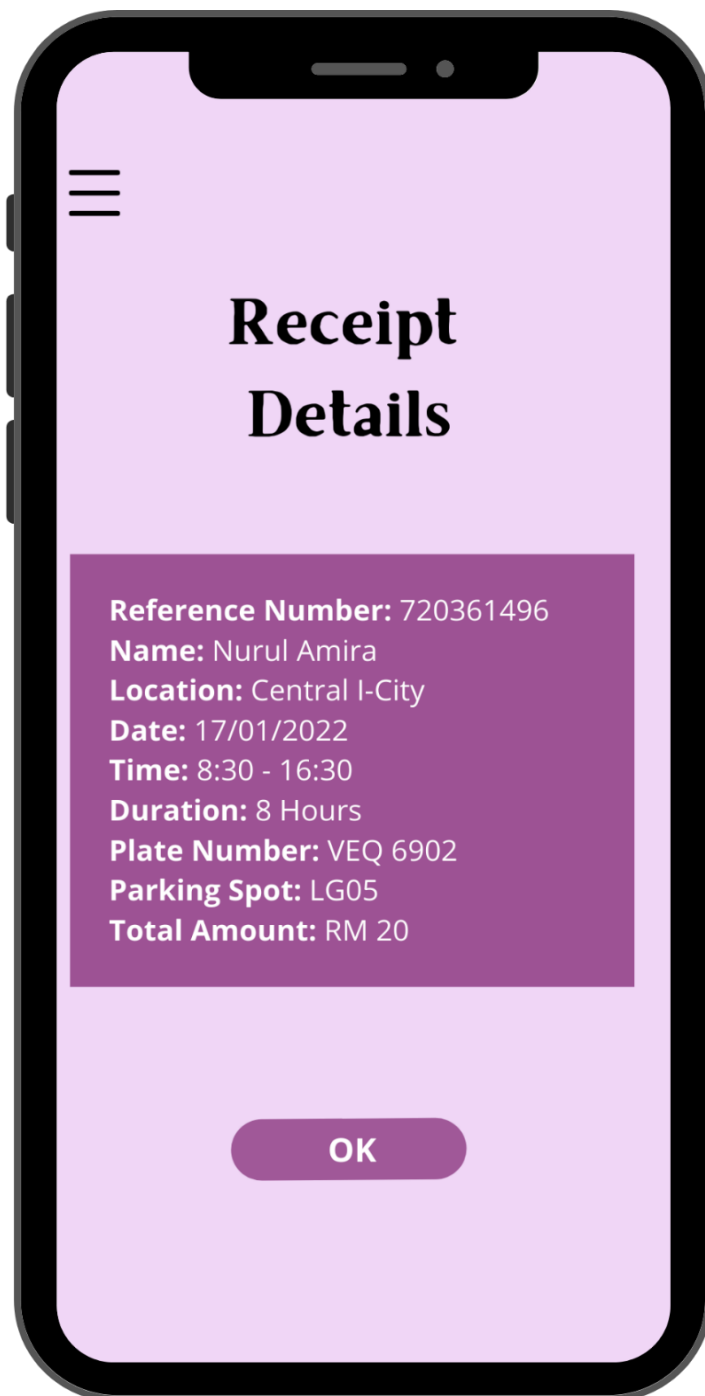
Payment Method:

☐ Card  

☒ Online Banking

CONFIRM

Users enter their plate number, choose method of payment
and confirm the transaction



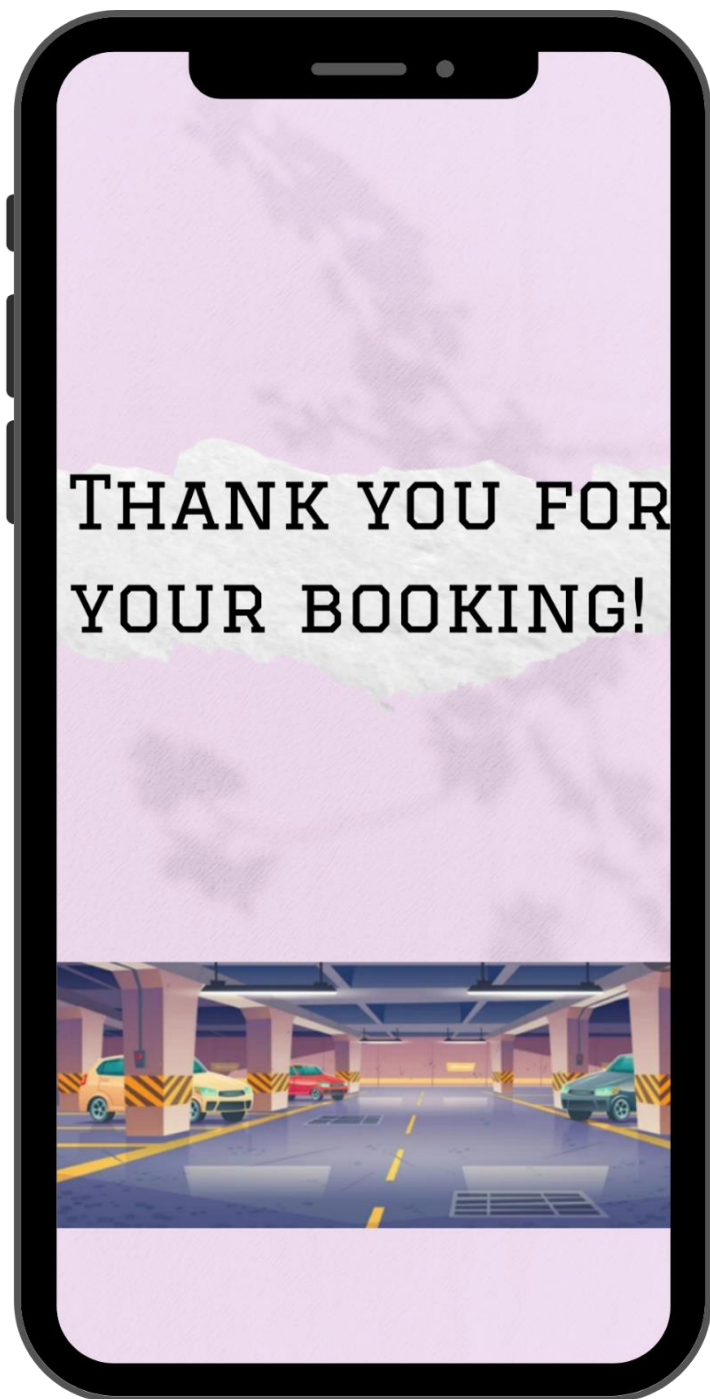
Receipt details to make sure the information is correct



“Check-in / Check-out” page of the application.
QR code for check-in so that user can enter the parking



“Check-in/Check-out” page of the application.
QR code for check-out so that user can exit from the parking



"Thank you for your booking" appear when user check-out from the parking

4.2 Systems and Measurement Schemes

The user has to install the application first before using the car parking application system. By that, the mobile app uses are involving all users of the system and will be connected to parking management subsystem. This car parking system works with some client subsystem which are user agents and parking manager databases. The system environment is illustrated as below:

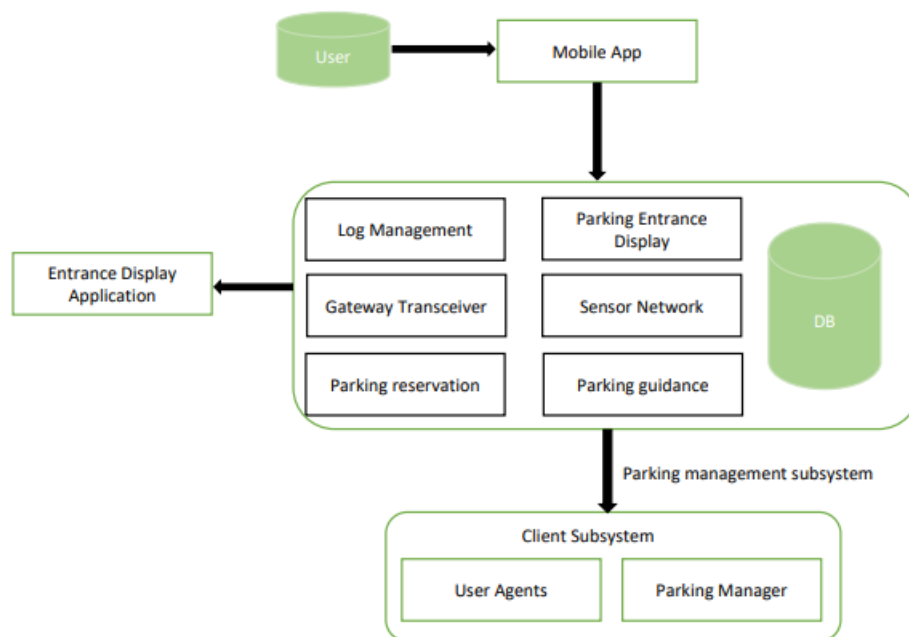


Figure 4.1: Car Parking Architecture

The system is made up of the following functional components that are connected to each other:

1. Log management: to store all the information about the user and arrange time of the booked parking.
2. Parking entrance display: opening the parking entrance directly from the QR code by adding an entry into the real-time database.
3. Gateway transceiver: receives the created QR code based on details of booking system.
4. Sensor network: QR code will be used to check the presence of the driver on the parking lot.

5. Parking reservation: reserves a parking lot at their desired parking facility to ensure the availability of vacant car park spots when the user arrive at the parking space.
6. Parking guidance: reaching the location and provides information about a vacant parking space.

The interactions between different entities help obtain information between the user and the booking system in which there are parking management subsystem that be connected to entrance display application. The parking management subsystem there is client subsystem and there are two organization which are user agents and parking manager that helps acquire information of booking such as available parking slot, displaying the status, detection of free parking spaces on an outdoor parking lot, detection of location car parking, checking on details of payment booking and give confirmation of car parking system.

The users are allowing use at any time in compliance with the conditions provided as well responsible for ensuring that the information they provide in the system by filling in the correct information and does not constitute a case of fraud. User information is used to find out if the system is good for them and want to know feedback about the existence of this application. Car parking is a risk to oneself; therefore, the user should double-check before giving confirmation in the system to ensure that no unfortunate situation occurs.

CHAPTER 5: CONCLUSION

The car parking application system is designed to assist the user in locating a parking space that is available in advance, hence decreasing the amount of time spent searching for a parking location. Additionally, the system assists users in recalling their vehicle's parking lot location so that they can recheck their vehicle's location in the application if they are unable to recall where their vehicle was parked or if they are unable to locate their vehicle. When it comes to helping users with their problems, this car parking application system is extremely efficient and effective. For example, users must spend more time searching for available parking spaces because the parking lot has a limited number of spaces, which includes staff who work there. Beyond that, people often have trouble recalling where they parked their cars. Thus, this car parking application system enables users to reserve an available parking space at any time without the need to waste time searching for a parking space, and there is also a receipt detail in case the user forgets where their car is parked. The receipt will include a reference number, the user's name, the location, the date, the time, the duration of time the car will be parked, the user's license plate number, the parking place picked by the user, and finally, the total amount of the booking. This car parking application system is quite convenient for users who go out on a regular basis without encountering any difficulties.

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