The Designing the Smart Parking Finder

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The Designing the Smart Parking Finder

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Abstract—Parking lots are needed by the general public, especially for those who bring vehicles. The problem is the large numbers of vehicles can cause limitation of the parking lots especially in malls or other public places. Usually people driving around the whole parking lots to find the available ones. when the parking lots are all full, driver must search for other places to park their vehicle immediately. Designing the Smart Parking Finder has the purpose of making it easier for users to get available parking spaces and showing the location of the existing parking lot. On the other hand, it also facilitates the search for parking lots, but can reduce the search time for parking lots, and can also save fuel. For now, the application is still for some parking lots at the mall that have collaborated.

Index Terms—Parking system, real time data transfer, mobile.

I. INTRODUCTION

Population continues to grow, align with the number of vehicle [1]-[3]. This growth is impact to an increasing demand for land to park the vehicle [4]. In metropolitan areas, most vehicle drivers feel stress during rush hours [5], [6]. Almost every day, shopping centre is visited by people with various kinds of purposes, like refreshing, buy things, hangout with friends or family, and many more [7], [8]. A lot of transportation methods are used to go to that shopping centre [9]. The most common is by private car. Recorded the number of traffic jams in 2016, Indonesia was ranked as the second worst in the world. The average Indonesian citizen spends time on the road (stuck in traffic) up to 47 hours a year.

On the other side, when the large numbers of the vehicle traveling in the urban areas increases [10], also can cause the demand of the parking lots, so the car driver often not to get a parking lot for their car at a shopping centre, and must park their car outside the Mall building. The car drivers have to circulate in search an optimum parking slot. The time spent by drivers to find the parking space is related to the availability of parking information [11].

Other problems that are caused by the large number of private cars are the length of the queue out of the Mall. As a result, increasing the parking fares when making a payment at the exit. Especially for the Mall that have hourly fares system [12], [13]. Most of the mall are manually managed parking space and difficult task to supervise any parking spot in large parking place [14].

Parking problems are common in almost every major city in the worldwide [15]. Providing the convenience parking facilities and sufficient parking slot will give high impact to visitor loyalty and engagement [16]. The deficit parking space cannot always be solved by the build of new parking space or by increasing the parking capacity [17]. Many research have been done to solve this problem, but the situation and scope are different [18]. Even many research have identified benefits of forecasting parking space, there are only a few case appropriate with Indonesia situation [19]. Based on those problems, our team inspired to develop parking finder and booking app at a shopping centre area and giving an online payment service at once. With the purpose to get ease of private car users' people to get strategic parking lot in a shopping centre. Moreover, the mobile application technology created a shift to harness artificial intelligence for the growth of humanity [20], [21]. Therefore, this situation give the opportunity to develop the parking finder application which suitable with Indonesia area. The benefit from the traffic point of view, we need parking guidance system which can enable ease traffic congestion and increase the safety for vehicle and pedestrian [22]. From the convenient level, it can implement all parking function on the smart phone and give better experience. Then from the environment perspective it can reduce pollution and reduce vehicle emission [23].

With the advancement of technology, smart devices are becoming more common in everyday life [24]-[26]. Currently, smart parking schedule are more important since it determine the benefit of parking space building and the efficiency of vehicle to be park in appropriate parking slot [27]-[29]. According to this situation, this research try to identity the requirement, that divided into several steps, which are : First, we used mapping parking spot based on floor plans. Each mall provides their parking floor plans, including data about how much the vehicles can get in, are there particular parking spots for women or handicap. Sensor is an important tool in vehicle

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detection for parking management, we have embedded that sensor in the ground, more precisely right where the rear tires step on in each parking spot. Two sensors each parking spots, right and left.

When the tires step on the sensor. The sensor will be active and send data to server and mark that zone has been used. From the user point of viewpoint, the activated sensors will be not appearing as an available parking spot.

The proposed systems work automated with some extent but it had cover to guide the car using the shortest path. Just like we want to choose the seat in cinema, each parking spot have their numbers. The used parking spots will be marked as unavailable. So, the users can only park their car in an available one. Moreover, the proposed application has many benefit toward customer drivers, such as low cost, can be used in everyday and everywhere, decrease time to search parking area, eliminate redundant traffic in parking area, and it can be more secure to detect the parking area [30].

II. MATERIAL & METHOD

The concept is that any type of vehicle will have a sensor on the cell phone that will detect whether the parking area still has the availability of parking or is not yet available. Note that users have access to the internet network, can use Wi-Fi or cellular networks. use access to the internet network as well but the user also uses a powerful ultrasonic sensor, so that the data obtained can be more accurate and precise. Later this information will

be sent to the database and shared with other users. Other systems, systems or applications will not work. if the driver or user moves very quickly because the sensor will find it difficult to get accurate and accurate data.

Many research found that there are several constraint when the parking application implemented, which are parking space size and position [31]. Therefore, the scope of this research only focussed on parking finder detection that does not involve the size and position of the parking area only number of parking space.

The application of this application we want to apply in the commercial sector. This application can also be used to pay for parking online by applying the e-pay feature in it. With the e-pay feature on this mobile phone, users don't need to pay for parking manually. Enough with scan the barcode that has been given at the time of entry into the parking lot. Then the machine will automatically check whether this user has paid for parking or not. If it turns out the user has not paid for parking online then payment can still be made manually to the parking guard or using e-cards. -money that can be directly pasted and cut off the balance to pay for the parking.

For payments we are using e-pay, it can only be done in this application. First of all, the user must be download this application, then user must register the account for the first time for those who do not have it, or directly log into the application for those who have already registered that can be seen in Fig. 1.
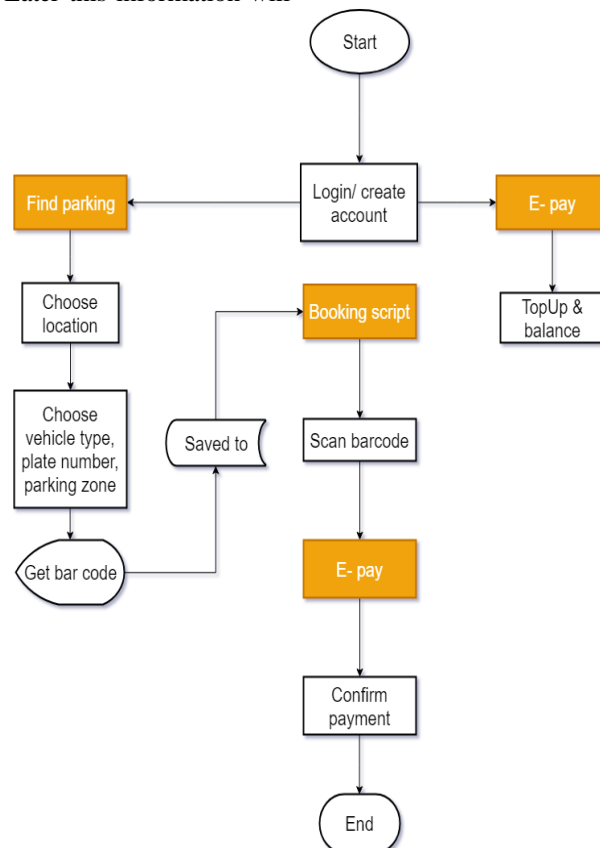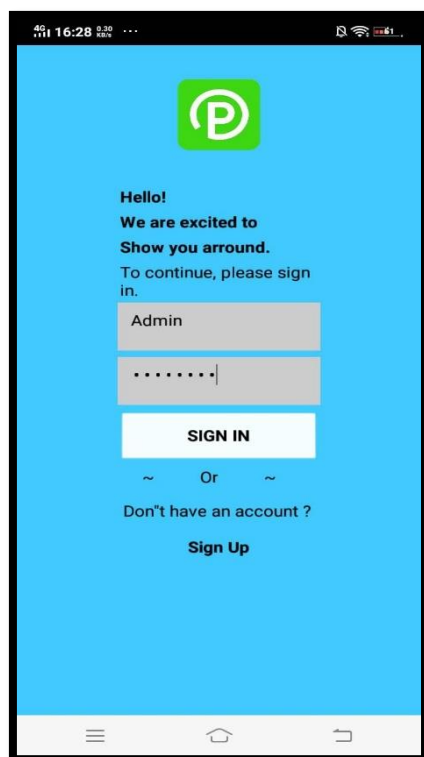

Fig. 1. Mapping parking spot flow
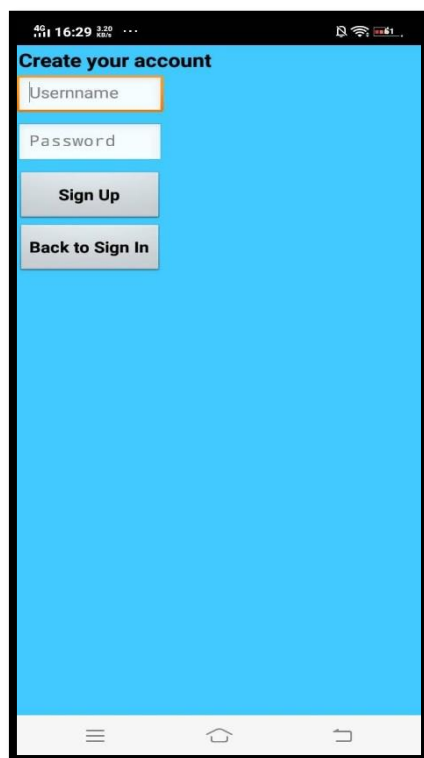
Fig. 2. Form login

Fig. 3. Create new account

III. PROTOTYPING

The prototype here are adapted according to user needs, so the features in App are used by users with ease. As you can see the flowchart Fig. 1, this app has three main menus, which are:

- Find parking
- E- pay
- Booking script

This application Ways of Working divided into six steps, which are:

1. Open the Mobile Application
2. Introduce Destination
3. Display the closest parking areas
4. Display available and occupied spaces
5. The user selects the desired parking area
6. Navigation to the area

The flow of the app begins with the users need to login to our application, that can be shown in Fig. 2. If they don't have account, they can click sign up for register Fig. 3. After the user click sign up, user is asked about their new username and password. After that their account will be saved in our database and then continue to login again.

If the users has successfully logged in, the main menu will be openned. This menu will display the balance from the user using e-pay and the menu for find parking and booking script as shown in Fig. 4.
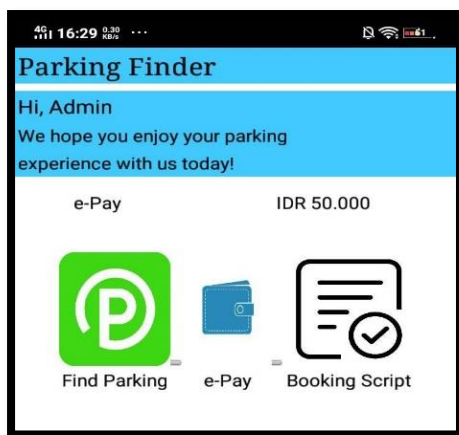
Fig. 4. Parking finder

If the user click on the Find Parking menu, it will direct to Fig. 5 to appoint the destination address to find the parking slot. The user can specify the detail address to search if there is still a parking space available. After the user find out the parking space, the user can book parking using this application. The user needs to complete the booking procedure. They have to select the type of car, car number, and they have to choose the parking zone as shown in Fig. 6. After the booking process complete, the application will generate booking barcode Fig. 7. that can be used for the user to enter the parking space when they enter the area and when they check out, then the application will send the notification email to the user after they verify the booking. The booking fee is IDR 10.000 and the parking fee will be charged according to the parking price standar in that place. The user have to bring their mobile phone when they want to park based on their reservation, if they forgot to bring their mobile phone, so they can not enter to their booked parking space.

The parking space will be booked for two days after the user get the barcode. If the user cancel the booked, or the user does not come for two hours, the book will be canceled automatically and the other user can book this parking space using the application.

For Booking Script menu, the user can check parking ticket in booking script. In here, time of user park will

increasing along with the length of parking. Moreover, when the user check out, system will check this menu to calculate the parking fee. All the history of booking data will be recorded and saved in the mobile phone drive. Moreover, this data will be synchronize periodically to the mobile application server, so the parking clerk also can monitor the booking space from the application.
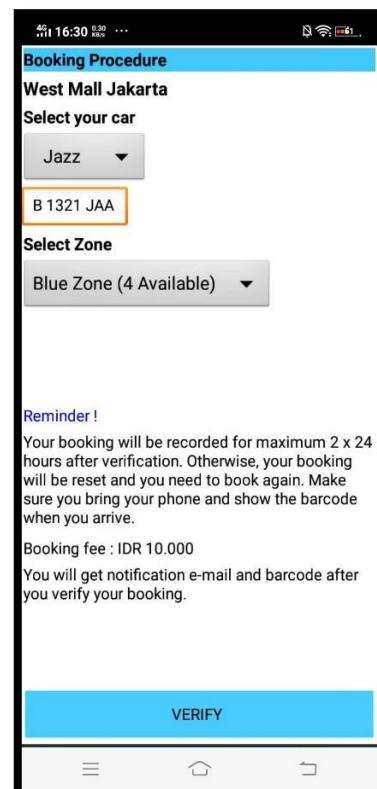
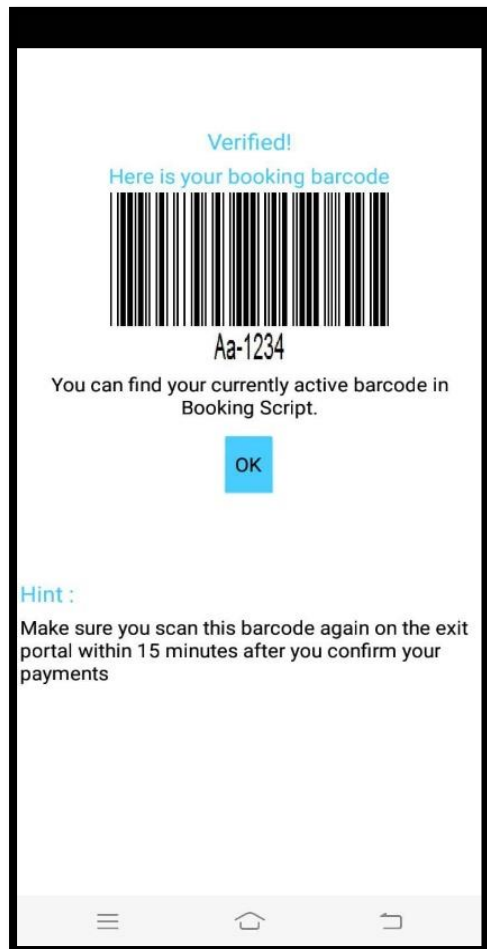Fig. 5. Location & map

Fig. 6. Booking parking
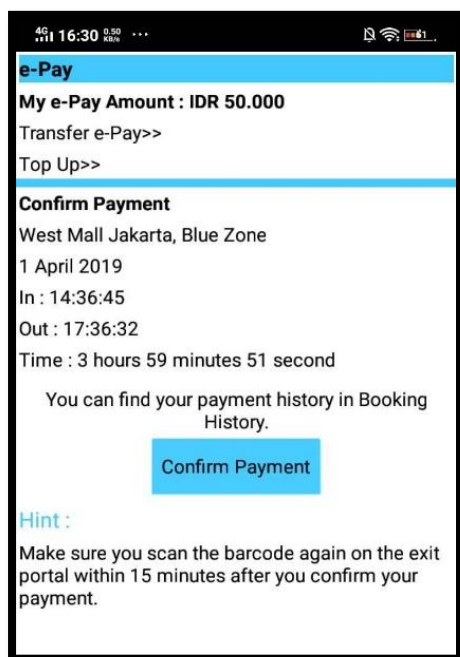
Fig. 7. Get barcode

Fig. 8. Payment e-Pay

For e-Pay menu will show the total amount of parking transaction as shown in Fig. 8. If the amount already suitable, the user can settle the transaction with click the

button confirm payment, the balance will be deduct. In this menu, the user also can top up the balance for their account using some method, such as transfer, credit card, etc. After the user confirm the payment, the user have to make sure to scan the barcode again on the exit portal within 15 minutes. If the user scan the barcode over 15 minutes, the user will be charged doubled and they cannot check out. They need to call the operator to identify the late check out, after that the operator will check their status from the back end systems, so as the transaction can be released and the user can check out from the parking area.

After the transaction successfully be released, all the transaction can be recorded as history shown in Fig. 9. The user can check their history parking booking in Booking Script menu. In this menu, will show the detail of parking, such as date of transaction, place, car identity, parking space location, barcode, and booking fee.

The mobile application for this parking finder is connect with the parking application backend system that will be running in the parking system.
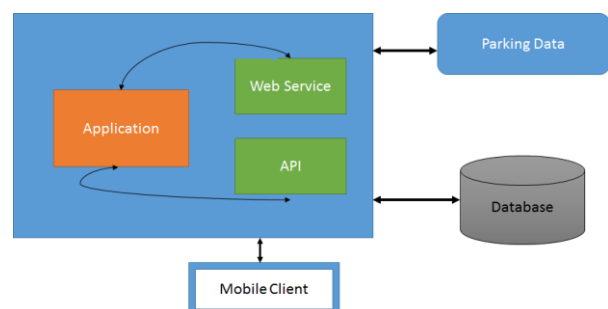

Fig. 9 History booking

Fig. 10. Smart parking finder architecture

To implement the smart parking finder, we will use the architecture as shown in Fig. 10. The application will connect with web service and API (Application Programming Interface) to read the protocol. Server has been implemented to provide business customer service in web environment. After that the system will connect with the parking data which autmatically update the vacant parking spaces and synchonize it with the database. Moreover, the application will connect with the mobile server to read the smartphone data which supplied to end user who connect with query through mobile application

or website based and the application also will be synchronize with the back end application of smart parking finder, so the the conventional transaction can be run as usual to serve the manual user which booked the parking without the application. Authorization and authentification based common web service shared commonly for those user are requested to this parking finder service. In the back end server part play vital role for uploading / downloading parking space information between customer and parking places.

IV. DISCUSSION

With this research, we can be more understand about the problem and how to solve parking management. According to the finding, ee learn that this problem its always we faced in our real life. It seems like this problem not so necessary but in fact there are still driver still difficult to have a park lots. We wish our project can help more driver and all people to find the parking space.

The differences between us and the other research that has been done before is we are using an e-pay for the payment parked lots. With using this e-pay, user can easily pay his park just with their smartphone and can top up the balance everywhere and everytime they can, which is the transaction become more faster and easier.

V. CONCLUSION

Parking finder is a system that works for giving information to user those want get an available parking lot. The way to connect between mobile apps and device must be completed with implementing safe speed and data transfer. We know that if the internet is poor or suddenly lost it can be difficult for our system to detect and get driver information. So, we suggested that driver will get our information if their internet is have a good signal. Because we want to make sure that our driver and our system is connectable.

Depend to other research, the advantages of our exploration result are that we use a good user interface. With a good user interface, we believe that user will enjoy using our application but also to searching parking lots. Not just a good user interface, our system is quick and not to take a time. With this combinable our application will improve from time to time.

Next, we hope that our application will also integrated with GPS. GPS(Global Positioning System) is a space-based satellite navigation system that provides location and time information in all weather conditions, anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites. The system provides critical capabilities to military, civil and commercial users around the world. With this GPS in the future will come a lot of benefit to our users.

Moreover secured information sharing is crucial to support decision of whether the querying parking spot which suitable with the car driver need.

CONFLICT OF INTEREST

Authors declare that they have no conflict of interest. And they do not have any financial relationship with any organization.

AUTHOR CONTRIBUTIONS

Fernando provided the exploration on the problems on this research. Verrell Vadilan Rizky did the exploration on the research model and survey papers. Yohan provided the experiments. Ford Lumban Gaol did the checking and validation of the result and explored with the future work of the research. Tanty Oktavia provided the final checking of the research result. All authors discussed the results, commented on the manuscript and approved the final version.

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