

DEVELOPMENT OF CAR RENTAL RECOMMENDATION APPLICATION IN BANDUNG CITY BASED ON THE NEED USING GLOBAL POSITIONING SYSTEM SENSOR FOR ANDROID-BASED REPORTING

Yudi Kurniyawan¹, Dedeng Hirawan²

^{1,2}Teknik Informatika – Universitas Komputer Indonesia

Jln. Dipatiukur No. 112 – 116 Bandung 40132

Email: yudikryn@gmail.com¹, dedeng@email.unikom.ac.id²

ABSTRACT

The purpose of this research is to help car rental service providers by displaying information about locations and facilities provided in the application and can help vehicle seekers by recommending and offering offers that suit the needs and budget of vehicle seekers in the city of Bandung. This research phase was carried out by renting the Google Developers Console on the Google Cloud Platform for map services by utilizing the Global Positioning System smartphone sensor and displayed on an Android-based platform and users can download applications built through the Google Play Store. The results of this study indicate that by providing recommendations based on the budget owned by vehicle seekers certainly makes this application more desirable. Weaknesses in this study are the data obtained are only available in the city of Bandung and there is no vehicle ordering feature directly in the application because security in transactions becomes a risky thing in the study. The reason for the results of the research is because the public wants applications that can recommend vehicles but according to their budget. The impact of this research is to facilitate the public in finding car rental.

Keywords : *Car Rental, Rental Recommendations, GPS, Global Positioning System.*

1. Introduction

Car rental services is one business that is very rapid development. To help simplify the travel and completes the agenda while on vacation [6]. One of the means of transportation-has a good advantage and with-the payload capacity of the lot, as well as easy and cheap to rent is car. In the business of leasing a vehicle or car is already be in the field of services provider or a business a very beneficial especially in support with a car is a necessity in transportation. Generally the community is happy to use the car as a short distance transportation or long distances to travel. Most people choose to use cars because it is

easier to use when traveling and by having a large payload make more convenience in the use of tools of personal transport rather than using public transport, or friends participate in the journey. The problems that arise in the community in city bandung arrivals from outside the city of bandung which is still confused with finding services rental services car has the price in accordance with the budget that is owned search engine services, covers the location, distance, car type, and the availability of a driver. Supported by the number of rental cars that are on Google Maps some of which are already not active and the destination is not in accordance with the location found on Google Maps. Further problems are on the provider of car rental services is the absence of the container which helps to provide a more specific information about the location and the price of the car that provided to search engine services. While in the city bandung, there are many providers of car rental services and easy to find, but because of the lack of known information make it to be more difficult to find and incompatibility with needs. Based on the problems that have outlined above, then the solution could do for be able to help bring together providers services and search car rental services is to create systems that can be rental in accordance with the budget..

The construction of the system in this research uses a prototype method to accelerate the system development process.

1.1 Android

Android is an operating system is an open source software that has in common with LINUX. First development by Android Inc. and in aid of a fund by Google. This operating system is becoming the operating system on smart phones or smartphones and computer tablets. In 2005 Android Inc is managed by Google. And in 2007 Google founded a consortium of companies that is hardware and also software as well as in the field of telecommunications to advance open standards for the product in the hardware. So in October 2008 is the beginning and the first time the

mobile phone is supported with based on Android operating system to the community [4].

According to Nazaruddin Intercessory H [1] Android is an operating system use on mobile devices based on the linux operating system to include system operation, medium. Android facilitates an open platform for the developers to create the app themselves. Android Inc. which is a newcomer to create software for cell phone/smartphone. Then for its development the operating system android formed the Open Handset Alliance, i.e. a consortium of 34 companies hardware and software, telecommunications, a partner in governance including Google, HTC, Intel, Motorola, Qualcomm, T-Mobile and Nvidia.

1.2 Global Positioning System

The GPS has the abbreviation i.e. Global Positioning System, which has the usefulness of a navigation system supported with the existing technology on the satellite signal can be received from between the satellites. This system involves and uses 24 satellites that each transmit a signal, namely the micro-wave directly to the earth. Signal directly received a device called a receiver on the surface, adapatun other uses of this receiver that is collecting data from the satellite, such as: Time. GPS Receiver is obtaining data time via the atomic clock which has an accuracy of very fast and high, Latitude, Longitude, and Elevation, Komulasi data. The GPS receiver can keep track information, such as the total travel that has already been done, average speed, highest speed, lowest speed, time/hours to the destination, and so on [2].

1.3 Google Maps

Google Maps is a map that can be accessed online and can be easily accessed because it is a free service owned by Google. Google services this one provides an API (Application Programming Interface) to be used by the developer [9]. Developers can add the Maps in their own applications. Display google can be in custome to be shaped display maps or images directly.

On Google maps we can directly see the layout or the photo in a location directly. With such a talked-about, Google Maps is a map that can be accessed via smartphone or computer. We can add these features for free through the API that has been provided to our website for free. Google Maps API is a library made from Java Script. Its use is quite easy, namely the ratio using HTML and Java Script if you want to apply on the website, and also stable internet access. By using Google Maps We can save time to see a place or region without having to go to that place first. In other words, we just create a data while the map which is

displayed is owned by Google so we don't mess around with the build map of a location, and even the world, such as in figure 1.

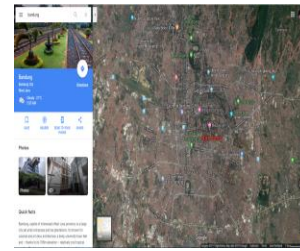


Figure 1. Google Maps

On the Google Maps API there are 4 types of options the model map provided by Google, such as roadmap, satellite, terrain and hybrid appear on the roadmap [2].

1.4 Haversine

The analysis of the algorithm is a completion method and approach to help solve or be the solution to a problem, the algorithm used on a problem would have to be tested and appropriate dalam membantu solving a problem.

Problems of application development this is how to get a based on the price desired by a user or search engine services as well as giving the limitation of distance in a certain radius, on the completion of and approach to help solve the problems and become a solution to the problems get, the author uses Algorithm of Haversine that will be implemented at the stage of encoding.

Haversine is the equation used based on its spherical shape of the earth, eliminate a factor the earth is slightly elliptical. This is a trigonometric equation of the ball, the law of haversines, relating the sides and angles of a triangle ball, the law haversie, the relation to the spherical triangle. Connect points u, v, and w on the sphere [10]. If the length of the third side is (u to v), b (u to w), and c (v to w), the angle opposite side c is C. then the haversine it becomes:

$$\text{Haversine}(c) = \text{haversine}(a-b) + \sin(a) \sin(b) \text{haversine}(C)$$

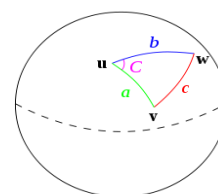


Figure 2. Haversine

1.5 Prototype

Software development method using the model of prototyping, because in making this system the involvement of users is so high that the system meets the needs of users with better [3,5].

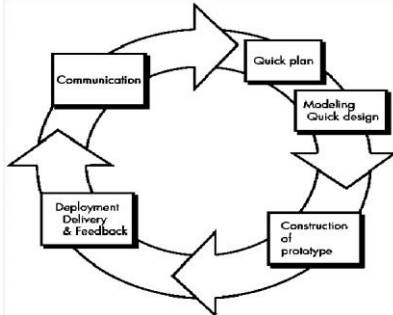


Figure 3. Prototype Method

Explanation point the prototype model is as follows :

1. **Communication**
 Researchers collecting conduct a needs analysis system to collect data, namely by conducting interviews with the owners of the Fertile Rental Cars and rental car, as well as collect data-additional data based on the results of the questionnaire and the common problems that occur on public complaints.
2. **Quick Plan**
 Researchers at this stage of the proceeding of the process of Communication, at this stage of the generated data associated with the user's desire in the construction of the system, i.e. a system that can bring together and accommodate the service seekers and service providers of car rental services to interact and facilitate the search of the vehicle in accordance with the needs of the service seekers.
3. **Modeling Quick Design**
 Researchers began to perform a system design in accordance with the needs of the services and seekers of car rental services that can be estimated before the encoding process. Process modeling quick design is done by designing the data structure, software architecture and unified modeling language (UML) using Microsoft Office Visio [8].
4. **Consturciton Of Prototype**
 At this stage, researchers start to do encoding is to build a web service API using SLIM framework in accordance with the planning at the stage of modeling quick design, do coding on Android Studio set up the interface and gives permission to the sensor Global Positioning System as well as functional on Android smartphones to send and display

response data in the form of JSON on server through web service API [7]. After the encoding is completed further testing done against the system that has been built, the goal there is to find errors of the system to then be able to fix..

5. **Development Delivery & Feedback**
 This stage can be in the say finals in the manufacture of a system. After doing the analysis, design and coding, then the system already so used by the user, then the system that has been in the wake of the performed maintenance or maintenance periodically.

2. THE CONTENTS OF THE RESEARCH

2.1 Analysis Of The Current System

Evaluation in the current procedure is an overview of the problem based on the stages of the activity. Explanation of evaluation procedures that run can be seen in table 1.

Table 1. Evaluation Of Current Procedures

Problem	Solution
Search engine services search for information about the location of the service provider of car rental services in the city of bandung.	Looking for information rental on google, social media and in the general environment.
Service seekers looking for the price of the car in accordance with the budget in possessed	Looking for information about the rental price of each rental

2.2 Analysis Of System Architecture

The analysis of the system architecture is a process to describe the physical system to be built and also its supporting components. Here's an overview of the system architecture will be built.

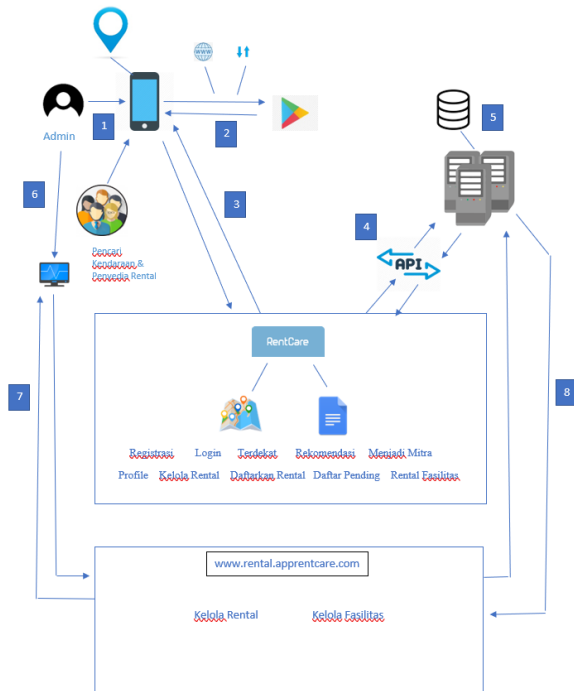


Figure 4. The Architecture Of The System To Be Built

The architecture of the system of the above describes how the system will be running later, for the explanation will be in detail on the following points :

1. Search of the vehicle and the provider of the rental using a smartphone based on android that is supported by a GPS sensor and WiFi / Mobile Data.
2. Search of vehicles and a provider of rental download application Rentcare in playstore.
3. Search of vehicles and a provider of rental fill the data needed the app and choose the features that are available on the application RentCare.
4. The application sends the request for the desired user to the server through the API.
5. The Server gives the request data or request that the user wants to retrieve data through the database.
6. Admin using your computer or laptop.
7. Admin access the website RentCare and choose the features that you want to access.
8. Data which is managed by admin in send directly to the server and stored into the database.

2.3 Analysis of a Wi-Fi Network and Cellular Data

Wi-Fi is short for Wireless Fidelity, which has the sense of a set of standards used for Wireless local

Area Network (WLAN), while Cellular Data is a data package on a Smart Phone and so on. There is no minimum Limitation on accessing the features contained in the application, but presence of an internet connection is needed for the performance of and the terms of use of the features contained in the app.

2.4 Use Case Diagram

Use case diagram is a modeling for the behavior of the system to be made. To describe the relationship that occurs between the actor with the activity be in the system, the following in figure 5 and figure 6.

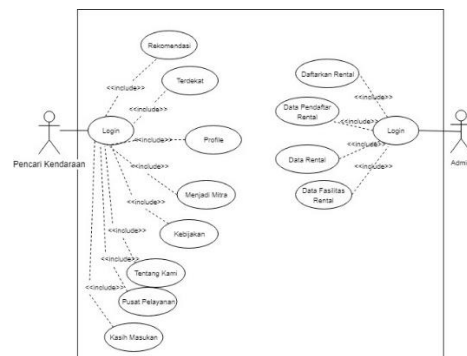


Figure 5. Use Case Diagram Application

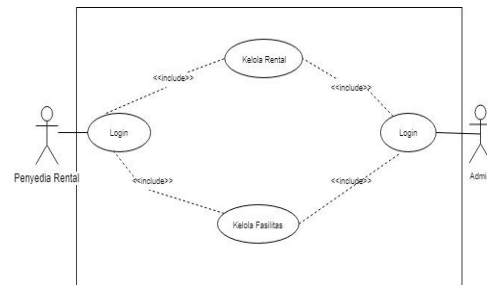


Figure 6. Use Case Diagram Website

2.5 Class Diagram

Class Diagram is an overview of the structure and relations on each objects running on the system, can be seen in figure 7.

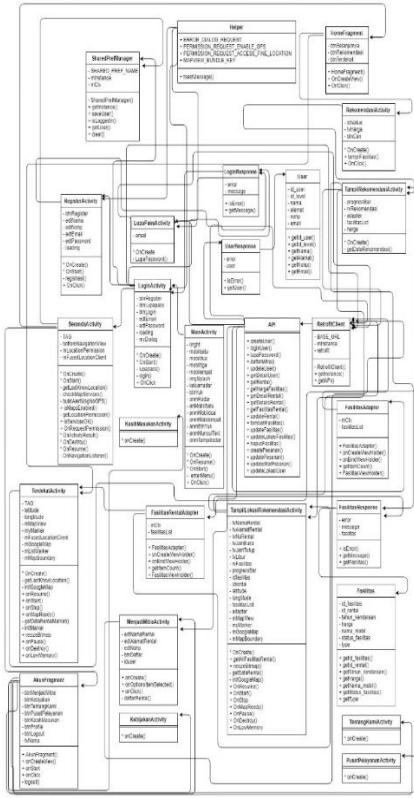


Figure 7. Class Diagram

2.6 Skema Relasi

Relation schema is a set of relations between multiple tables in the system database, can be seen in figure 8.

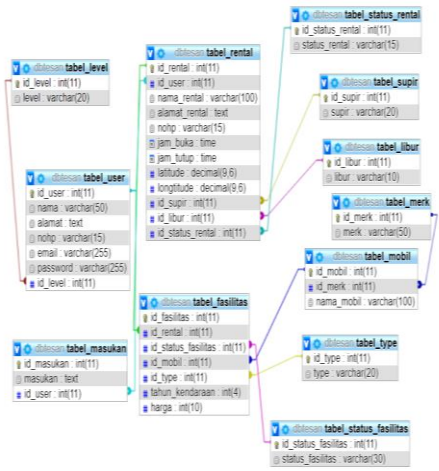


Figure 8. Relation Schema

2.1 Scenario Use Case.

Scenarios in a Use Case is a flow of events for a use case that describes a sequence of interactions

of the actor with the use case in the early idari early actors interact to complete.

Table 2. Scenario Use Case

Use Case Name	Recommendations	
Goal In Context	User get the result of the recommendations of the car	
Precondition	The system displays the recommendations page	
Successful End Condition	The system successfully displays the results of the recommendations	
Failed End Condition	System fails to displays the results of the recommendations	
Primary Actor	User	
Secondary Actor		
Trigger	User press button recommendations	
Included Cases		
Main Flow	Step	Action
	1	User press button recommendations
Extension	Step	Branching Action
	1.1	The system displays the input data
	1.2	User fill the form data input
	1.3	The User sends the input data
	1.4	The system displays the data results recommendations

2.2 System Testing

System testing is a very important and intended to seek a deficiency contained in the system in the wake. This test is intended to know in the way of the performance of the system or application has been made and compliance with the design objectives of the system or application. Type testing in this testing done which includes Testing Functionality and Usability..

2.2.1 Black Box Testing

Black box testing focuses on whether the software that is built to meet the needs mentioned in the specifications. Testing is done by running or executing unit, and then observed whether the result of the unit being tested is whether in line with expectations.

2.2.2 Scenario Black Box Testing

The scenario of software testing for testers on the application recommendation car rental in Bandung in table 3.

Table 3 Scenario Black Box Testing

Test Case	Detail Testing	Testing Type
Login	Test data email and password to Login	<i>Black Box</i>
Registrasi	Test data to register new account	<i>Black Box</i>
Rekomendasi	Test data displays recommendations based on budget	<i>Black Box</i>
Menjadi Mitra	Test data register rental	<i>Black Box</i>
Profile	Test the conversion of data user	<i>Black Box</i>
Daftarkan Rental	Test data register the rental by admin	<i>Black Box</i>
Data Daftar Rental	Test data receive data registration rental	<i>Black Box</i>
Data Rental	Test data complete data rental and rental locations	<i>Black Box</i>
Data Fasilitas	Test data added facilities vehicles provided by the rental	<i>Black Box</i>

2.2.3 The Results Of Black Box Testing

Testing is done by testing each process for possible errors that occur, following the results of the testing that has been done can be seen in table 4.

Tabel 4. The Results Of Black Box Testing

Cases and Test Results (Data Correct)			
The Action / Data Input	Expected	Observations	Conclusion
Enter all of the field input in accordance with the database	Display to the page welcome	Display to the page welcome	[√] Accepted [] Rejected
Cases and Test Results (Data Incorrect)			
The Action / Data Input	Expected	Observations	Conclusion
Enter all of the field input in accordance with the database	Display the text 'email or wrong password' under the password field	Featured posts 'email or wrong password' under the password field	[√] Accepted [] Rejected
Empty an Field	Displays the icon of the error information with the text 'Email or Password should not be password'	Appear the icon of the error information in each field with the text 'Email or Password cannot be empty'	[√] Accepted [] Rejected

2.2.4 Conclusions Black Box Testing

Based on the results of Black Box testing that has been done, it can be concluded that functionally the whole process on the system has been partially run in accordance with the expected.

2.3 Recommendation Testing

The scenario On the testing recommendations made to know the error when doing the recommendation. Testing recommendations can be seen in Table 5.

Table 5. Result Of Testing Recommendations

Cases and Test Results (Data Correct)			
Data	Expected	Observations	Conclusion
budget: 250000	Perform vehicle message is found and display the	Managed to search for vehicles and go into the yard featured	[√] accepted [] rejected

	page featured recommendations	recommendations	
Cases and Test Results (Data Correct)			
Data	Expected	Observation	Conclusion
budget: 20000	Show the message of the empty vehicle and display the page featured recommendations	Successfully displays the message of the empty vehicle	[✓] accepted [] rejected

2.4 Menjadi Mitra Testing

On testing become a partner done to find out the errors when registering to Menjadi Mitra. Testing become partners can be seen in Table 6 Menjadi Mitra Testing

Tabel 6. Result of Menjadi Mitra Testing

Cases and Test Results (Data Correct)			
Data	Expected	Observation	Conclusion
nama_rental: Bizz Rental no_hp: 0227546541 alamat_rental : Jl. Lodaya no.22 E	Show the message successfully registered	Registration Successfully	[✓] accepted [] rejected
Cases and Test Results (Data Incorrect)			
Data	Expected	Observation	Conclusion
nama_rental: Arins Rental no_hp: 0227546541 alamat_rental : Jl. Riau no.23	Appear the message no hp rental has been used	Appear the message failed to list because the data has been used	[✓] accepted [] rejected

Cases and Test Results (Empty Data)			
Data	Expected	Observation	Conclusion
nama_rental: no_hp: alamat_rental :	Tampil pesan gagal mendaftar data kosong	Menampilkan pesan gagal mendaftar nama_rental, no_hp, alamat_rental kosong	[✓] diterima [] ditolak

3. Conclusion and Suggestion

3.1 Conclusion

The results obtained from research conducted in the preparation of this thesis and refers to the purpose of the research is obtained the conclusion as follows:

1. Application Recommendation Car Hire can help recommend a rental car in accordance with the cost of user-supplied.
2. Application Recommendation Car Rental provides convenience to give detailed information about the cars that will be in rental and rental locations.

3.2 Suggestion

There is some advice there and given regarding the development of applications that have been made to make the development of further stages of the system, namely:

1. Added many data providers rental car in the city and outside the city of Bandung.
2. Add the direct booking feature in deploying recommendations luxury car.

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