Destination Information System for Bandung City Using Location-Based Services (LBS) on Android

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Destination Information System for Bandung City Using Location-Based Services (LBS) on Android

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Abstract. Bandung is a city in West Java, Indonesia with many interesting locations to visit. For most favourite destinations, we can easily look for it on Google and we will find some blogs there discussing about related content. The problem is we can not guarantee that the destination is frequented by visitor. In this research, we utilizes an application to help everyone choosing destination frequented by visitor. The use of information technology in the form of picture, maps, and textual on Android application makes it possible for user to have information about destination with its visitor in a period of time. If destination has visit history, selection of proper destination will be given with fresh informations. This application can run well on Android Lollipop (API Level 21) or above with a minimum RAM of 2 GB since it will compare two coordinates for every data. The use of this app make it possible to access information about location with its visitor history and could help choosing proper destinations for the users.

1. Introduction
Bandung is a city in West Java, Indonesia with many interesting locations to visit. Travelling to Bandung can be used as an option to relieve fatigue after a full day activity. The problem is when people go for a travel but do not feel like travelling instead of creating a new burden of thoughts. Selection of proper destination influential in this regard.

Based on the number of foreign and domestic tourists statistics who visit Bandung, since 2012 the number of tourists who come to Bandung showing an enhancement[1] [2]. In 2012 the number of tourist arrivals reached 3,513,705 people and increased by 9.84% to 3,897,429 people in 2013. Then in 2014 increased by 11.79% to 4.418.781 people. However, a decrease occurred in 2015 by 9.37%, bringing the total tourists coming into 4,004,492 people.[2][3]

Table 1. Number of Foreign and Domestic Tourist in Bandung Year 2010-2015[2][3]

<table>
<thead>
<tr>
<th>Year</th>
<th>Foreign</th>
<th>Domestic</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>180,603</td>
<td>3,024,666</td>
<td>3,205,269</td>
</tr>
<tr>
<td>2011</td>
<td>194,602</td>
<td>3,882,010</td>
<td>4,076,072</td>
</tr>
<tr>
<td>2012</td>
<td>158,848</td>
<td>3,354,857</td>
<td>3,513,705</td>
</tr>
<tr>
<td>2013</td>
<td>170,982</td>
<td>3,726,447</td>
<td>3,897,429</td>
</tr>
<tr>
<td>2014</td>
<td>176,487</td>
<td>4,242,294</td>
<td>4,418,781</td>
</tr>
<tr>
<td>2015</td>
<td>130,039</td>
<td>3,874,453</td>
<td>4,004,492</td>
</tr>
</tbody>
</table>
The table above shows the data arrival of foreign and domestic tourists in 2010-2015. In 2010 there is a significant increase towards the year 2011 compared to other years, it is foreign tourists which increase by 7.19% and for domestic tourists increase by 22.08%. However, entering the year 2012 decrease by 18.373% for foreign tourists and 13.58% for domestic tourists. The same thing happen when entering year 2015 where foreign tourists decrease by 26.31% and 8.67% for the domestic tourists. Nevertheless, in 2013 and 2014 the data shows a fairly steady rise, both in foreign and domestic so that the average number of tourist arrivals in the last six years stands at 3,852,624 people. Seeing the number of tourists scattered in the city of Bandung and its surroundings, it is possible to generate dissemination of tourist information based on the areas frequented in a certain period of time using information technology from an application. Everyone will certainly not have the same destination at the same time and that makes the visitor data can be an information. Although social media applications can already provide user location sharing features but there are still shortcomings that they can not directly display information about what the users share because the social media application does not discuss about profile of a location. Similar research are found like Manav Singhal \[4\], and Amit Kushwaha \[5\] which are implementing the use of GPS technology to retrieve users data.

This study aims to improve the information of destination in Bandung and nearest with its visitor using Android applications that can meet these needs so that the parties involved can immediately access the desired information. Android is used because 80% users are using Android in the last five quarters \[6\].

2. Research Methodology

Research methodology in this research include the identification of problems, formulation of problem identification and problem formulation, formulation of objectives, data collection, system analysis, planning system, building system, testing system, and withdrawal conclusion. The following are described in detail.

a. Problem Identification and Problem Formulation
   In this stage is the initial stage of research that begins by identifying problems that may arise when someone tries to select proper destinations. Once found the problem then the next stage is to formulate the problem and determine the appropriate method to implement the system in order to solve the existing problems.

b. Formulation of Objectives
   In this stage the researcher determines the purpose and objectives to be achieved to solve the problems that have been described in the previous stage.

c. Data Collection
   In this stage the researcher determines how to obtain the data needed to be used on the system as input data. The steps used in data collection are Using questionnaires, interviews, literature studies to find out previous research.

d. System Analysis
   In this stage the researcher performs the analysis of the system that is identifying and evaluating the problems, opportunities, constraints that occur and the expected needs, so as to fit the needs. The steps used in the analysis are system analysis, problem analysis, system architecture analysis, non-functional requirements analysis, and functional requirements analysis.

5. Planning System
   In this stage is finding the optimal form of application to be built with consideration of the factors problems and needs that exist in the system as has been determined by combining the use of appropriate hardware and software technology so that obtained the optimal and easy to implement. The steps in system planning are designing relation schemes, table structures, menus, interfaces, and error messages.

6. Building System
   In this stage is to build a system based on the results of analysis and system design so that the system built will be in accordance with the needs of the results of analysis and system design.
7. Testing System
   In this stage the software testing process is performed to ensure that all statements are tested as well as to uncover errors and ensure that defining inputs will provide output in accordance with the required results.

8. Withdrawal Conclusion
   In this stage is the last stage where will be drawing conclusions on the system that has been built. From these conclusions will be assessed whether the system built is in accordance with the original purpose of research or not.

3. System Design

3.1. System Overview
   To make it works these components are necessary; Android smartphone, a server with web services and database server. First of all, application needs to be installed on Android smartphone. Users can access information on the server by making request to web services using application installed. Furthermore, web services will provide the information requested by client in the form of JSON response. JSON response reprocessed into user friendly information for the user.

![Figure 1. Block Diagram of System](image1.png)

3.2. System Analysis and Planning
   With the use of GPS technology it is possible to provide real time location of device even with room-level accuracy like research by Yohan Chon [7]. It is useful if we are going to build a system with location features, but in this research will not talking about accuracy since we can tolerate it in region-level accuracy. The system to be built involves two important things. The first is getting the latest location data from the user. And the second thing is displaying it back as visitor data over a place based on location within specific radius.

![Figure 2. The Concept Of The System To Be Built](image2.png)
a. Updating Current Location
Location sharing features are used in this study to generate user location data. This data is used to support the research because with the existence of this data then the system can produce information based on the closest coordinates. Just like research which done by Bagreecha Komal [8], a system can be built to provide facilities for users when user is newer to any place through the application named places directory. We actually could implement this as visitor log data in the future.

b. Selection of proper destination
The system will assist the user in selecting the destination by displaying the destination profile along with the closest visitor data on the current day. this is possible by calculating the radius of the location between the destination and the previously received visitor data. So the system will download all data today first, then calculated whether each data is near the destination or not.

3.3. Use Case Diagram
Use case diagram of monitoring system consists of 8 use cases that is create an account, help signing in, login, logout, edit profile, find destination, and share my location. The use case diagram can be seen in Figure 3 below.

![Use Case Diagram](image)

Figure 3. Use Case Diagram

4. Results And Discussion

4.1. Hardware Implementation
The hardware used to test the application is as follows:

<table>
<thead>
<tr>
<th>No.</th>
<th>Hardware</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Processor</td>
<td>Quad-core with 1.2 GHz speed</td>
</tr>
<tr>
<td>2</td>
<td>RAM</td>
<td>3GB</td>
</tr>
<tr>
<td>3</td>
<td>Layar</td>
<td>5 inch</td>
</tr>
<tr>
<td>4</td>
<td>Storage</td>
<td>40MB</td>
</tr>
<tr>
<td>5</td>
<td>Kamera</td>
<td>16MP &amp; 3.7MP</td>
</tr>
</tbody>
</table>

4.2. Software Implementation
The software used to test the application is as follows:
Table 3. Software Implementation Testers

<table>
<thead>
<tr>
<th>No.</th>
<th>Software</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Computer Operating System</td>
<td>Windows 8.1 Pro</td>
</tr>
<tr>
<td>2</td>
<td>Android Studio</td>
<td>Versi 2.3.2</td>
</tr>
<tr>
<td>3</td>
<td>Android SDK</td>
<td>Level 22 and above</td>
</tr>
<tr>
<td>4</td>
<td>Programming language</td>
<td>Java, PHP, JSON</td>
</tr>
<tr>
<td>5</td>
<td>Database</td>
<td>MySQL</td>
</tr>
<tr>
<td>6</td>
<td>Operating system</td>
<td>Android Lollipop 5.1</td>
</tr>
<tr>
<td></td>
<td>Smartphone</td>
<td>(API Level 22) and above</td>
</tr>
</tbody>
</table>

4.3. Screenshot Program
Here is an example of screenshot program. The figure 4 describes that user is sharing their location.

![Figure 4. Screenshot Program](image1.png)

Locations will be used for displaying statistic visits of a destination like the figure below.

![Figure 5. Screenshot Program](image2.png)
This application enables users to find destinations that are frequented based on starting position determined on the map in a certain radius and it is based on data supplied by application.

4.4. System Testing

Testing is done in order to find errors and deficiencies in the software being tested. With the testing we can know whether the software is made already meet the criteria in accordance with the purpose of software design. Testing is done by black box testing techniques that focus more on finding functional fault program.

Black box testing is performed for create an account, help signing in, login, logout, edit profile, find destination, and share my location. The results can be seen in below table.

<table>
<thead>
<tr>
<th>No.</th>
<th>Test items</th>
<th>Testing Type</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Create an account</td>
<td>Black Box</td>
<td>Accepted</td>
</tr>
<tr>
<td>2</td>
<td>Help signing in</td>
<td>Black Box</td>
<td>Accepted</td>
</tr>
<tr>
<td>3</td>
<td>Login</td>
<td>Black Box</td>
<td>Accepted</td>
</tr>
<tr>
<td>4</td>
<td>Logout</td>
<td>Black Box</td>
<td>Accepted</td>
</tr>
<tr>
<td>5</td>
<td>Edit profile</td>
<td>Black Box</td>
<td>Accepted</td>
</tr>
<tr>
<td>6</td>
<td>Find destination</td>
<td>Black Box</td>
<td>Accepted</td>
</tr>
<tr>
<td>7</td>
<td>Share my location</td>
<td>Black Box</td>
<td>Accepted</td>
</tr>
</tbody>
</table>

5. Conclusion

Based on the results of research the following conclusion can be drawn, by using this application, users can display destination with visitor history per day. Selection of proper destination can be done with the statistic of visitor

References