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Android Based Restaurant Finder Application Using Location Based Service in Bali

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Abstract**—***As one of the famous tourism destinations in Indonesia, Bali certainly offers a complete range of culinary tours to realize the convenience of domestic and foreign tourists. That makes information about restaurants should be accessible and easily known by tourists. The problem faced by foreign and domestic tourists when visiting Bali is that many restaurants in Bali are not accompanied by information that the restaurant is a certified halal restaurant by the Indonesian Religious Leader and non-halal from the food menu provided by the owner or manager of the restaurant and media information about restaurant location. Based on that problem, then the researcher made the Restaurant Finder Application using Location Based Service in Bali with Android-Based. Using the Google Maps API to create Map Fragments and activate the Places API to determine locations, Maps Javascript API and Maps SDK for Android. The programming languages used are Java and XML on the mobile side and using PHP and HTML for the admin side. Based on the results of the trial using the black box method and questionnaire, the application runs very well on three smartphones and based on the user acceptance test distributed to 30 respondents which are divided into three groups, producing that in terms of the application interface, function and convenience of the application shows in range very good.*

Keywords**—** *Location Based Service, Restaurants, Android, Google Maps API, Global Positioning System, Android Studio, Bali, System Development Life Cycle.*

I. INTRODUCTION

Tourism is currently the main economic booster in Bali. Bali Provincial Statistics Agency noted that foreign tourist arrivals to Bali in 2017 reached 5.7 million and the growth of visits increased by 15.62% compared to the same period from previous year [1]. As one of the tourism destinations with a majority non-Muslim population, Bali Province certainly offers a complete range of halal culinary tours to realize the convenience of travel for Muslim and also for non-Muslim tourists.

The Province of Bali in 2017 was recorded by Bali Provincial Statistics Agency owning 2,251 restaurants spread in all districts in Bali [2]. Information about halal or non-halal restaurants should be accessible and easily known by foreign and domestic tourists. A restaurant is a business that sells dishes to the public and provides a place to eat these dishes by determining certain rates [3].

The problem faced by foreign and domestic tourists when visiting Bali is many restaurants in Province of Bali are not accompanied by media information on the location of restaurants. It's makes foreign and domestic tourists who travel to Bali sometimes need a lot of time just to find one of the existing restaurant locations especially for foreign or domestic Muslim tourist. They mostly cannot know which restaurants served a halal menu and which restaurants are not because of limited information about halal or non-halal restaurant. For this reason, we need a media that can provide information on the location of restaurants in the Province of Bali. This research is intended to answer these problems.

This research is a restaurant finder application which is separated by halal or non-halal information in Bali Province based on Geographic Information System (GIS) and using Location Based Service (LBS). GIS is a computer-based information system for storing, managing and analyzing, and invoking geographic reference data that has developed rapidly in the last five years [4] which aims to simplify the process of finding a restaurant through media mapping.

Android is used as a basis for this information system, because Android has been known as one of the open source operating systems where developers are free to develop various applications according to their own wishes. In addition, the reason why this geographic information system is built on Android is more to prioritize aspects of the high level of mobility that each android application has [5] In this study, researchers used the Location Based Service (LBS) method, a service that provides information based on place, refers to GIS or electronic map which is indicated by latitude and longitude to get an accurate location point [6].

With this Location Based Service Restaurant Finder Application in Bali with Android-Based, it is expected to help and facilitate the foreign and domestic tourists while visiting the Province of Bali to look the location of the halal or non-halal restaurants. Halal or non-halal restaurants will be seen in this application easily by the tourist. This application is also expected to improve the performance of a restaurant owner group so it can be more effective, efficient and easy to promote the restaurant to other people who looking for restaurant.

II. LITERATURE REVIEW

A. Bali Island

Bali and tourism cannot be separated. As a major tourist destination, the wealth and beauty of nature, as well as the uniqueness of its cultural arts are the main attraction. Bali is not only famous in the country but also abroad. Bali has the nickname of the island of the gods because it has special characteristics that are influenced by Hinduism. Therefore, the tourism sector is a mainstay not only by the Provincial Government of Bali, but also many people in the community expect from this Services sector. Factors that cause Bali as a

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mainstay tourist destination in Indonesia, because it has a specificity on tourist objects, both natural attractions, cultural tourism and culinary tourism [7].

B. Restaurant

A restaurant is an effort to provide food and beverage Services equipped with equipment for the process of making, storing and serving in a fixed place that is not moving in order to obtain profits [8]. Restaurant is a place where someone comes to be a guest who will get Services to enjoy food, whether morning, afternoon or evening according to the hour and by guests who enjoy the meal must pay according to price determined according to the list provided in the restaurant. From some definitions, can be concluded that a restaurant is a place of business that serves guests who come with a scope of activities to provide food and beverages that are commercial in nature [9].

C. Geographic Information System (GIS)

Geographic Information System is a computer-based system used to store and manipulate geographic information. GIS is designed to collect, store, and analyze objects and phenomena where geographic locations are important or critical characteristics to analyze. Thus, GIS is a computer system that has the following four capabilities in handling data that refers to geography: input, data management (data storage and calling), data analysis and manipulation, output [10].

D. Location Based Service (LBS)

One of the characteristics of a mobile phone or tablet pc is portability, so it's not surprising that some Android features are very interesting such as Servicess that allow you to find, search and visualize your position on physical location maps like GoogleMaps. We can make maps based on GoogleMaps and make them as elements in the User Interface (UI) layout that we design. We can make full access to GoogleMaps maps, and allow us to control display settings, change the zoom view location, and move the display location. Location Based Service is a Services that functions to search with Global Positioning Services (GPS) technology and Google's cell-based location. Map and location-based Servicess use latitude and longitude to determine geographic location, but as a user we need our realtime address or position not the value of latitude and longitude. Android provides a geocoder that supports forward and reverse geocoding. Using a geocoder, you can convert latitude values into real world addresses or vice versa. Location Based Service is a general term used to describe the technology used to find the location of the device we are using [11].

E. System Development Life Cycle (SDLC)

System Development Life Cycle method or often abbreviated as SDLC is development that functions as a mechanism to identify software. The development of computer-based information systems can be a complex task that requires a lot of resources and can be time consuming to solve. The system development process goes through several stages from the start of the system until the system is implemented, operated, and maintained. The cycle of system development is a form that is used to describe the main stages and steps in these stages in the development process. The stages in system development are called the System Development Life Cycle because at each stage of the system it will be carried out in descending order from planning, analysis, design, implementation and maintenance [12].

F. Android

Android is a Linux-based mobile operating system that includes operating systems and applications. Some other meanings of Android is an open or open source platform for developers or programmers to create applications, is an operating system purchased by Google Inc. from Android Inc. And is not a programming language but only provides a run time environment called DVM (Dalvik virtual machine) which has been optimized for devices / devices with a small memory system [13].

G. Unified Modeling Language (UML)

UML (Unified Modeling Language) is a modeling language for systems or object oriented software. The purpose of UML is to provide modeling languages that are free from various programming languages and engineering processes, bringing together the best practices contained in modeling and providing models that are ready to use , that expressive visual modeling for developing and exchanging models is easy and generally understood [14].

H. Black Box Testing

Black Box Testing focuses on functional specifications of the software. The tester can define a collection of input conditions and test the program's functional specifications. Black Box Testing is not an alternative solution to White Box Testing, but rather a complement to testing things that White Box Testing does not cover. Black Box Testing tends to find the following [15].

III. Research Method

The method used in this research is the system development life cycle (SDLC) which is described by use case diagrams, class diagrams and trial stage as shown below.

A. Use Case Diagram

Use case diagram is a model for information system behaviour that will be made. The use case is used to find out what functions are in the information system and who has the right to use these functions [16]. This Figure 1 is the use case diagram of this application.

The use case above is used to find out what functions are in the information system and who has the right to use this function.

B. Class Diagram

Class Diagram is a relationship between classes and a detailed explanation of each class in the design model of a system, also shows the rules and responsibilities of entities that determine system behaviour. The class diagram oh this research shown as Figure 2 as below.

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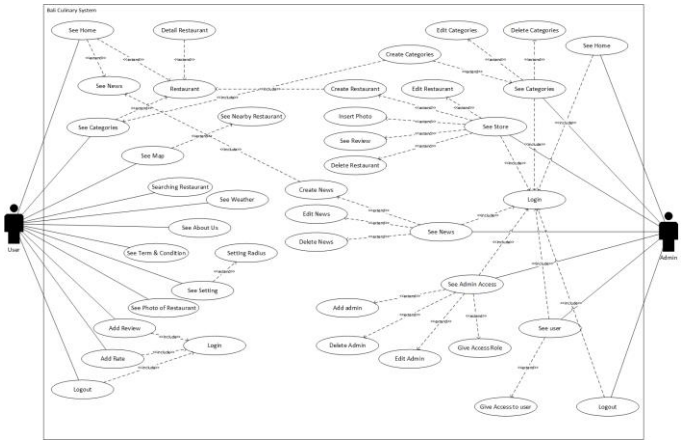

Fig. 1. Use Case Diagram

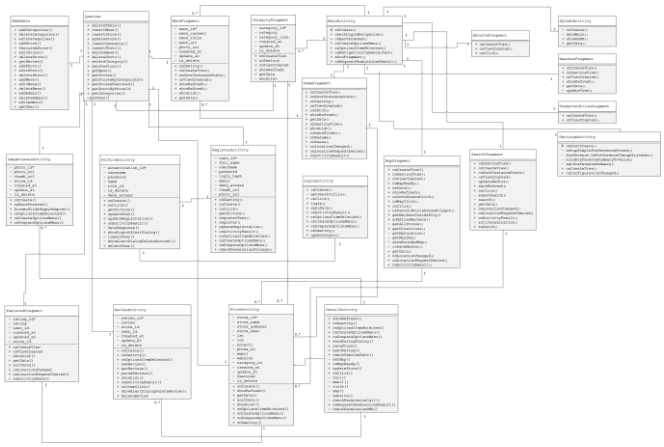
Fig. 2. Class Diagram

Class Diagrams also show the attributes and operations of a class and constraint related to the object being connected. Class diagrams typically include: Class (Class), Relationship Associations, Generalitation and Aggregation, attributes (Attributes), operations (operations / methods) and visibility, the level of access of external objects to an operation or attribute. Inter-class relations have information called Multiplicity or Cardinality

C. *Trial Stage*

In this trial stage, the application will be tested on the Android operating system which has an Ice Cream Sandwich (version 4) minimum version. The minimum specifications needed to run a restaurant location search application are 850 MHz processor, 1 GB RAM capacity (Random Access Memory), has a minimum data network / internet connection EDGE (Enhanced Data for Global Evolution) and has an active GPS (Global Positioning System) system.

IV. RESULT AND DISCUSSION

The result of this research is a mobile application which contain of application implementation in mobile side and web admin side. The application testing also discuss in this chapter using black box testing and Questionnaire Testing Result.

A. *Application Implementation*

Application implementation phase is the final stage to display applications that have been completed using the Xiaomi Redmi Note 3 smartphone on the Android 9 operating system (Pie) by clicking run 'app' on the run menu in Android Studio, after that the application gradle will load to process the application. If the gradle of the application has finished loading, then the result is the application will be installed on an Android device which has already connected and ready to do the process in the form of displaying the results of the applications that have been made. The application implementation in this research is contain of two side which is mobile side used for the user who looking for the restaurants and web admin side used for the admin to input and verify the restaurant that will be shown in mobile side.

1. Mobile Side

   In mobile side, contains of four main page as follows:

   a. Home page implementation

   Home page contain Restaurant and News list which can see by user after SplashScreen page shown in Figure 3 below.

Fig. 3. Home Page Implementation

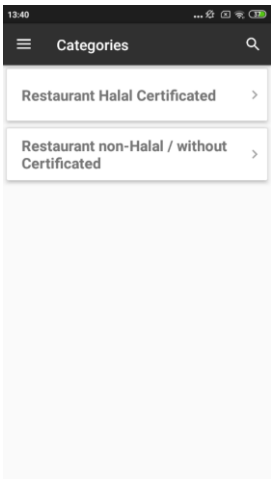

Fig. 4. Categories Page Implementation

   b. Categories page implementation

   In this application there are two categories, there are

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Restaurant Halal Certificated which is restaurant that serve halal food and have certificate from MUI, The second categories is Restaurant non Halal or without certification, which mean the restaurant serve non halal food or maybe serve halal food but did not have certification from the MUI. This page shown in Figure 4.

c. Map page implementation

There are three features in Map page which are draw map, nearby restaurant and route to the restaurant. Users can easily find the nearest restaurant according to their location when searching for restaurants. Restaurant search distance can be set in the settings menu. This page shown in Figure 5 below.

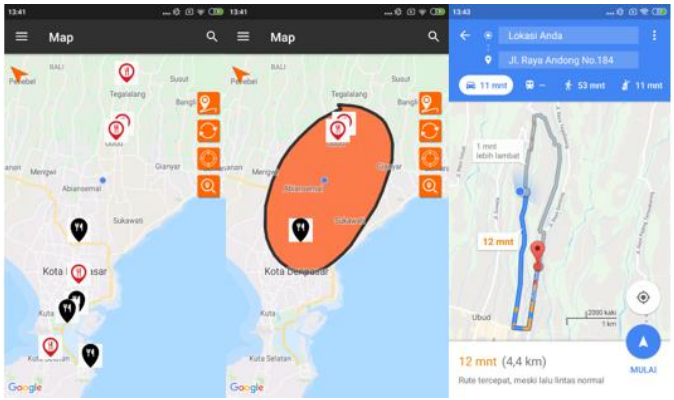

Fig. 5. Map Page Implementation

d. News page implementation

News page is used to see the news that admin input in web admin. This page provides information about restaurant news in Bali. News published about new food and restaurants that have just opened. This page shown in Figure 6 below.

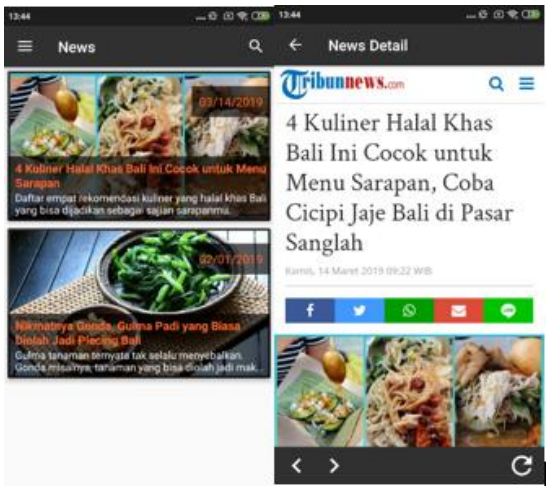

Fig. 6. News Page Implementation

2. Web Admin Side

In web admin side, contains of four page as follows:

a. Home page

This page is used to show the restaurant that admin input. On this page the data displayed is the restaurant name and restaurant address. All data input will appear through the android application. This page shown in Figure 7 below.

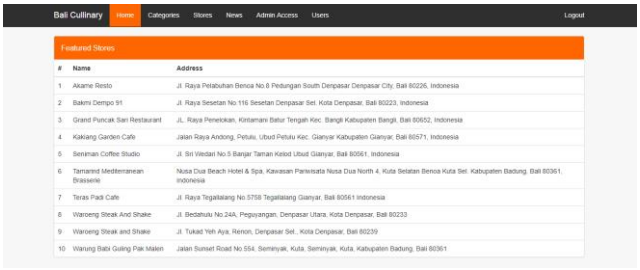

Fig. 7. Admin Home Page

b. Categories page

This page is used to add, delete, edit the categories that admin input. Before entering restaurant data, first create a restaurant category namely the Restaurant Halal Certificated and Restaurant Non-Halal/without Certificated. This page shown in Figure 8 below.

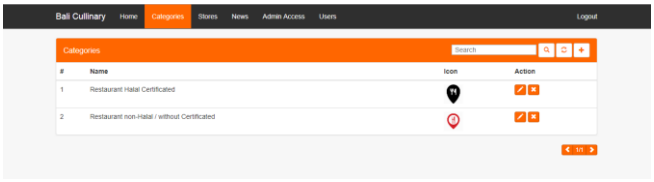

Fig. 8. Admin Categories Page

c. Store page

This page is used to add, delete, edit the restaurant that admin input. Restaurant data that has been entered into the system will appear on the Android mobile application. The data must be entered in the form of restaurant name, address, photo, rating and featured. This page shown in Figure 9 below.

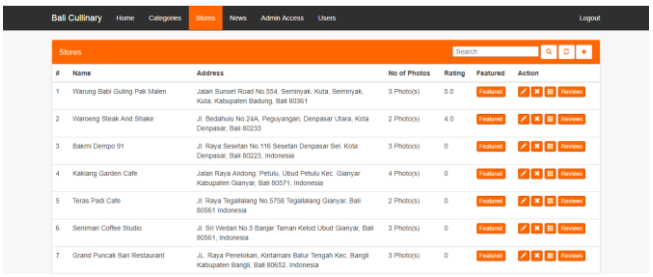

Fig. 9. Admin Store Page

d. News page

This page is used to add, delete, edit the news that admin input. News data that has been entered into the system will appear on the Android mobile application. data that must be entered in the form of news headlines, content, category and the date the news was published. This page shown in Figure 10 below.

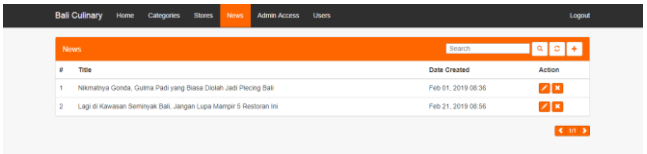

Fig. 10. Admin News Page

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B. Application Testing

In this application testing discuss about the testing of this application using black bos testing and questionnaire testing result describe as follows:

1. Black Box Testing

The test carried out with the black box method contains a series of testing functions, menus and buttons from the application. This test is carried out to three different smartphones to find out whether the application can run properly when run on a smartphone that has RAM, an android version and a different screen resolution. This application is tested on Xiaomi Redmi Note 3 which has Android Version 9 (Pie), 3 GB RAM and a screen resolution of 6 "(inches), on Vivo 1612 V5s with Android version 7.0 (Nougat), 4 GB RAM and a screen resolution of 5.5"(inches) and on Samsung Galaxy Note 8 smartphone with version Android 7.0 (Nougat), 6 GB RAM and a screen resolution of 6.3"(inches). The result of this BlackBox testing is all function, menus and buttons on this application are work properly.

2. Questionnaire Testing Result

On the results of the trial in the form of a questionnaire distributed to 30 respondents with 10 questions, this test was conducted to find out the benefits, functions and uses of this application. The choice of answers given is 5 based on a Likert Scale namely Strong Approve, Approve, Undecided, Disapprove, Strongly Disapprove. The results of the questionnaire trials can be seen in Table I below.

TABLE I. Questionnaire Testing Result

No	Question	Answer				
		SA	A	U	D	SD
Interface						
1	The overall look of the Bali Culinary application is interesting	17	13	-	-	-
2	The color on the Bali Culinary application is interesting	5	19	6	-	-
3	Display according to the smartphone screen	24	6	-	-	-
Function						
4	The Bali Culinary application is able to present restaurant recommendations quickly	22	5	3	-	-
5	The menu choices on Bali Culinary application are easy to understand	9	19	2	-	-
6	With the feature of telephone, sms, website, and email, it can help users to communicate with restaurants. (For booking places, etc.)	24	6	-	-	-
Convenience						
7	The Bali Culinary application is user-friendly	17	11	2	-	-
8	The Bali Culinary application is useful and helps users in choosing restaurants located in Bali	23	7	-	-	-
9	The language used is easy to understood by the user	22	6	2	-	-
10	The Bali Culinary application is able to save time in determining restaurant choices	20	10	-	-	-

Questions are made in general that are related to the interface, function and convenience of the application so that all parties involved in this evaluation can understand in giving an assessment. The following is the display of the results of the questionnaire answers in the form of a graph can be seen in Figure 11 below.

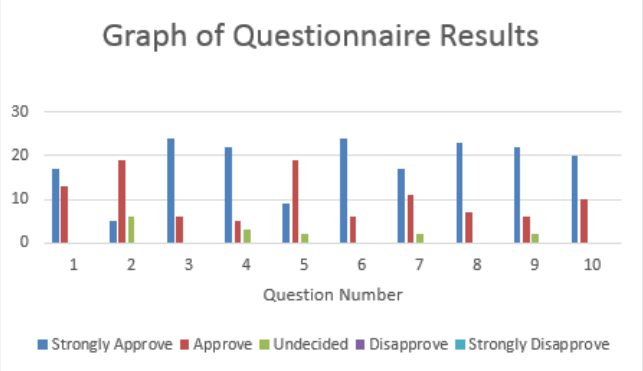

Fig. 11. Graph of questionnaire results

The next step is to calculate the results of the questionnaire conducted on 30 respondents and decided to 3 groups, there are Interface, Function and Convenience. the assessment for each question depends on the number of the answer choices used in the questionnaire with the Likert scale method. The answers provided are five choices with a rating weight of 5 for Strongly Approve, 4 for Approve, 3 for Undecided, 2 for Disapprove and 1 for Strongly Disapprove. Can be seen in table II, III and IV about the results of questionnaire evaluations.

TABLE II. Questionnaire evaluation results for Interface group

Result			
Scale	**Weight**	**Summary**	**Score**
Strongly Approve	5	46	230
Approve	4	38	152
Undecided	3	6	18
Disapprove	2	0	0
Strongly Disapprove	1	0	0
Total		90	400

After calculating each of the assessment weights, the total score is obtained. This total score is used to calculate the conclusions of the respondents' assessment of the Bali Culinary application. The following are the results of the calculation for Interface group:

Maximal Score = Total summary x Highest weight
= 90 x 5 = 450
Respondents Ass. = (Total Score/Maximal Score) x 100%
= (400 / 450) x 100%
= 88,9 % (Very Interesting Interface)

TABLE III. Questionnaire evaluation results for Function group

Result			
Scale	**Weight**	**Summary**	**Score**
Strongly Approve	5	55	275
Approve	4	30	120
Undecided	3	5	15
Disapprove	2	0	0
Strongly Disapprove	1	0	0
Total		90	410

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The following are the results of the calculation for Function group:

Maximal Score = Total summary x Highest weight
= 90 x 5 = 450
Respondents Ass. = (Total Score / Maximal Score) x 100%
= (410 / 450) x 100%
= 91,1 % (Functioning Very Well)

TABLE IV. Questionnaire evaluation results for Convenience group

Result			
Scale	**Weight**	**Summary**	**Score**
Strongly Approve	5	82	410
Approve	4	34	136
Undecided	3	4	12
Disapprove	2	0	0
Strongly Disapprove	1	0	0
Total		120	558

The following are the results of the calculation for Function group:

Maximal Score = Total summary x Highest weight
= 120 x 5 = 600
Respondents Ass. = (Total Score / Maximal Score) x 100%
= (558 /600) x 100%
= 93 % (Very Convenient)

V. CONCLUSION AND SUGESSTION

A. Conclusion

Based on the results of testing the application using the black box testing method and questionnaire, it was found that all menu functions in the Bali Culinary application had succeeded in accordance with their functions. Based on the results of the questionnaire test distributed to 30 respondents who were divided into three groups, it resulted that in terms of the application interface shows the application interface is very interesting, in terms of application functions indicate the application is functioning properly and in terms of ease of application shows that the application is very convenient. It can be concluded that the Restaurant Finder Application Using Location-Based Service in Bali with Android-Based has been successfully created and runs as expected. This application has been tested on three Android devices that have different RAM capacities, screen resolutions and operating systems and show this application work properly. This application is expected to help domestic and international tourists in finding the nearest restaurant with Halal or non-Halal label, information about the restaurant and the distance from the user to the restaurant in Bali.

B. Sugesstion

There are several things that can be developed in this application to make this application more interesting, for example, to make settings in the Indonesian language so that tourists who do not understand English can also use this application. The second suggestion is developed to integrate existing data and information from supporting applications. The third suggestion is can be accessed with the iOS operating system so that users who use smartphones with iOS operating systems can use this application properly.

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