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Nearest Service Search System Based On Android

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Abstract

The national financial industry utilizes technological developments to expand public access to services in financial inclusion as a form of economic development in Indonesia. Financial inclusion is an effort to encourage the public to have access to the financial system. however, in expanding financial inclusion, there are obstacles to the community and banking financial institutions. Community constraints include the lack of a bank around the place of residence, the long distance to the nearest branch office, and a lack of understanding of financial management, while the constraint on financial institutions is the limited banking services to the public in all corners. Based on these problems, it is necessary to use infrastructure and access to technology to obtain service information without an office with the location of the user and the nearest route that can be aimed at. This research will build an android-based SIPANDAI application with the application of the Spherical Law Of Cosines (SLOC) method. SLOC is a method for searching distances from one location to another that is a derivative of Spherical Trigonometry in apps for solving problems related to finding the shortest distance. Based on the research results, the application of the SLOC method has a distance tolerance of 0 - 10 meters if compared to Google maps Distance measurement.

Keywords : Android,financial inclusion, SLOC, Spherical Trigonometri

Introduction

The development of an economy in Indonesia, the Service Authority Finance (OJK), the national financial industry utilizes technological developments to expand public access to services in developing financial inclusion. Financial inclusion is a concept that results from the influence of globalization on the banking world, namely an effort to encourage the financial system to be accessible to all levels of society [1].

Constraints faced in expanding financial inclusionIn general, it can be grouped into two, namely the obstacles facedsociety and banking financial institutions. For the community, the obstacles they face are the absence of a bank in the vicinity of their residence or it takes a long time to get to the nearest branch office, as well as the level of understanding of financial management that is still lacking [2].

The obstacles faced by banking financial institutions include limited banking services to the public in all corners. This is marked by the limited infrastructure due to the natural conditions of Indonesia, which is an archipelago. The calculation of the economic scale of bank operations in an area is an important factor, as illustrated by the small number of indicators for banking services such as branch offices and ATMs for every 1000 km of area. On the other hand, to increase the network of offices in remote areas, banks are faced with the problem of relatively expensive establishment costs [2].

The Financial Services Authority at the end of 2014 launched a regulation on Officeless Financial Services in the Context of Financial Inclusion, namely the Laku Pandai Service or Branchless Banking. In detail, namely the activity of providing officeless services where the bank performs other services through cooperation with other parties (bank agents), and is supported by the use of information technology facilities [3].

Based on what has been said above, in particular the use of infrastructure and access to technology to get information on the list of services without an office with the location of the user and the closest route to go, it is necessary to have an application that can make it easier for the wider community to access information about the search for these smart behavior services. This research will build an application called SIPANDAI which is based on Android. The choice of Android-based technology is because every user who uses Android applications will find it easy to access information provided by financial institutions. Because, Android applications can be accessed using a variety of smart phone devices [4].

This application requires an internet network to access the data, uses the JavaScript programming language with the React Native library, and the Js leaflet as the basis for the map layer technology. And in its

application, this application uses the Spherical Law of Cosines method which is useful for calculating distances so that the closest intelligent behavior service is obtained based on location.
To search the distance from one location to another, there is a formula that can be used as a solution. the formula is the Spherical Law of Cosines which is a derivative of Spherical Trigonometry. Spherical Trigonometry is a curved triangle on the earth's surface that can be applied to the realm of geography, geodesy, and astronomy (Sperry, 1928).
(Sperry, 1928) In applications in the field of geography, this method is very useful in the problem of finding the shortest distance for shipping activities. The search for the shortest distance is explained by illustrating a curved triangle, one side of which is the distance sought.
Research with similar topics has been previously developed including the Application of Route Finding and the Location of the Nearest ATM Using the Haversine Formula Equipped with an Android-Based Bank Call Center [5]. and Application of Spherical Law of Conises in Mobile Web-Based Tourism Object Selection Application [6]. Compared to previous research, this research has differences, namely the use of React Native which is a Javascript library as a programming language and JS leaflet technology as the basis for displaying map layers, as well as the Spherical Law of Cosines method where the technology is a new technology that is useful for searching by location. on this Android-based SIPANDAI application. With the construction of this application, it is hoped that it can improve the development of financial services and is also expected to facilitate the wider community in finding smart behavior services to conduct transactions at the nearest place.

Methodology

The waterfall method in Figure 1 is implemented in the service search research of smart behavior. The research stages include data collection, analysis, design, coding, and testing.
Data collection
Field observation is one of the processes from the data collection stage which is carried out based on data that has been obtained from the financial authorities. Observations were carried out to ensure and obtain location data, profiles of smart behavior services and provide coordinate points for each smart behavior service. Observation data can be seen in Table 1.

Table 1. Results of Observational Data Collection.

No	Nama Agen laku pandai	Latitute	Longitude	Alamat
1	Ardana Laku Pandai	6.591738281207202	106.6852264772263 7	Cibuntu, Kec.Ciampea, Kabupaten Bogor, Jawa Barat
2	Ike Selviany	-6.56458	106.70263	Perum bukit asri blok a 8 no 11, Kabupaten Bogor, Jawa Barat
3	Yani Sari	-6.585723	106.732151	Dramaga pasar Bogor, Kabupaten Bogor, Jawa Barat
4	Ms. Dinda Alamsari Johan	-6.566727	106.732775	Dramaga setu leutik, Kabupaten Bogor, Jawa Barat
5	Mr. Ahmad Jamaludin	-6.57815	106.68514	Kp Setu Bogor Jawa Barat, Kabupaten Bogor, Jawa Barat

Analysis Method (Requirement Definition)

The analysis phase is the process of defining system requirements to be built such as analysis of the current system, proposed system, functional requirements, non-functional requirements, user requirements, system architecture analysis and analysis of the use of the Spherical Law Of Cosines formula.

Design Method (System and Software Design)
The system design process is designed using Object Oriented Programming (OOP) by drawing UML diagrams and designing interfaces for financial service facility search applications.
Coding (Implementation And Unit Testing)
At the coding stage, the Spherical Law of Consine method is implemented into a language recognized by the computer. In this study, the program code uses the JavaScript programming language and the React Native library.
Testing (Integration and System Testing)
After the coding stage, the system testing stage is carried out by testing the function of each menu that has been created in the application with the Black Box testing method.

Result
At the stage of analysis of the proposed system is an overview of the system that will be made and useful so that system design can be directed to the main functions of the system requirements.
System Architecture Analysis
Based on the results of system analysis, the client-server model can be used as a suitable model to be implemented in system development. With one process, namely the client (Smart behavior search system) which sends and requests JSON data from the web service on the server. This application also uses the Leaflet JS API as part of the base layer map.
To make changes and retrieve data in the database, the application will communicate with the JSON String from the user's web service API which is available on the system database for data processing. The location will be displayed with Leaflet JS when the distance has been obtained based on the Spherical Law of Cosine formula, which is used to determine the search distance for smart behavior.

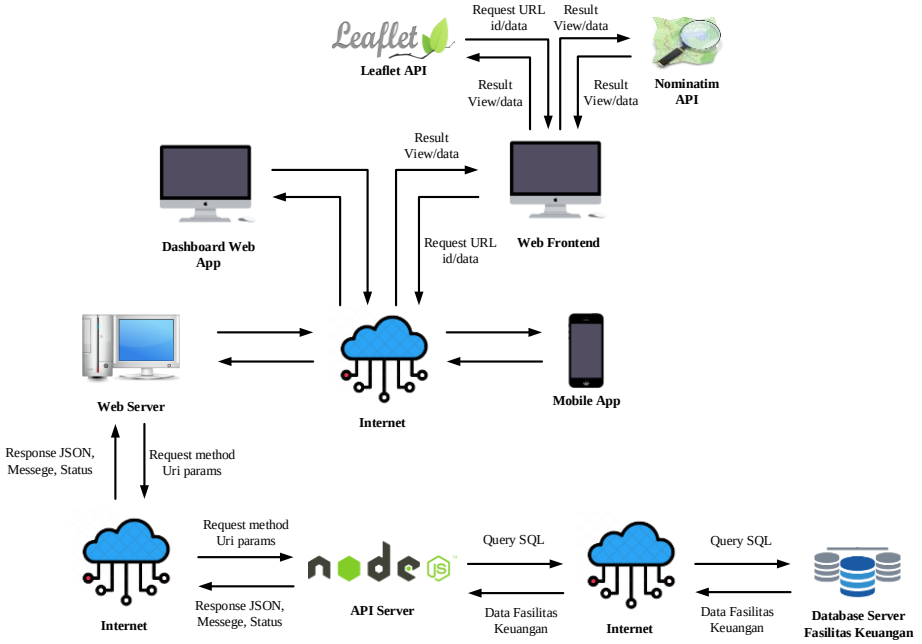

Figure1. Architecture System

Spherical Law Of Conises (SLOC) Analysis
To calculate the user's distance from the intended smart behavior service, the application uses the SLOC formula analysis, by drawing a straight line from two coordinate points for the distance measured by the SLOC formula regardless of the terrain being traveled. In this study, the SLOC formula was tested on 10 samples of smart behavior service point data by assuming the location of the Al Hidayah Mosque, Jalan Cibadak-Ciampea, Benteng, West Java, 16620, on the map as the user's coordinate point with latitude -6.5566706 and longitude 106.7046297. The distance between the user's location and the smart behavior service will then be calculated using the following steps of the SLOC method:

Determine the Coordinates of the Origin Location (Start Place Coordinate) and the Destination Place Coordinate (Destination Place Coordinate).
The first stage is to determine the origin location which is denoted by latitude (φ_1) and longitude (λ_1). The location coordinates are assumed to be:

$$\varphi_1 : -6.5566706$$
$$\lambda_1 : 106.7046297$$

The second stage determines the coordinates of the destination location, namely the coordinates of Ike Selviany (ATM) Perum Bukit Asri services, Blok A8 no 11. It is denoted by latitude (φ_2) and longitude (λ_2) which have the following coordinates:

$$\varphi_2 : -6.56458$$
$$\lambda_2 : 106.70263$$

Performing the calculation of the distance between the origin and destination location with the SLOC formula formula
After the coordinate values of the origin and destination locations are determined, the next step is to calculate the radian value of each coordinate. The static earth radius value variable in the SLOC Formula is denoted as R with a value of 0.90KM or 90M. as follows :

$$\varphi_1 : Radians\ (-6.5566706) = -0.1144355$$
$$\lambda_1 : Radians\ (106.7046297) = 1.8623471$$
$$\varphi_2 : Radians\ (-6.56458) = -0.1145735$$
$$\lambda_2 : Radians\ (106.70263) = 1.8623122$$

Calculation of the radian value of each coordinate will be entered into the SLOC formula with calculations based on the coordinates that have been determined by the following formula:

$$d = \mathbf{R}\ .\ \mathbf{Acos}(\ \mathbf{Cos}(\varphi_1).\mathbf{Cos}(\varphi_2)\ .\mathbf{Cos}(\ (\lambda_2) - (\lambda_1)) + Sin(\varphi_1).\mathbf{Sin}(\varphi_2)\ ) \quad (1)$$

The following are the results of calculations based on known coordinates:

$$d = 6371\ .Acos(Cos(-0.1144355).Cos(-0.1145735).Cos\big((1.8623122\ ) - (1.8623471)\big).Sin(-0.1144355).Sin(-0.1145735))$$
$$d = 0.907\ Km$$

Assuming the same origin coordinates, namely latitude -6.5566706 and longitude 106.7046297 indicate the location of the Al Hidayah Mosque, Jalan Cibadak-Ciampea, Benteng, West Java, 16620. The following is shown in Table 2 some of the results of the analysis of distance calculations using the SLOC formula.

Table 2. Analysis of Distance Calculation of SLOC . formula

No	Nama Jasa	Latitude, Longitude	Sin (φ_1)	Cos(φ_1)	Sin(φ_2)	Cos(φ_1)	$Cos(\lambda 2 - \lambda 1)$	$d(m)$
1	Ardana Laku Pandai	6.591738281207202, 106.68522647722637	-0.1141859	-0.2874379	0.1147939	-0.2871135	0.9999999	**1462.038**
2	Ike Selviany	-6.56458, 106.70263	-0.1141859	-0.2874379	-0.114323	-0.2874045	1	**0.907**
3	Yani Sari	-6.585723, 106.732151	-0.1141859	-0.2874379	-0.1146896	-0.2878979	0.9999999	**4.436**
4	Mrs Dinda	-6.566727,	-0.1141859	-0.2874379	-0.1143603	-0.2879084	0.9999999	**3.3**

	Alamsari Johan	106.732775						**04**
5	Mr Ahmad Jamaludin	-6.57815, 106.68514	-0.1141859	-0.2874379	-0.1145583	-0.2871121	0.9999999	**3.216**

To compare the accuracy of the tolerance distance, the results of the calculation of the SLOC formula are compared with calculations using Google maps Distance measurement. This analysis produces an error tolerance of distance calculation of about 0-10 meters. Measurements with the Google Maps application use distance measurement tools by marking two coordinate points that will be calculated the distance. An example of Google Maps Distance Measurement used to measure the coordinate distance of the sample data of Perum Bukit Asri Block a8 No 11 and the location of service seekers can be seen in Figure 2. And the results of the comparison of distance measurements can be seen in Table 3.

Figure 2. Distance measurement Google Maps Distance Mesurement.

Table 3. Comparison of distance measurements

No	Name	Address	Latitude	Longitude	Formula SLOC (M)	G-Maps Distance Measurement (M)
1	Ardana Laku Pandai	Cibuntu, Kec.Ciampea, Kabupaten Bogor, Jawa Barat	-0.1141859	-0.2874379	**1462.038**	**1462.038**
2	Ike Selviany	Perum bukit asri blok a 8 no 11, Kabupaten Bogor, Jawa Barat	-0.1141859	-0.2874379	**0.907**	**0.907**
3	Yani Sari	Dramaga pasar Bogor, Kabupaten Bogor, Jawa Barat	-0.1141859	-0.2874379	**4.436**	**4.436**
4	Mrs Dinda Alamsari Johan	Dramaga setu leutik, Kabupaten Bogor, Jawa Barat	-0.1141859	-0.2874379	**3.304**	**3.304**
5	Mr Ahmad Jamaludin	Kp Setu Bogor Jawa Barat, Kabupaten Bogor, Jawa Barat	-0.1141859	-0.2874379	**3.216**	**3.216**

Integration and System Testing

The testing phase of the implementation of the code on the system to check the functionality of the system as a whole by testing the validation results of the application output in response to a process sent by the user. Table 4 is the result of testing with the Blackbox method.

No	Test Name	Input Given	Condition	Expected Output	Conclusion
1	Login	Username, Passsword, Button Login	Server Not Connected and Input Complete	Login not successful	[√] Succeed [ ] Fail
			Connected Server and Complete Input	Login successful	[√] Succeed [ ] Fail
2	Logout	Button Logout	Server Not Connected and Input Complete	Logout didn't work	[√] Succeed [ ] Fail
			Connected Server and Complete Input	Login successful	[√] Succeed [ ] Fail
3	Search Filter Page	Button Sandwich (≡)	Server Not Connected and Input Complete	Smart service search filter page does not appear	[√] Succeed [ ] Fail
			Connected Server and Complete Input	Smart service search filter page appears	[√] Succeed [ ] Fail
4	Service Search good behavior	Service search criteria filter data good job, search button	Server Not Connected and Input Complete	Good behavior service does not appear	[√] Succeed [ ] Fail
			Connected Server and Complete Input	Clever behavior service appears	[√] Succeed [ ] Fail
5	Service details sell smart	Button Maker	Server Not Connected and Input Complete	Smart behavior service marker point does not appear	[√] Succeed [ ] Fail
			Connected Server and Complete Input	Displays smart behavior service marker points	[√] Succeed [ ] Fail
6	Service route sells smart	Button rute	Server Not Connected and Input Complete		[√] Succeed [ ] Fail
			Connected Server and Complete Input		[√] Succeed [ ] Fail
7	Add bookmarks good behavior service	Button Bookmark	Server Not Connected and Input Complete		[√] Succeed [ ] Fail
			Connected Server and Complete Input		[√] Succeed [ ] Fail
8	Manajemen Bookmark	Button Delete	Connected Server and Complete Input		[√] Succeed [ ] Fail
			Connected Server and Complete Input		[√] Succeed [ ] Fail

Conclusion

Based on the research on the web-based behavior search application, the conclusions that can be drawn are as follows: 1) by applying the SLOC method this application has the feature of knowing the user's distance to the smart behavior service location and determining the route of travel to the smart behavior service location. smart people around the user 2) the SLOC formula applies the distance measurement technique by drawing a straight line between the two coordinate points of this method regardless of the road access field being

traversed, when compared to Google Maps Distance measurement distance calculation tolerance with the SLOC formula of 0-10 Meters.

Refrence

[1] E. F. Nelwan, "Analisis Faktor-Faktor yang Mempengaruhi Minat Nasabah Menggunakan Layanan BNI New Internet Banking dengan Menggunakan Kerangka Model Penerimaan Teknologi (TAM) (Studi Empiris Terhadap Nasabah BNI Kantor Cabang Utama Manado)," Jurnal Riset Bisnis dan Manajemen, vol. 2, p. 26, 2014.

[2] H. Sarah, "Dampak Branchless Banking Terhadap Kinerja Keuangan PT Bank Muamalat Indonesia Tbk," Jurnal Al-Muzara'ah, p. 137.

[3] O. J. Keuangan, "POJK Nomor 19/POJK.03/2014," 19 vovember 2014. [Online]. Available: https://www.ojk.go.id/id/kanal/perbankan/regulasi/peraturan-ojk/Pages/9peraturan-otoritas-jasa-keuangan-tentang-layanan-keuangan-tanpa-kantor-dalam-rangka-keuangan-inklusif.aspx. [Accessed 2022].

[4] A. Muharam, Web developer LOGIQUE's Blog, 27 Juli 2018. [Online]. Available: https://www.logique.co.id/blog/2018/07/27/keunggulan-aplikasi-web/. [Accessed 16 Februari 2022].

[5] D. Darmawan, "Aplikasi Pencarian Rute dan Lokasi ATM Terdekat Menggunakan Formula Haversine Dilengkapi dengan Call Center Bank Berbasis," 2015.

[6] N. H. Agustin, "Penerapan Spherical Law Of Cosines Pada Aplikasi Pemiihan Objek Wisata Berbasis Mobile Web (Studi Kasus : Pariwisata Jawa Timur)," 2015.

[7] C. Site, "Metode Pengembangan Sistem SDLC (System Development Life Cycle)," Coding Site, 2 november 2014. [Online]. Available: http://coding-site.blogspot.com/2014/11/metode-pengembangan-sistem-sdlc-system.html. [Accessed Agustus 2022].

[8] H. F. S. H. A. I. Arif Rohman, "Sistem Pencarian Fasilitas Keuangan Terdekat Berbasis Web Dengan Metode Spherical Law Of Cosines (SLOC)," Jitter, vol. X, 2022.