International Journal of Allied Research in Engineering and Technology (IJARET)
Volume.13, Number 8; August-2022;
ISSN: 2836-5631| Impact Factor: 5.52
https://zapjournals.com/Journals/index.php/ijaret
Published By: Zendo Academic Publishing

SEAMLESSLY TOURING LHOKSEUMAWE CITY: ANDROID GIS FOR LOCATIONS AND LODGING

[1]D. Darwis, [2]A. Irawan, and [3]A. Surahman

Article Info

Keywords: Information technology, Android smartphones, Geographic Information System (GIS), Tourism Locations & Lodging Services

Abstract

The rapid growth and advancement of information technology have significantly impacted human activities, allowing access to a plethora of new information in cyberspace. Among the current technological developments, Android smartphones have emerged as a prominent platform, providing users with the ability to access various types of information anytime and anywhere. The Android operating system stands out due to its customizable nature, enabling users to tailor their applications according to individual preferences and leveraging an extensive repository of computer applications designed for Android smartphones. This study focuses on Lhokseumawe City, situated in the province of Aceh, Indonesia, which plays a crucial role as a distribution and trade hub in the region, being strategically located between Banda Aceh and Medan. Spanning an area of 181.06 km², the city comprises four sub-districts, housing nine settlements and 68 villages [1].

The purpose of this research is to develop an Android-based application for Tourism Locations & Lodging Services in Lhokseumawe City, aimed at facilitating users in locating tourist attractions and lodging options, while also providing them with the shortest routes to their desired destinations. To achieve this, the study adopts Geographic Information System (GIS) technology, which encompasses data collection, database systems, and spatially oriented computer systems to obtain relevant information. The integration of GIS technology into the Android application enhances user experience by enabling them to efficiently identify nearby tourist spots and find the most convenient routes to reach them [2].

The proposed Android application holds considerable potential in enhancing tourism experiences and promoting Lhokseumawe City as an attractive destination. By leveraging GIS technology, users can effortlessly explore the city's offerings, making informed decisions about their travel plans. The application's customizable features cater to the diverse preferences of users, ensuring a personalized and seamless experience. However, in implementing such technology-driven solutions, it is crucial to consider and mitigate potential

[1] *Department of Electrical, Faculty of Engineering, Universitas Malikussaleh, Aceh, Indonesia*
[2] *Department of Information Systems, Faculty of Engineering, Universitas Malikussaleh, Aceh, Indonesia*
[3] *Department of Informatics, Faculty of Engineering, Universitas Malikussaleh, Aceh, Indonesia*

negative impacts that may arise, safeguarding the city's unique charm and preserving its cultural heritage.

1. Introduction

The development of information technology is now growing and advanced, and the technology can facilitate human activities to get a variety of new information in cyberspace; technological advances also have negative and positive side impacts on current technology. Utilization of technology can be applied to various kinds of technology; one of the current technological developments is Android smartphones, wherever and whenever all activities to get various kinds of the latest information can be known through Android-based technology. The advantage of the Android operating system is that the operating system applications in it can be changed according to our own wishes and the number of computer applications that are already available for Android smartphones. Lhokseumawe City is a city in the province of Aceh, Indonesia. This city is located right in the middle of the eastern route of Sumatra. Located between Banda Aceh and Medan, so this city is a vital route of distribution and trade in Aceh. Lhokseumawe City, Aceh, with a height of 2-24 meters above sea level, has an area of 181.06 Km² which is divided into four sub-districts, namely Blang Mangat District with an area of 56.12 Km², Muara Dua District with an area of 57.80 Km², Muara District One area is 55.90 Km² and Banda Sakti District has an area of 11.24 Km². These four sub-districts consist of 9 settlements and 68 villages [1].
Applications for Tourism Locations & Lodging Services with Android-Based Lhokseumawe City are to make it easier for users to include location guides or the existence of tourism and lodging and find the shortest route in Lhokseumawe City.
Geographic Information System (GIS) is an information technology that includes data collection, database system technology and spatially oriented computer systems to obtain information. Geographic Information Systems (GIS) can also be used to help users to get information, especially in detecting the closest route to the tourist attractions they want to visit [2].

2. Literature Review

2.1. System Definition

The definition of the system according to Mulyadi [3], the system is "a network of procedures made according to an integrated pattern to carry out the company's main activities".
Understanding the system according to Romney and Steinbart [4] The system is a series of two or more interconnected components, which interact to achieve a goal. Most systems consist of smaller subsystems that support a more extensive system.
Based on the above understanding, it can be concluded that the system is a collection of components that are interrelated with one another to achieve the goal of carrying out a company's main activities.

2.2. Definition of Information

Information is "data that has been organized and has had uses and benefits". [5] Data is the main thing that must be understood first before we discuss information because data becomes the basis of information after the data is processed with various steps and procedures to produce quality information.
[4]stated that information is data that has been managed and processed to provide meaning and improve the decision-making process. As such, users make better decisions as the quantity and quality of information increase.

2.3 Understanding Information Systems

Understanding according to [5], Information systems are organized ways to collect, enter, process, and store data, and organized ways to store, manage, control, and report information in such a way that an organization can achieve its goals. which has been set. According to [6], an information system is "a series of formal procedures in which data is grouped, processed into information, and distributed to users".

2.4. Information System Components

According to [7] [8]explains that a computer-based information system (CBIS) in an organization consists of the following components: a. Hardware, namely hardware components to complete the activities of entering data, processing data, and outputting data b. Software, i.e. programs and instructions were given to a computer

c. Database, which is a collection of data and information organized in such a way that it is easily accessible to users of information systems
d. Telecommunications, namely communication that connects system users with computer systems together into an effective work network.
e. Humans, namely personnel from information systems, including managers, analysts, programmers, and operators and are responsible for system maintenance.

2.5 Definition of Geographic Information System

The term "geographical" is part of "spatial" (spatial). These two terms are often used interchangeably or interchangeably until a third term, “geospatial” appears. These three terms have the same meaning in the context of geographic information systems. The use of the word "geographical" has the meaning of a problem concerning the earth with a two or three-dimensional surface. The term "geographical information" has the meaning of information about both places located on the earth's surface, knowledge of the location of the point where an object on the earth's surface is located, and information regarding attributes or information contained on the earth's surface and its position is given or known [2] Geographic Information System (GIS) is a combination of 3 main elements, namely systems, information, and geography. [9].

A geographic Information System (GIS) is also an information system based on a computer, which is designed and operated using data that has spatial information (spatial reference). This system retrieves, analyzes, checks, integrates, manages, or processes, and displays data spatially and refers to forms or conditions on earth. By looking at the main elements, it is clear that the Geographic Information System is one of the information systems that emphasize the element of "Geographical Information". A geographic Information System is a kind of software (software) that can be used for the entry, storage, manipulation, display, and output of geographic information along with the attributes of the Geographic Information System [10].

Geographic information system is defined as a tool or media for entering, storing, retrieving, manipulating, analyzing and displaying data with geographic attributes that are useful to support decision-making processes in planning and management of natural resources, environment, transportation, urban and administrative issues [11] [12][13][14].

GIS technology combines common database operations, such as statistical analysis and queries, with the unique visualization and analysis capabilities of mapping. It is this competence that distinguishes GIS from other information systems that make it useful in various circles in explaining strategic designs, events, and predicting what will happen. Geographic Information System (GIS) is a collection or organized collection of data from computer software, computer hardware, geographic data and personnel designed to obtain, analyze, repair, store, manipulate and display all forms of geographically referenced information. GIS can be implemented on a real world model (real world) on a computer monitor. Maps are a form of graphic implementation in the real world [2].

Application development by providing location information aims to interpret the appropriate environment, currently geolocation-based applications have been widely developed in accordance with the context of the problem and the purpose of system development so as to provide more added value from an application [15]

2.6 Distance

According to Putu [16], distance is a number that shows how far an object changes position through a certain trajectory. In physics or in everyday life, distance can be an estimate of the physical distance from two positions based on certain criteria, for example the distance from Jakarta to Bandung.

Distance is different from position coordinates, distance cannot be negative. Distance is a scalar quantity while displacement is a vector quantity. The distance traveled by a vehicle is usually indicated in kilometers, people or objects, it must be distinguished from the distance between one point and another. distance is a number that shows how far an object changes position through a certain path. In physics or in everyday life, distance can be an estimate of the physical distance from two positions based on certain criteria, for example the distance from Jakarta to Bandung.

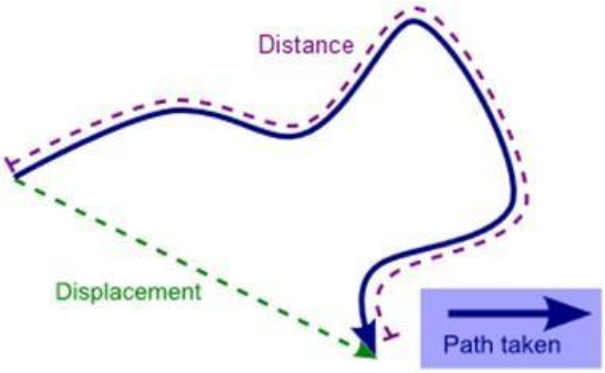


Fig 1. Distance

Glosarium [17] A trajectory is a path through which a moving material/object, a trajectory or route is a place for the position of the points by a moving object. The trajectory of an object's motion can be a straight line, a circle or a parabola, the trajectory can be more easily understood in the form of a graph. Look at Figure 2, what is meant by the trajectory is the link/path from city A to city B.

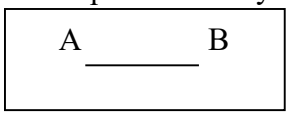


Fig 2. Trajectory

A map is a picture of the earth's surface depicted in a flat plane, a map is also a geographical area of the earth's surface that is presented in a variety of different ways, ranging from conventional printed to digital maps that appear on a computer screen. Maps can be drawn in a variety of styles, each showing a different surface for the same subject to visualize the world in an easy, informative, and functional way. Computer-based (digital) maps are more versatile and dynamic because they can show many different views on the same subject. This map also allows for scale changes, combined animations, images, and sounds, and can be connected to additional information sources via the internet. Digital maps can be updated to new thematic maps and can add other detailed geographic information [18].

The shortest path is the minimum path required to reach a place from a certain place. The minimum path in question can be found by using a graph. A graph is a set of points in a two-dimensional plane connected by a set of lines (edges). A graph is formed from a set of points connected by lines. There are several terms related to graphs, including: a. These points are called vertices.

b. The lines connecting the vertices are called edges. adjacent, if they have the same edge.

c. Is the weight usually found on the edge that represents the distance from the vertices connected by that edge.

d. A path is a path that passes through an edge and a vertex in a graph.

e. A cycle is a path that starts and ends at the same vertex.

f. A direct in directed graph is a graph in which the edges have

The term tourism has not been understood by many people, but Indonesian linguists and tourism experts say that the word tourism comes from two syllables, namely stingray and tourism. Pari means many or many times and around while tourism means to travel for recreational purposes. So, tourism means to travel for recreational purposes which are done repeatedly and around. The definition of tourism according to Norval states that tourism is the whole activity related to the entry, stay, and movement of foreign residents inside or outside a certain country, city, or region. While Hunziker and Kraft provide an understanding of tourism, the overall relationship, and symptoms that arise from the presence of foreigners. The definition of tourism according to Norval states that tourism is the whole activity related to the entry, stay, and movement of foreign residents inside or outside a certain country, city, or region. While Hunziker and Kraft provide an understanding of tourism, the overall relationship, and symptoms that arise from the presence of foreigners.

2.7 Android

Android is an operating system for Linux-based mobile devices operation system, the device in the middle. Android makes applications that are open source so users can create the look they want[19]. One of the mobile phone operating system used by smartphones is Android. Android is a system operations for smartphones

based on Linux[20][21] One of the advantages of Android compared to a mobile phone system or Another smartphone is Android is open source code so it's easy developers to create and modify applications or features that not yet on the appropriate Android operating system with their own will[22].

3. Methods

3.1. Research methods

Descriptive research is research that is oriented to problem-solving, the characteristics of descriptive research are the implementation of research carried out after the incident took place. The type of descriptive research itself can be grouped into three groups, namely:

a. a. If it only describes the data as it is and explains the data or with explanatory sentences qualitatively, it is called qualitative descriptive research.
b. If data analysis is carried out by connecting one variable with other variables, it is called associative descriptive.
c. If the data analysis is compared, it is called comparative descriptive.

3.2 Data Collection Techniques

There are several methods used in the data collection process, namely: a. Interview

That is done by way of question and answer or interviews for data collection procedures orally and in writing with the parties concerned, in this case the employees, especially the Department of Culture and Tourism of the City of Lhokseumawe. b. Observation

The author makes direct observations or goes directly to the field, the author makes direct observations of the object of the problem studied, which includes observations of tourism data and lodging services in Lhokseumawe City. c. Literature Study

The author examines and studies various types of articles from the internet related to the problems studied. d. Documentation

Documentation is one method of data collection that is also used in research methods. At its core, documentation is a method used to explore holistic data. In this study, researchers obtained several official documents, in the form of archives related to the role of the Lhokseumawe City Culture and Tourism Office in developing tourism potential and lodging services, such as data on infrastructure, data on the number of visitors, strategic plans for the Office, and so on. Furthermore, as personal documentation, researchers have photos of the state of tourism objects and lodging services in Lhokseumawe City.

3.3 System Development Method

In developing this android-based application system, the method that researchers use is the waterfall method. The reason for using this method is because the work on the system project to be built can be scheduled properly and is easy to control. The waterfall method also takes a systematic and sequential approach in building an application system.

3.4 Thinking Framework

In the research, the writer performs the steps or stages of activities using the framework of thinking, namely as follows:

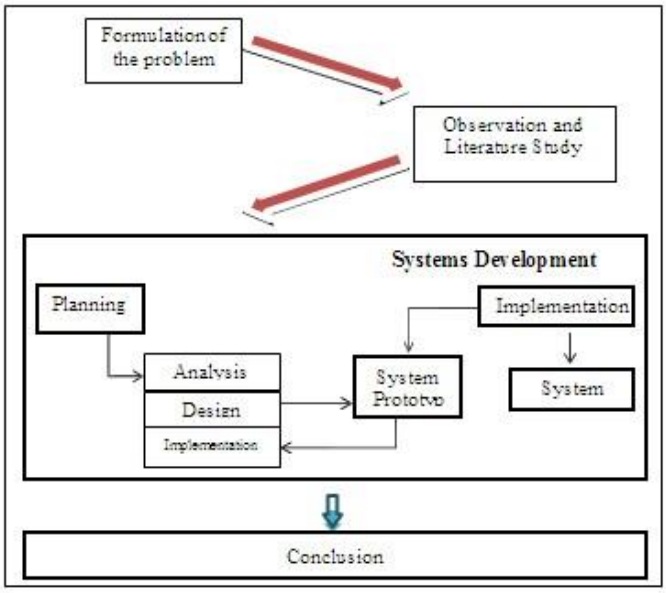


Fig 3. Framework

4. Results

4.1 System Design Results

In completing the design of the Android-Based Lhokseumawe Tourism and Lodging Application. Searching the location for Tourism and Lodging in Lhokseumawe uses android studio software which is in development and uses the MySQL DBMS database in database storage. And to describe and visualize the system that will be made the author uses the Unified Modeling Language (UML).

Use case diagrams describe the functions contained in the system created, which consists of actors, use cases and the relationships involved between the two. The following is a use case diagram that will explain how this application runs.

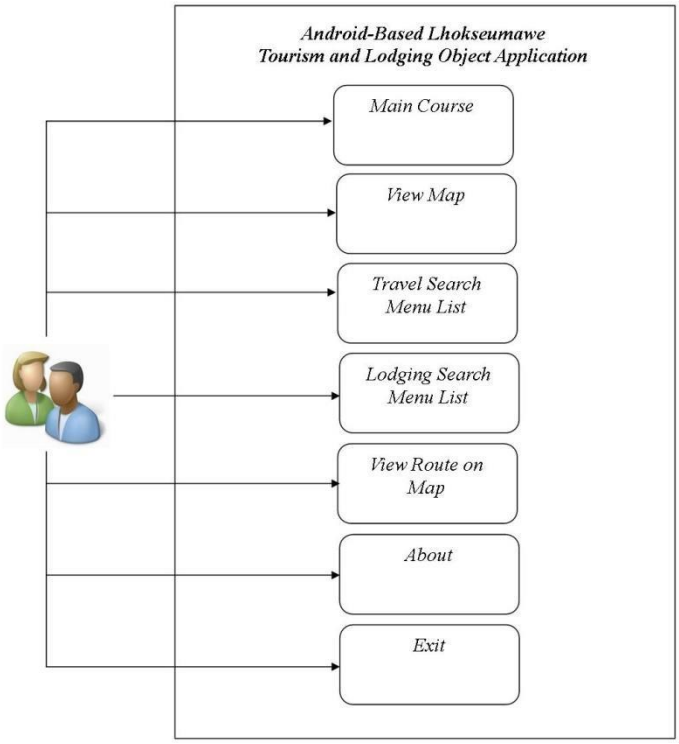


Fig 4. Use Case Diagram for E-Tour Guide Applications

Sequence Diagram is a sequence of several object interactions that run on the application or system that is created. The following is a sequence diagram of the Android-Based Lhokseumawe Tourism and Lodging Object Application:

1. Sequence Diagram for finding the shortest route.

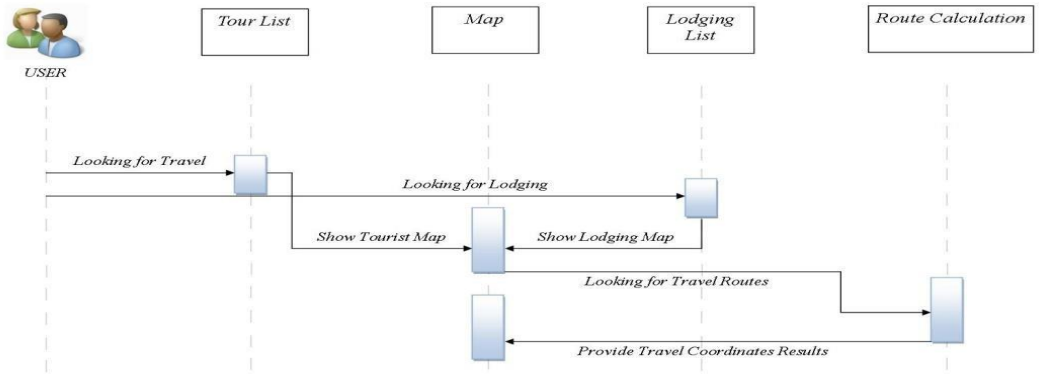


Fig.5 Tourism Object Application Sequence Diagram and Lhokseumawe Lodging Based on Android

The following is the design of the Android-Based Lhokseumawe Tourism and Lodging Object Application class diagram:

Fig 6. Class Diagram

In making this Android-Based Lhokseumawe Tourism and Lodging Object Application, the MySQL DBMS database is used. The database in this application uses 5 tables, namely the data table that contains data about the application. The following is the database structure for the Android-Based Lhokseumawe Tourism and Lodging Object Application:

Table	Action	Rows	Type	Collation	Size	Overhead
tbl_hotel	Browse Structure Search Insert Empty Drop	4	InnoDB	latin1_swedish_ci	16.0 KiB	-
tbl_peta_hotel	Browse Structure Search Insert Empty Drop	0	InnoDB	utf8mb4_general_ci	16.0 KiB	-
tbl_peta_wisata	Browse Structure Search Insert Empty Drop	2	InnoDB	utf8mb4_general_ci	16.0 KiB	-
tbl_user	Browse Structure Search Insert Empty Drop	2	InnoDB	utf8mb4_general_ci	16.0 KiB	-
tbl_wisata	Browse Structure Search Insert Empty Drop	6	InnoDB	utf8mb4_general_ci	16.0 KiB	-
5 tables	Sum	14	InnoDB	utf8mb4_general_ci	80.0 KiB	0 B

Fig 7. DataBase Structure

4.2 Implementation Results

In the implementation of these results, there are several kinds of main menus according to user needs. The following are the results of the implementation of the Tourism and Hotel Geographic Information System application in Lhokseumawe City.

Fig 8. Implementation of the Main Page

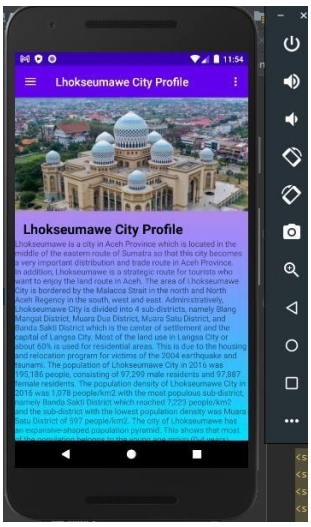


Fig 9. Implementation of Lhokseumawe City Profile Menu Page

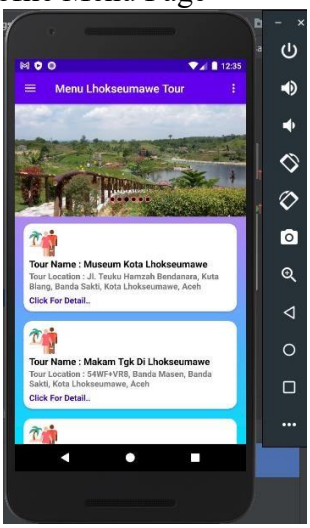


Fig 10. Implementation of the Tour List Menu Page

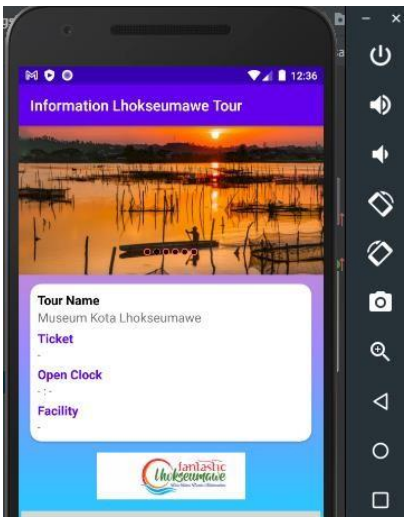


Fig 11. Implementation of the Tourist Info Page

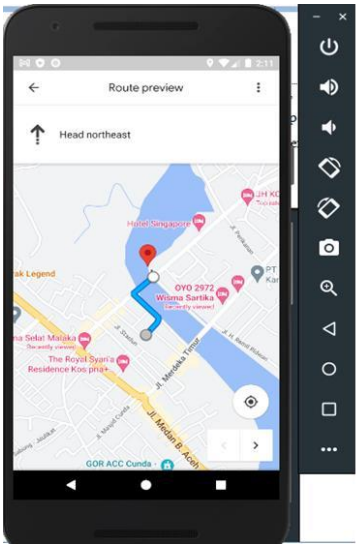


Fig 12. Map Of Search Results For The Shortest Route To Travel Page

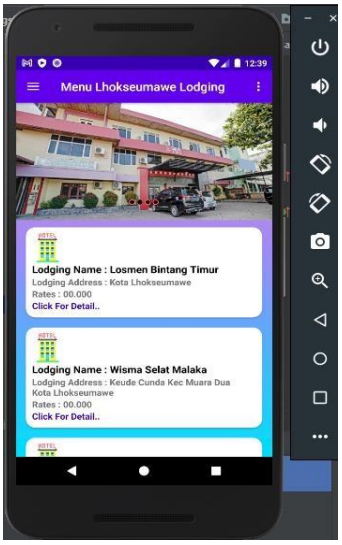


Fig 13. Lodging List Menu

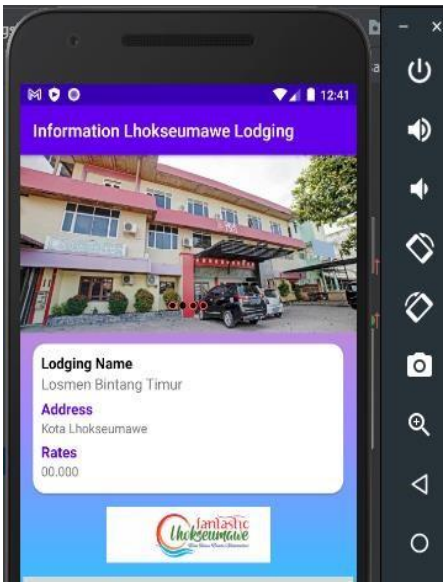


Fig 14. Lodging Info Implementation Results

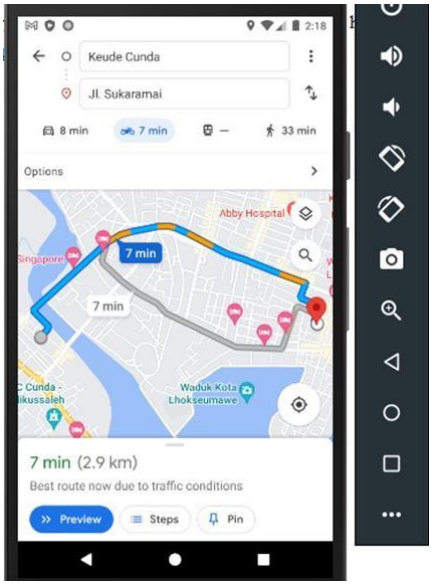
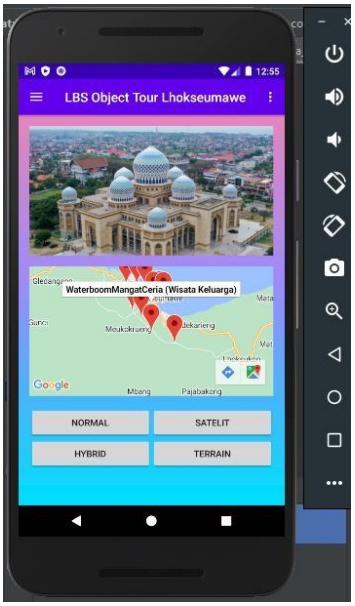


Fig 15. Map Of Lodging Route Search



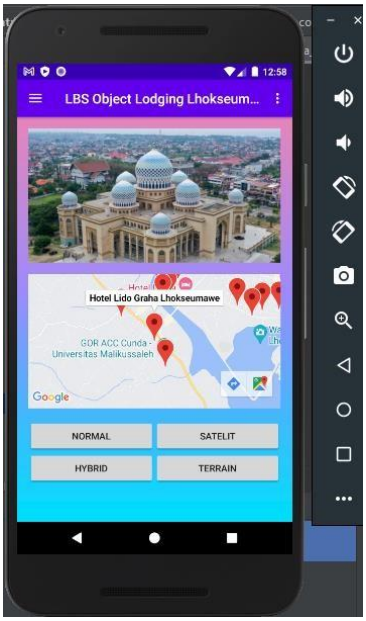


Fig 16. Navigation Menu for Tourist Locations **Fig 17.** Menu Navigation for Lodging Locations

4.5. Unit Testing

In unit testing the application made by using black-box testing. This test is based on what is seen, focuses on functionality and the final result or output. This test is aimed more at software design according to standards and reactions to bugs in the application program. In this test, it begins by installing the Android-based Lhokseumawe Tourism and Lodging Object Application which is owned then performs black-box testing. The following are the results of the black-box test as shown in the table.

Table 1. Black Box Test Results

No	Test Name	Result Description	Validation		Percentage (%)
			Yes	Not	
1	Open the App	Click the Top Navigation Menu on the Left Showing the Main Page	Yes		100
2	Lhokseumawe City Profile	Showing Description of Lhokseumawe City Profile	Yes		100
3	Exit	Back Home	Yes		100
4	Tour List	Display of Tour Names	Yes		100
5	Tour Details	Tour Detail View	Yes		100
6	Travel Route	Showing Search Results for Nearby Tours	Yes		100
	Exit	Back Previous Page	Yes		100
7	Lodging List	Lodging Names Display	Yes		100
8	Lodging Details	Lodging Details View	Yes		100
9	Lodging Route	Showing Search Results for Nearest Lodging	Yes		100
10	Exit	Back Previous Page	Yes		100
11	Exit	Click Navigation Menu Top Left	Yes		100
12	About Me	Showing App Builder Profile	Yes		100
13	Exit	Click Navigation Menu Top Left	Yes		100

5. Conclusion

The results of the conclusions on the Android-Based Lhokseumawe Tourism and Lodging Application that are applied to this application are as follows:

a. The results of this application display tourist locations and lodging services and display tourist lists and lodging services

b. Route search using Google Maps can be used in route search in search of tourist locations and lodging services.
c. From the results of the application that is run, it is found that the closest tourism and lodging services are from the starting point/location.
d. Using this Android-based Lhokseumawe Tourism and Lodging Application, can make it easier for people to find locations for tourism and lodging services, especially those in Lhokseumawe.

Acknowledgment

Gratefully acknowledges financial support from The Institute for Research and Community Service (LPPM) Universitas Malikussaleh, Aceh, Indonesia.

References

"Kota Lhokseumawe," *10 April 2022*. https://id.wikipedia.org/wiki/Kota_Lhokseumawe

A. Fajri, E. P. Purwandari, and F. F. Coastera, "METODE ALGORITMA DIJKSTRA (Studi Kasus : Kelurahan Kandang Limun dan Beringin Raya)," vol. 6, no. 1, pp. 69–79, 2018.

Mulyadi, *Sistem Informasi Akuntansi*. Jakarta: Salemba Empat, 2016.

S. Romney, Marshall B, *Sistem Informasi Akuntansi*, 13, edited. Jakarta: Salemba Empat, 2015.

Krismiaji, *Sistem Informasi Akuntansi*. Yogyakarta: Unit Penerbit, 2015.

abdul Kadir, *Pengenalan Sistem Informasi*, Revisi. Andi.Yogyakarta, 2014.

H. Millon and C. Hilgenhurst, *Boston Government Center*, Archit. De. 1971.

M. Muthmainnah, D. Yulisda, and V. Ilhadi, "Academic Information System Audit Using Cobit 5 Domain APO Framework," *Int. J. Eng. Sci. Inf. Technol.*, vol. 2, no. 1, pp. 123–130, 2021, doi: 10.52088/ijesty.v2i1.223.

E. Budianto, *Sistem Informasi Geografis dengan Arc View GIS*. Andi. Yogyakarta, 2010.

E. Prahasta, *Sistem Informasi Geografis, Konsep-Konsep Dasar. (Perspektif Geodesi dan Geomatika)*. 2009, 2009.

B. S. Sulastio, H. Anggono, and A. D. Putra, "Sistem Informasi Geografis Untuk Menentukan Lokasi Rawan Macet Di Jam Kerja Pada Kota Bandarlampung Pada Berbasis Android," *J. Teknol. dan Sist. Inf.*, vol. 2, no. 1, pp. 104–111, 2021, [Online]. Available: http://jim.teknokrat.ac.id/index.php/JTSI

A. F. O. Pasaribu, D. Darwis, A. Irawan, and A. Surahman, "Sistem Informasi Geografis Untuk Pencarian Lokasi Bengkel Mobil Di Wilayah Kota Bandar Lampung," *J. Tekno Kompak*, vol. 13, no. 2, p. 1, 2019, doi: 10.33365/jtk.v13i2.323.

D. Darwis, "Aplikasi Kelayakan Lahan Tanam Singkong Berdasarkan Hasil Panen Berbasis Mobile," *J. Teknoinfo*, vol. 10, no. 1, p. 6, 2016, doi: 10.33365/jti.v10i1.11.

D. Darwis, A. Ferico Octaviansyah, H. Sulistiani, and R. Putra, "Aplikasi Sistem Informasi Geografis Pencarian Puskesmas Di Kabupaten Lampung Timur," *J. Komput. dan Inform.*, vol. 15, no. 1, pp. 159–170, 2020.

Syaiful Ahdan and Setiawansyah, "Pengembangan Sistem Informasi Geografis Untuk Pendonor Darah dengan Algoritma Dijkstra berbasis Android," *J. Sains dan Inform.*, vol. 6, no. 2, pp. 67–77, 2020,

[Online]. Available: http://doi.org/10.22216/jsi.v6i2.5573 [16] I Putu Agus Swastika, *Audit Sistem Informasi Dan Tata Kelola Teknologi Informasi.* Yogyakarta: Andi. Yogyakarta, 2010.

Glosarium, "Lintasan," 2021. From http://glosarium.org/arti/?k=lintasan,

Carter, Denny, and I. Agtrisari, *Desain dan Aplikasi SIG*. PT Elex Komputindo, 2003.

D. Leman and M. B. Akbar, "Sistem Informasi Geografis (Gis) Untuk Penanggulangan Kecelakaan Berbasis Android," *It (Informatic Tech. J.*, vol. 6, no. 2, p. 217, 2018, doi: 10.22303/it.6.2.2018.217-225.

A. Rakhman and A. Sutanto, "Analisa Sistem Informasi Geografis Tempat Laundry Berbasis Android," *Smart Comp Jurnalnya Orang Pint. Komput.*, vol. 7, no. 1, pp. 256–259, 2018.

S. H and Nazruddin, *Pemograman Aplikasi Mobile Smartphone dan Tablet PC Berbasis Android*. Bandung: Informatika, 2011.

Nugroho and Bunafit, *Latihan Membuat Aplikasi Web PHP dan MySql dengan Dreamweaver MX dan 8*. Bandung: Gava Media, 2006.