

Geographic Information System For Mapping The Location Of Markaz Khidmat Islam Islamic Boarding School Deli Serdang District Based On Android

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ABSTRACT

Geographic Information System (GIS) Mapping Location of Islamic Boarding School Markaz Khidmat Islam Deli Serdang Regency Based on Android is an application that utilizes advances in information technology in the field of geography, especially in the context of mapping the location of Islamic boarding schools. This application integrates standard database capabilities and data analysis with spatial analysis specific to mapping. The purpose of this research is to develop a GIS application that can provide spatial analysis for the location of Islamic boarding schools, as well as support the development of sustainable education in the Deli Serdang Regency area. The research method involved interviews and periodic testing of the draft GIS application to be implemented. The result of this research is the development of a GIS application that can assist users in mapping the location of Islamic boarding schools effectively. The implication of this research is the utilization of GIS technology in supporting educational development, especially in terms of mapping the location of boarding schools to ensure better and efficient access for students.

Keywords: GIS, education, application

1. INTRODUCTION

Data processing is done using GIS software such as Quantum GIS or QGIS and Google Earth to support the implementation of the application. The purpose of data analysis is to provide useful information to users, such as information regarding the location layout, potential natural resources, and potential development of the area around the Ponpes. Data visualization is done using web-based technologies such as Google Maps or OpenStreetMap. By using android-based technology, the information obtained is effectively opened by the client through android. In addition, android-based technology also allows users to interact with the information obtained, such as changing the zoom level of the map, or searching for information about certain places around the Ponpes.

Therefore, with this android-based GIS mapping, it is hoped that it can help the management of Markaz Khidmat Islam Boarding School in making the right decisions in the use and management of its resources. In addition, this GIS mapping can also be a reference for the community around the Ponpes in developing the area around the Ponpes in a sustainable manner.

The purpose of this research is to develop a geographic information system (GIS) that can be used to map and identify the location of the Markaz Khidmat Islamic Boarding School (Ponpes) in the Deli Serdang Administrative Region. The goal of improving this system is to relieve people who want to find or study at pesantren more easily and efficiently. With the development of a geographic information system mapping the location of Markaz Khidmat Islamic boarding schools in Deli Serdang Regency, it is hoped that it can facilitate the community in accessing and knowing information related to these boarding schools so that it can help in expanding the dissemination of information about the existence of Islamic boarding schools.

In the previous research by [1] with his journal entitled “Sistem Informasi Geografis (SIG) Pondok Pesantren di Sumatera Barat” discusses the Geographic Information System (GIS) of Islamic Boarding Schools in West Kalimantan, which aims to facilitate users in finding information about Islamic boarding schools in the region. In addition, [2] also

conducted research with his thesis entitled “Sistem Informasi Geografis Pemetaan Lokasi Pondok Pesantren Berbasis Android Di Kabupaten Purbalingga”.

In the research conducted, there are differences and developments from previous research, namely research developed by researchers using android-based methods so that in searching for locations, mapping locations, to managing the location of android-based Ponpes that can be accessed by everyone, especially local residents.

2. THEORETICAL FOUNDATION

A) Geographic Information System

A formal geographic information system, also known as a GIS, is a collection of physical and logical objects that relate to the earth [3]. In addition, GIS is an application that can input, store, process and display spatial data. A geographic information system is a system that accumulates, analyzes, and displays graphical data[4][5]. These systems are used to manage and analyze information related to geographical locations and are widely used in fields such as urban planning, environmental management, and public health. One example of a GIS application is remote sensing-based GIS, which collects and processes remote sensing data to provide accurate and detailed geographic information [6][7][8]. GIS is the name given to computers for storing and managing geographic data. The collection, storage, and investigation of things or phenomena whose geographical location is a key or important feature for the purpose of analysis. is the purpose of developing geographic information systems [9] [10][11].

B) Islamic Boarding School

Islamic boarding schools are also known as Islamic Educational Institutions, and they serve as a means of educating students about Islam and spreading religious knowledge. The education system in pesantren is unique to them. To meet the national pesantren standards, it takes several processes to develop the data architecture and information systems of pesantren into Islamic educational institutions. In the beginning, they were limited to a small number of villages, but as time passed, the pesantren became more sophisticated, adequate and feasible[12].

3. RESEARCH METHODS

Research methodology is a research process that has three steps; namely data collection, implementation and testing. In this case, the method used by researchers includes several steps :



Figure 1 Research Stages

A. Data Collection

In the data collection session, interviews were conducted with various resource persons who became the main reference for researchers in collecting data. Some of the interviewees were Dr.H.Zulfahmi Lubis, Lc, MAg as the highest leader at Pesantren Markaz Khidmat Islam and Fitri Khairani Siregar, MA as the principal of the pesantren. In this stage, the data collection that researchers get starts from the number of santri and santriwati, how residents' access to the location of the pesantren, what complaints from parents/guardians/disciples about the layout of the pesantren location, and how the community and parents/guardians/disciples respond if there is a system that makes it easy to map the location or area of the Markaz Khidmat Islam Islamic Boarding School.

B. Implementation

The geographic information system for mapping the location of Markaz Khidmat Islam Islamic Boarding Schools in Deli Serdang Regency can be implemented with several steps that need to be carried out systematically. The first step is to map the location of Markaz Khidmat Islam boarding school in Deli Serdang Regency using GIS technology. Data related to the location of the ponpes such as addresses, contacts, facilities, and activities that can be found in the ponpes are collected and entered into a database. The second step is to develop a GIS-based web or mobile application that can be used to map the location of the ponpes and provide related information. This application should be designed with a friendly and easy-to-use interface to make it easier for users to find and identify the location of the boarding school.

The third step in the implementation of the geographic information system mapping the location of Markaz Khidmat Islam Islamic Boarding School in Deli Serdang Regency is integration with Google Maps. To implement the mapping feature in the GIS application, Google Maps API can be used. By using the Google Maps API, the application can show a map of the location of the boarding school and provide directions to the location of the boarding school from the user's starting point. This is followed in the fourth step by testing and evaluation of the created application. Testing ensures that the application works correctly and in accordance with the goals that have been set. Furthermore, the application is evaluated to see its effectiveness in assisting users in finding the location of the boarding school and improving accessibility to the boarding school. In implementing the geographic information system for mapping the location of Markaz Khidmat Islam Islamic Boarding Schools in Deli Serdang Regency, cooperation and coordination between application developers, boarding school owners, and other related parties are needed to ensure that the data provided is accurate and up-to-date. This is important so that the application provides valid information and can be trusted by users. This application is expected to expand the dissemination of information more easily and effectively about the existence of ponpes so that the wider community can know and utilize the Markaz Khidmat Islamic Boarding School in Deli Serdang Regency..

C. Testing

The testing stage is very important in the development of a geographic information system application for mapping the location of Markaz Khidmat Islam Islamic Boarding School in Deli Serdang Regency. The testing includes functionality, usability, performance, and security testing. Functional testing ensures that all features developed for the application work well and meet the requirements. While usability testing is carried out to measure how easy the application can be used by users.

Furthermore, performance testing is done to find out how fast the application can provide information and perform the mapping process. Finally, security testing is done to ensure that the data inputted by users and stored in the database is safe and protected from attacks by irresponsible parties. By implementing the testing steps systematically, you can ensure that the application functions properly and brings great benefits to users.

4. RESULTS AND DISCUSSION

A) Use of Floyd Warshall Algorithm

This research uses the Floyd Warshall Algorithm. Floyd Warshall algorithm is an algorithm to find the shortest distance between every pair of nodes in a non-negative weighted graph[13][14][15]. This algorithm uses dynamic programming techniques and runs with time complexity $O(n^3)$. This algorithm has been formally proven and expounded in several journals, such as in the journal "Derivation and Formal Proof of Floyd-Warshall Algorithm"[16] and "Shortest path algorithm for graphs in instances of semantic optimization"[17].

In addition, this algorithm is also compared with Dijkstra's algorithm in the journal "Comparison of Dijkstra and Floyd-Warshall Algorithms in Determining the Shortest Route from Gubeng Station to Surabaya Tourism"[18]. This algorithm is widely used in various applications such as routing in computer networks and finding the shortest distance in graphs. The advantage of this algorithm is that it can find the shortest distance between each pair of nodes in one computation time[19][20]. However, the drawback is the considerable time complexity and it is not suitable for use on very large graphs or with negative weights. The following case example is a graph with starting point A and destination point F :

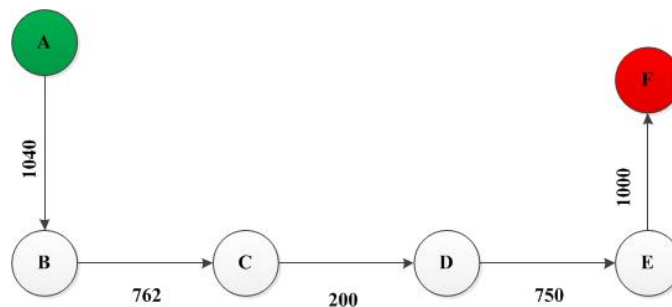


Figure 2 Example of Graph

The example graph in Figure 2 consists of 6 nodes/points consisting of a collection of estimated road names and intersections that will be traveled using the Floyd Warshall algorithm. The nodes are explained as follows.

Table 1: Node Location Points

NODE	LOCATION	COORDINATES
1	Jl. Medan - Tebing Tinggi, Medan Amplas	3.537161, 98.711275
2	Simpang Marindal	3.538336, 98.698273
3	Jl. Marindal, Mekar Sari (Simpang Kanal)	3.531376, 98.698369
4	Simpang Kongsi	3.518306, 98.698243
5	Taman Perkuburan Muslim (Simpang Jl Pelajar)	3.497972, 98.696092
6	Pondok Pesantren Markaz Khidmat Islam	3.501340, 98.704815

When viewed from table 1, the route to be traveled is from point A Jl Medan - Tebing Tinggi, Medan Amplas to point F = Pondok Pesantren Markaz Khidmat Islam. In this case, after knowing the location nodes and coordinate points, the next step is to create a mapping illustration made through the QGIS application. The following is an image of the mapping of the location of the Islamic boarding school using the QGIS application and Google Earth.

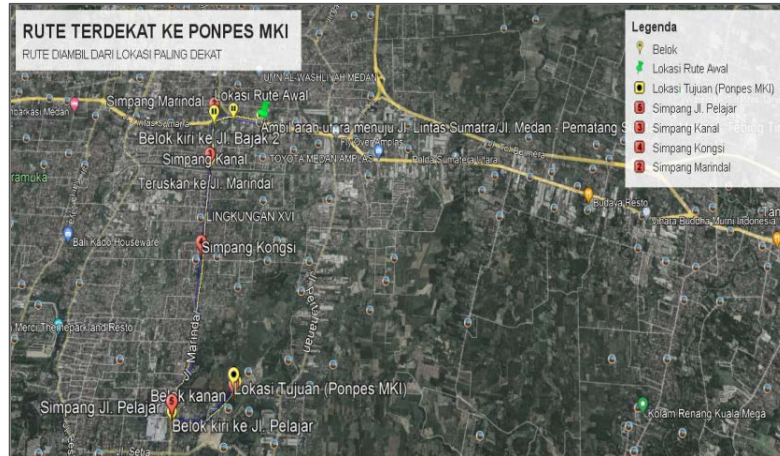


Figure 3 Overview of the Nearest Route to the Pesantren Location

Figure 3 shows the closest route taken and depicted from the nearest location to the destination location of Ponpes Markaz Khidmat Islam. This picture becomes a reference in the implementation of android and web.

b) Implementation of Mobile Mapping Application

At the implementation stage of Mobile Mapping, the features displayed are the route to the pesantren. An explanation of the pesantren or pesantren profile. In this application there is also an online motorcycle taxi fare forecast feature from the original location to the location of the boarding school, with this price estimate it can help people to get to the location of the pesantren. The difference between this feature and the online motorcycle taxi feature is that this feature itself is only specific to the main location, namely the location of Pesantren Markaz Khidmat Islam. The following is an overview of the android application that has been implemented :

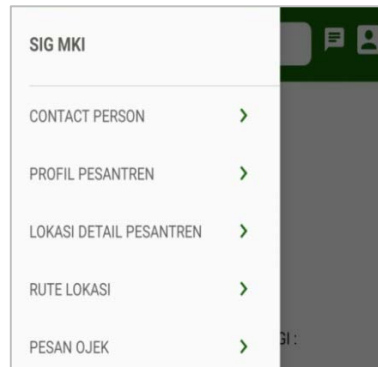


Figure 4 Layout of the MKI GIS Application

Figure 4 is a layout view of the MKI GIS application which consists of Contact Person, Pesantren Profile, Pesantren Detail Location, Location Route, and Ojek Message.

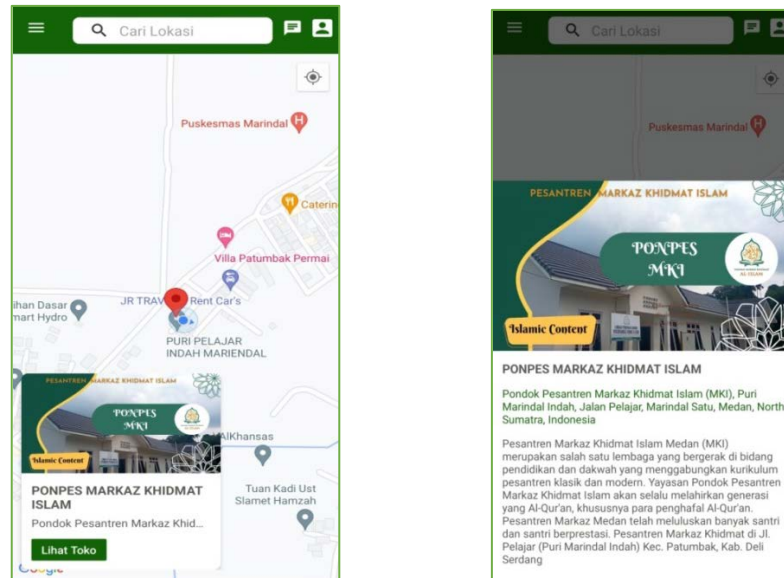


Figure 5 Detailed Location of the Islamic Boarding School

Figure 5 shows the detailed location of the pesantren or the center point of the pesantren accompanied by an explanation of the Markaz Khidmat Islam Islamic Boarding School. Thus access to information on the location of the pesantren will be more easily known by the public.

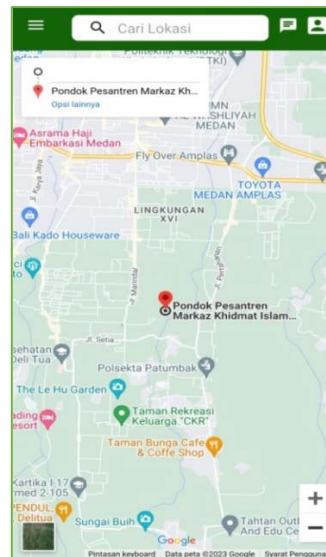


Figure 6 Route of the Pesantren Location

The section in Figure 6 shows the route of the boarding school location. From the original location to the boarding school. This section can be accessed by placement from the original location to the intended pesantren.

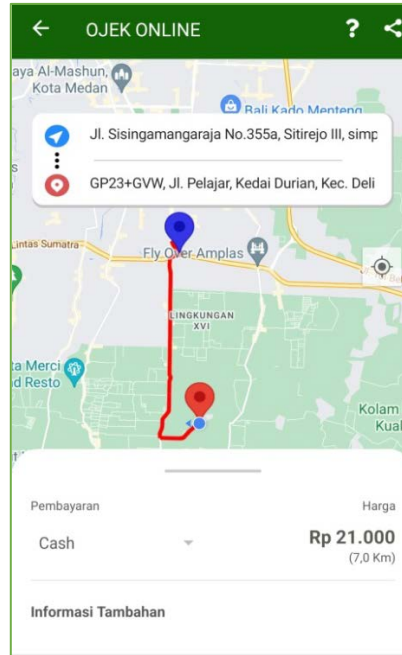


Figure 7 Estimated Online Ojek Fare Rates

Figure 7 shows the estimated fare for online motorcycle taxis from the origin location to the destination location, namely to the Islamic Boarding School. For this feature itself only displays the price or estimated online motorcycle taxi fare and the destination is only specifically to the pesantren.

c) Testing

Tests were conducted on three aspects, namely functionality, efficiency, and operability. Based on the results of the test percentage value, in the functionality aspect, this application gets an 88.4% assessment which is included in the very good category. While in the efficiency aspect, this application gets a good assessment with a percentage of 80.5%. For the operability aspect or the level of ease of use of the application, this application gets an assessment of 89.5% which is included in the very good category. Therefore, this application is considered successful in passing the trial and is ready to be implemented and feasible to use as a location mapping of Markaz Khidmat Islam Islamic Boarding School in Deli Serdang Regency.

5. CONCLUSION

From the test results this application is considered successful in passing the trial and is ready to be implemented and feasible to use as a location mapping of Markaz Khidmat Islam Islamic Boarding School, Deli Serdang Regency. Tests were conducted on three aspects, namely functionality, efficiency, and operability. Where the average obtained from the three aspects reached 85% with a good category.

This application is expected to ease the population in obtaining information related to the Markaz Khidmat Islam ponpes in Deli Serdang Regency more easily and efficiently. This application is also expected to expand the spread of information about the existence of ponpes so that the wider community can know and utilize the ponpes.

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