Cyberspace: Jurnal Pendidikan Teknologi Informasi
Volume 6, Nomor 1, Maret 2022, 33-42

IMPLEMENTATION OF THE DIJKSTRA ALGORITHM IN FINDING THE SHORTEST ROUTE TO AL-AZIZIYAH ISLAMIC BOARDING SCHOOL – LDII IN SAMARINDA

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Abstract

Globalization Technology is growing very rapidly uncontrollably, the ease of use of technology is supported by the many emerging technology tools that are very easy to obtain, even some technology tools sold at very affordable prices. Android technology installed and packed in the form of smartphones is familiar to use even among people who are marginalized in the corners of the region. Not only are the intellect literate with technology utilizing the ease and development of this technology, even the lay people who utilize the internet network and are familiar with google can also mark the location of its place on google maps. With the globalization of this technology, the author will use the Implementation of Alghorithm Dijkstra In Finding the Shortest Route from the author's residence to Al-Aziziyah Islamic Boarding School – LDII Di Samarinda. In this study, algorithm Dijkstra used alghorithm in determining the shortest path from the starting point to the destination point in a graff or shortest path with the help of LBS (Location Based Service), GPS, Google Maps, and Graff then found the shortest path was 4.88 km.

***Keywords**: Alghorithm Dijkstra, Global Positioning System, Location Search*

Abstrak

Globalisasi Teknologi berkembang sangat pesat tanpa terkendali, kemudahan penggunaan tekhnologi ini didukung dengan banyaknya bermunculan alat-alat tekhnologi yang sangat mudah untuk didapatkan, bahkan beberapa alat tekhnologi dijual dengan harga yang sangat terjangkau. Tekhnologi android yang di install dan di kemas dalam bentuk smartphone ini sudah familiar untuk di gunakan bahkan dikalangan masyarakat yang termarginalkan di pelosok daerah. Tidak hanya para inetelektual yang melek dengan tekhnologi yang memanfaatkan kemudahan dan perkembangan tekhnologi ini, bahkan masyarakat awam yang memanfaatkan jejaring internet dan akrab dengan google juga dapat menandai lokasi tempatnya pada peta google. Dengan globalisasi tekhnologi ini maka penulis akan menggunakan Implementasi Alghorithm Dijkstra Dalam Mencari Rute Terpendek dari Jl. Wahid Hasyim Menuju Al-Aziziyah Islamic Boarding School – LDII di Samarinda. Dalam penelitian ini menngunakan alghorithm Dijkstra dalam penentuan jalur terpendek dari titik awal ke titik tujuan dalam sebuah graff atau shortestpath dengan bantuan LBS (Location Based Service), GPS, Google Maps dan Graff maka di temukan jalur terpendek adalah 4,88 km.

Kata Kunci : Alghorithm Dijkstra, Sistem Pemosisi global, Pencarian Lokasi

1. Introduction

The rapid progress of the world of santri is seen by the proliferation of Islamic boarding schools that provide a variety of studies, both modern and traditional. This development and growth certainly have an impact on the development of science which also indirectly helps the government's task in educating the nation's life.

Islamic boarding schools have become one of the "option" choices in scientific diversity, of course, especially for Muslims. Since the beginning of the establishment of the Islamic boarding school, the Islamic boarding school has also been known to the public as the birthplace of scholars and future cadres of scholars who study and apply Islamic life according to the demands of the Qur'an. Many gave birth to the memorizers of the Qur'an. Which is also given special privileges in receiving state apparatus and scholarships.

The historical facts of the birth of Islamic Boarding Schools in Indonesia began with the entry of Islam into Indonesia through trade routes and since 1970 Islamic boarding school have also opened themselves up in the general learning curriculum.

In the 21st century or the millennium, Islamic boarding schools have not only become an institution in the education sector but also in the religious and social sectors. The Islamic boarding school itself was formed through a fairly long process. Starting with the formation of leadership in society [1].

The leader of the Islamic boarding school, either “Leader or Owner”, cannot be done by just anyone. The leader of a Islamic boarding school must have a religious background which is certainly recognized by Muslims, formerly a kyai was appointed because it was considered by the community to have knowledge that was fluent in Islam, and the cleric or kyai was a reference place for asking questions in matters of religion to social problems.

One of the boarding schools is an Islamic boarding school in East Kalimantan, the city of Samarinda which is managed by the Al Hut Bina Insani Foundation under the coordination of the DPD LDII named Ponpes Aziziyah.

As one of the favorite Islamic boarding schools in Samarinda, the author wishes to implement Dijkstra's Alghorithm in Finding the Shortest Route Towards Al-Aziziyah Islamic Boarding School from Jl. Wahid Hashim. By utilizing the sophistication of today's technology which has provided convenience, especially to the common people.

This study aims to find the shortest distance from vertex saty to another vertex, namely Jl. Wahid hasyim headed to Al-Aziziyah Islamic Boarding School, on Jl. Aziziyah. Also to provide the closest navigation path to the location. With this research, it is hoped that it will be easier to determine the distance traveled. In order to reach the destination accurately and efficiently. To facilitate the research, the author uses a previous literature review, regarding the design of Islamic boarding school finder based on Google Maps using Dijkstra's Algorithm [2].

In this study, researchers will calculate the implementation of Dijkstra's algorithm in Finding the Shortest Route from Jl. Wahid Hasyim Towards Al-Aziziyah Islamic Boarding School – LDII On Jl. Aziziyah Samarinda, To make the shortest path, the author uses the help of the Google Maps application to update its GPS location regularly so that it can see the history of tracking locations to the intended Islamic boarding school location.

John Naisbitt states the change in technology with the telecommunications revolution. The term revolution, said Naisbitt, was certainly built with the technological revolution. Telecommunications, as it is known, is a product of technology. When we

talk about communication technology, we are also discussing the technological revolution [4].

By utilizing technology using tables, nodes and graphs, the authors implement the closest distance to the Al-Aziziyah Islamic Boarding School, Samarinda. Dijkstra's algorithm itself is one type of algorithm that is very well known in formulating or determining the search for problems related to optimization problems and is simple. This algorithm is one of the algorithms that can solve the problem of finding the shortest path from one vertex to another with a weighted graph.

2. Research methods

In this study the authors used several data collection techniques including:

2.1 Needs analysis

The author analyzes problems regarding the calculation of the implementation of the Dijkrsta algorithm which is expected to overcome problems that can hinder travel from the specified location to the intended location. Both in the process of finding the location of the boarding school so that it takes the calculation of the closest distance to be able to arrive at the location on time, accurately and efficiently.

2.2 Observation

The author observed the location of Al-Aziziyah Islamic Boarding School-LDII in Samarinda to find out the location of the islamic boarding school and to find out the coordinates of the islamic boarding school and information about the islamic boarding school by using Google maps upon arrival at the location.

2.3 Literature review

During data collection, the authors obtained supporting sources to calculate the implementation of the Dijkstra algorithm in finding the shortest route to Al-Aziziyah islamic Boarding School - LDII in Samarinda, such as journals, books and e-books, as well as several sources from the internet to be used as authors as steps for implementing this Dijkstra algorithm.

2.4 Global Positioning System

GPS is a system that is useful as a satellite-based global navigation (GNSS = Global Navigation Satellite System). GPS has many benefits, it can be used in a car rental business or activated in electronic devices so that it can be easily found if it is lost or stolen, it can also be used to find the position of friends if shared through applications on gadgets such as Whatsapp and other applications that use GPS, used in weather forecasting, even during the covid pandemic, GPS helps code locations affected by covid with red zones when using Google Maps. There is even a satellite navigation tool used by ships to view weather forecasts [4].

GPS is a service that uses Location Based Service, which is a service that utilizes: Geographic Information System, Internet Service, and Mobile Devices. Location Based Services technology focuses on positioning with the positioning method. Application Programming Interface API Location relates to GPS and real time location data in android location.

We can use Location Manager to determine our current location, track movement/movement, as well as proximity to a particular location by detecting movement [5].

In determining two location points using distance theory, apart from the location point, the latitude, longitude and elevation coordinates are also recorded. After the coordinates of the two locations are determined, the conversion for these coordinates can be carried out, as well as to calculate the distance [6].

Figure 1: Initial Coordinate Point

Figure 2: Destination Coordinate Point

The coordinates of the starting point are described in figure one -0.453049,117,153220, on Jl. Wahid hasyim, the coordinates of the destination points are described in figure two at Al-Aziziyah islamic Boarding School, on Jl. Aziziyah -0.465205,117.185618.

2.5 Graf

Graphs are very helpful in determining the shortest path from one place to another. The author implements the dijkrsta algorithm using Graph. The author makes a node or nodes at several location points by symbolizing letters and writing down the distance of the location. The author uses "Undirected graph" Undirected graph with edges that do not have direction orientation and vertices or nodes that are not sequential [7].

2.6 Dijkstra's Algorithm

The shortest path "Shortespath" is also often used in determining the shortest or closest path to the graph media. This Dijkstra algorithm is also used in a network.

Advances in technology also have an impact on the world of networks, where the demands of advances in communication technology require scientists to make new innovations so that computers can communicate with one another even though they are geographically far apart.

Technological advances also have an impact on the network sector, the demand to always produce technological communication advances requires scientists to make new innovations so that computers can communicate with one another even though they are geographically far apart.

To determine the best route to be traversed by information in the network with routing in general using the shortest path search algorithm. Algorithm complexity itself is divided into two types "Space Complexity" space complexity and "time complexity" time complexity. in this study we will use space complexity which is defined as a measurement of the amount of space or memory that the algorithm uses to run as a function of the length of an input [8].

3. Results and Discussion

The route is said to be optimal if the search process in the algorithm includes all values in the clustering. Dijkstra is often referred to as the single source shortest path algorithm. The Dijkstra algorithm is used to determine the shortest distance in directed and undirected graphs.[9]

In the Simple Dijkstra Algorithm, a simple complex formula is used (Xd, T), target $X_{\text{destination}}$ The formula for this algorithm is identical to the Dijkstra graph search algorithm [9].

3.1 Data Discussion I

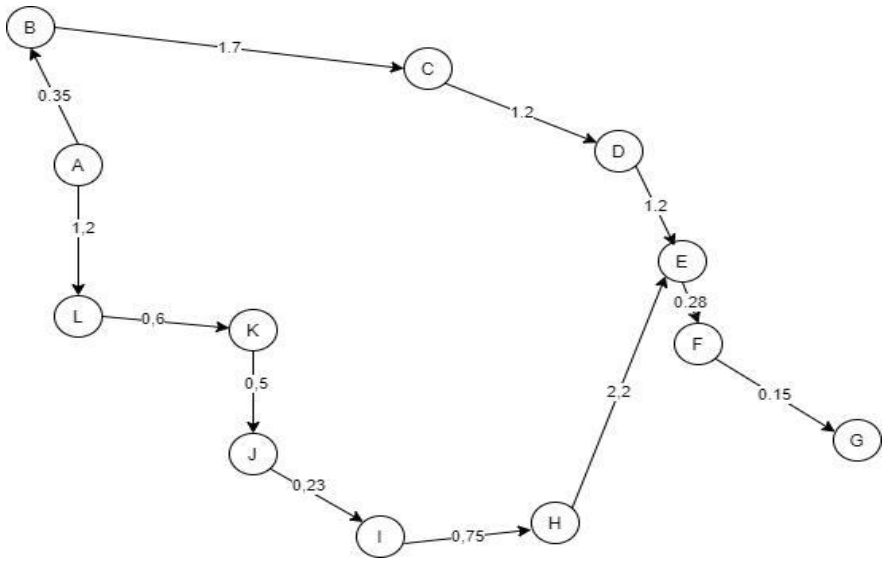


Figure 3. Route from Jl. Wahid hasyim to Al-Aziziyah Islamic Boarding School – LDII On Jl. Aziziyah Samarinda Source: Agustin (2020)

Information :

A. Jl Wahid Hasyim
B. Simpang Sempaja
C. JL.PM.Noor
D. Simpang Jl. DI Panjaitan
E. Jl. DI Panjaitan
F. Jl. Bugis Mugirejo
G. Jl. Aziziyah
H. Jl. Bontang Samarinda
I. Simpang Jl. Gelatik
J. Jl. Gunung Tabur
K. Simpang Jl. Krayan
L. Simpang Jl. Pramuka

The following is a table of travel routes from Jl. Wahid hasyim to Al-Aziziyah Islamic Boarding School – LDII on Jl. Aziziyah Samarinda:

TABLE 1. Route 1

Route 1	Distance
Jl Wahid Hasyim	0 km
Simpang Sempaja	0,35 km
JL.PM.Noor	1,7 km
Simpang Jl. DI Panjaitan	1,2 km
Jl. DI Panjaitan	1,2 km
Jl. Bugis Mugirejo	0,28 km
Jl. Aziziyah	0,15 km
	4,88 km

Figure 4. Visualization of Google Maps Route 1 from Jl. Wahid hasyim to Al-Aziziyah Islamic Boarding School – LDII On Jl. Aziziyah Samarinda

Table 2. Route 2

Route 2	Distance
Jl Wahid Hasyim	0 km
Simpang Jl. Pramuka	1,2 km
Simpang Jl. Krayan	0,6 km
Jl. Gunung Tabur	0.5 km
Simpang Jl. Gelatik	0,23 km
Jl. Bontang Samarinda	0,75 km
Jl. DI Panjaitan	2,2 km
Jl. Bugis Mugirejo	0,28 km
Jl. Aziziyah	0,15 km
	5, 91 km

Figure 5. Visualization of Google Maps Route 2 from Jl. Wahid hasyim to Al-Aziziyah Islamic Boarding School – LDII On Jl. Aziziyah Samarinda

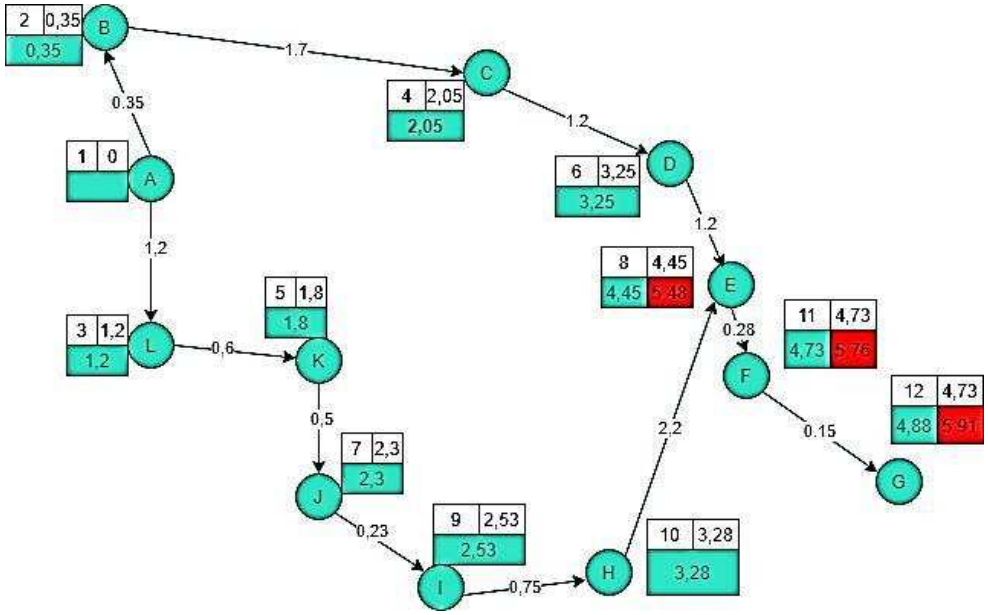
Table 3. List of Tracks from Jl. Wahid hasyim to Al-Aziziyah Islamic Boarding school – LDII

Route	Trajectory	Distance
1	A-B-C-D-E-F-G	4,88 km
2	A-L-K-J-I-H-E-F-G	5, 91 km

Source: Agustin (2020)

From the third table, we can see that the furthest distance is the second route taken via node A-L-K-J-I-H-F-G with a distance of 5.91 km. while the shortest path is the first route via node A-B-C-D-E-F-G with a total distance of 4.88 km. so that road users can choose the first route which is assumed to be the shortest path to Al-Aziziyah Islamic Boarding School – LDII On Jl. Aziziyah Samarinda.

The implementation of the Dijkstra algorithm:



Source : Agustin (2020)

Figure 6. Calculation Implementation Using Dijkstra's Algorithm, Route 1 and Route 2 from Jl. Wahid hasyim to Al-Aziziyah Islamic Boarding School – LDII On Jl. Aziziyah Samarinda

3.2 Data Discussion II

The first step is to provide a starting point at the Starting point, namely node A which is on Wahid Hasyim road with a weight of 0. Then proceed with calculating the shortest distance from the first route and the second route, namely node A to node B (Simpang Sempaja) with the weight of the distance being 0.35 km on the first route, and node A goes to node L (Jl. Gunung Tabur) on the second route with a weight of 1.2 km. and finally the destination node is node B because it has the smallest distance.

The second step calculates the shortest distance from node B (Simpang Sempaja) to node C (Jl. PM Noor) with a weight of 1.7 km in the first route, while in the second route from node L (Jl. Gunung Tabur) to node K (Simpang Jalan Krayan) has a weight of 0.6 km and finally the shortest distance is node L to K.

The third step calculates the shortest distance from node C (Jl. PM Noor) to node D (Intersection of DI Panjaitan) with a weight of 1.2 km on the first route, for the second route from node K (Simpang Jalan Krayan) to node J (Jl. Gunung Tabur) with a weight of 0.5 km, and the shortest distance is node K to J.

The fourth step calculates the shortest distance between node D (intersection of Jalan DI Panjaitan) to node E (Jl. DI Panjaitan) with a weight of 1.2 km on the first route, and on the second route from node J (Jl. Gunung Tabur) to node I ((Intersection of Gelatik Street) with a weight of 0.23 km and the shortest distance is node J to I.

The fourth step calculates the shortest distance between node E (Jl. DI Panjaitan) to F (Jl. Bugis Mugirejo) on the first route with a weight of 0.28 km, and on the second

route from node I (Simpang Jalan Gelatik) to node H (Jalan Bontang Samarinda) with a weight of 0.75 km and the shortest distance is node E to F.

The fifth step is to calculate the shortest distance between node F (Jl. Bugis Mugirejo) to node G (Jl. Aziziyah) with a weight of 0.15 km on the first route, and node H (Jalan Bontang Samarinda) to node E (Jl. DI Panjaitan) with a weight of the distance is 2.2 km, and the shortest distance is vertices F to G.

From the implementation of the Dijkstra algorithm above, we can conclude that the shortest path or the shortest distance is the first route that has already reached the destination on Jl Aziziyah, precisely Al-Aziziyah Islamic Boarding School - LDII Samarinda. Meanwhile for the second route, although at some points the second route node has the smallest weight of the shortest path, but when the first route has reached node G, the second route stops at node E where the second route still has to travel a distance with a weight of 0.28 in node E to F and The weight of the distance is 0.15 from Node F to G. It means that the second route is further with a weight difference of 0.43 km.

4. CONCLUSION

Based on the research that has been done. Researchers got several conclusions, namely the implementation of calculations using the Dijkstra Algorithm can help calculate the weight of the shortest distance in determining the route from the Starting point of Jalan Wahid Hasyim to Al-Aziziyah Islamic Boarding School - LDII Samarinda.

Google Maps, LBS (Location Based Service) based applications, Global Positioning Systems, graphs and other theories are also very helpful and supportive in the implementation phase of the shortest path calculation. Of course, by entering the distance weight data into the node which is also made to symbolize the name of the location that has been described in the results and discussion.

The researcher offers several suggestions that can be used for research development in finding the fastest and shortest route, including by expanding the scope of the research area such as covering other nearby islamic boarding schools in Samarinda and in Indonesia so that the implementation of this Dijkstra algorithm can provide benefits to the wider community, Especially Muslims in finding the nearest Islamic boarding school route.

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