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Development of the Gadingsari Village Tourism Geographic Information System Application

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Abstract.

Gadingsari Village is a city located in Jogjakarta, has cultural diversity as an asset of regional wealth, and must be developed as optimally as possible. Many tourists visit tourist attractions in Gadingsari Village, but there are difficulties in choosing the tourist attractions visited due to limited information about tourist attractions in Gadingsari Village. The other problems are congestion problems, cost problems, time problems,s, and labor problems. The purpose of this study is to create a geographic information system for tourism in Gadingsari village. The system is built using PHP and MySQL programming languages as database management as well as the application of the Dijkstra algorithm used to find the shortest path based on the smallest weight from one point of departure to another. The tests carried out in this study used the User Acceptance Test, aiming to determine the user's understanding of the application created. The resulting geographic information system consists of several features, namely the information feature of tourist places, and the feature of finding the fastest route to the tourist spot. In the fastest route search feature, the Dijkstra algorithm works optimally so that it can quickly find the fastest route to tourist places in Gadingsari Village.

BACKGROUND

Tourism is one of the important economic sectors for Indonesia which is always developing from year to year and will always experience growth (1). In the economy in Indonesia, the tourism sector directly provided a gross deposition of 4.8 percent in 2019, this provided an increase of 0.30 from 2018 which was 4.5 percent but, during the spread of covid 19, the Indonesian government carried out large-scale social restrictions so that this was affected by the sector of Indonesian tourism, t There was a decrease in total foreign tourist visits in January-May 2020 of 2.9 million, decreasing to 53.36 percent from the previous year of 6.3 million visits (2). To solve this problem, in this new normal period, Indonesia must develop all tourism potentials from all regions in Indonesia, one of which is the Gadingsari village. Here is a map of the ivory sari village shown in

Gadingsari Village is one of the 4 villages of Sanden District, Jogjakarta, which is located in the westernmost area, has a coastal area that is now a tourist attraction under the name "Goa Cemara". With the existence of the South Ring Road (JJLS) which passes through Gadingsari Village, it facilitates access to Gadingsari village as a tourist destination, this has a positive impact on the progress of coastal tourism in Gadingsari Village where the available transportation facilities can make visitors feel safe and comfortable to come to Gadingsari village. Finally, the

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number of tourist visits to Gadingsari Village from year to year is expected to increase (3),(4). However, sometimes tourists experience difficulties in choosing the tourist attractions visited because of limited information about tourist attractions in Gadingsari Village. This is because the information on tourist attractions in Gadingsari Village is incomplete and not up to date. So incomplete information makes tourists feel difficult in choosing tourist attractions according to the desired criteria. When dealing with tourism problems, The use of maps and geographic information can be used to solve community problems that are integrated into various fields, including tourism mapping(5),(6). geographic information system for Gadingsari village tourism is needed to assist tourists in finding information about the tourist place of Gadingsari Village and the fastest route will be visited.

Tourism geographic information systems have been created before and published by previous researchers, such as (7),(8), who stated that the comparison between the three algorithms namely Dijkstra, Bellman-Ford, and Floyd- Warshall is based on the complexity of space and time. The analysis shows that the Dijkstra algorithm is very useful in the problem of finding the shortest route from one source and will be optimized in a real way when implemented, such as heap optimization. The implementation of the Bellman-Ford algorithm is simple but the algorithm itself is not effective to create the shortest route. The Floyd-Warshall algorithm is the slowest and most inefficient algorithm when working with oversized map sizes. Based on these results, it is stated that the Dijkstra algorithm is superior in the route search process, therefore this study will apply the Djikstra algorithm to get the closest route from users to Gadingsari tourism places.

RESEARCH METHODS

Dijkstra Algorithm

The Dijkstra Algorithm is a form of the greedy algorithm. This algorithm is included in the search algorithm with a graph that is used to find the shortest path with one source on the graph that does not have a negative side budget and creates the shortest path in the form of a tree (9). Usually, algorithm Dijkstra will be implemented in a system using the Java programming language (10). Here are the stages of using the Dijkstra algorithm. The research method can be seen in the following flowchart **FIGURE 1.**

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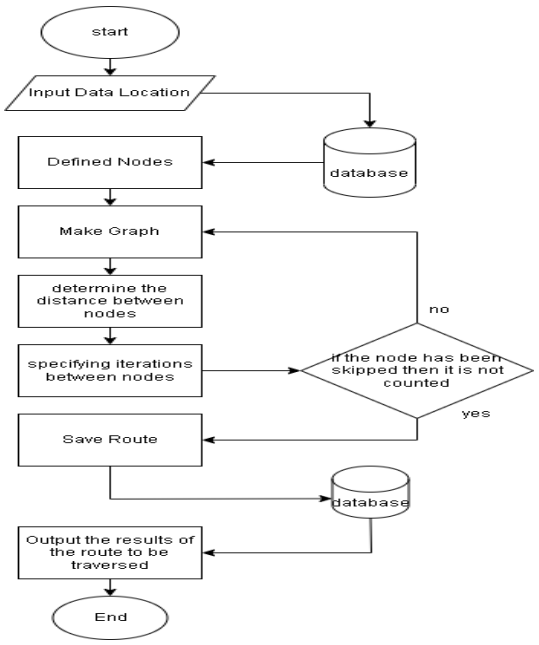

FIGURE 1. Flowchart Dijkstra Algorithm

The following is an explanation of the use of the Dijkstra Algorithm according to the flowchart figure above:

1. Input tourism location data that will be entered into the geographic information system and stored in the database.
2. Change the location data of the tourism place to a node symbolized by N to facilitate the creation of graphs.
3. Performing a graph creation that starts with node creation starts with the set of all nodes that have not been traversed and sets the initial node as a "Departure node".
4. Determine the distance between each node with the Eq. (1). :

$$T \quad Diai = 1 => 2 => 3 => \tag{1}$$

5. Specifies the iteration between nodes, provided that if the node has been bypassed then it cannot be recalculated.
6. If the fastest route has been obtained, then the route will be stored in the database

RESULTS AND DISCUSSION

Application Program Design

In the design of the application program, a web-based Geographic Information System application program was created with the use of Unified Modeling Language (UML). UML is a graph used to visualize, define, build, and document each design of the software system to be created. The process design consists of several parts, including the following:

a. Use Case Diagrams.

Use case diagrams are used to provide an overview of the actions taken by the system by

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generating a value and result that can be used by the actor. In the system, there are two actors, namely users as web users who need information about the closest distance and information about tourism to be visited in Gadingsari village and managers as people who process data and update data on tourism in Gadingsari village. The use case diagram for the system is shown in **FIGURE 2.**

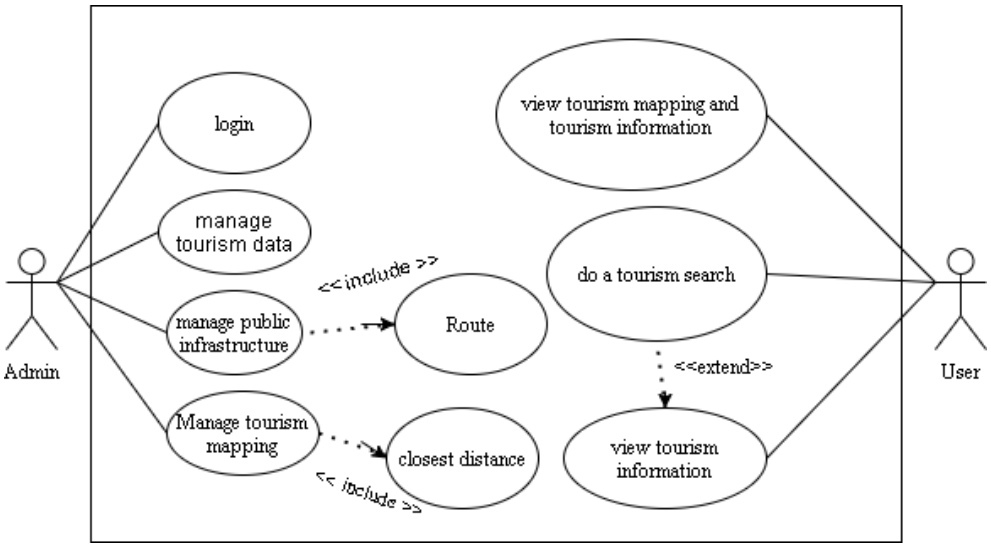

FIGURE 2. Use Case Diagram GIS Tourism

b. Database Design.

In designing a database for geographic information systems on tourism mapping in Gadingsari Village using the Entity-Relationship Diagram (ERD) design. As shown in **FIGURE 3.**

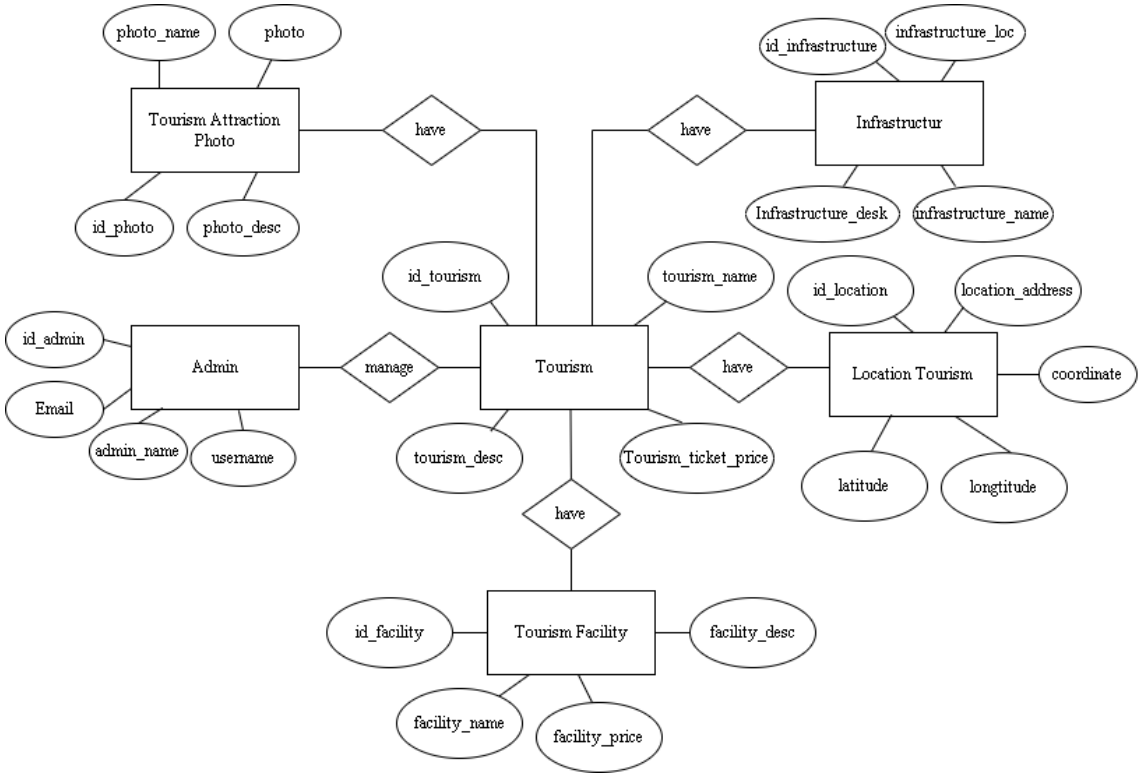

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FIGURE 3. Entity Relationship Diagram GIS Tourism

Use of the Dijkstra Algorithm on tourism maps

a. Input Location Data

The first stage is to determine the places to be included on the map. For this research, the selected places are divided into two, the first is tourist places such as beaches, hills, rivers, and others that are used as tourist attractions by the people of Gadingsari village and the second is supporting facilities for such as restaurants, refueling stations, lodging places and public transportation, which can help tourists in visiting various tourist places in Gadingsari village. Data on tourist attractions and supporting facilities can be seen in **TABLE 1.**

TABLE 1. Location Data of Gadingsari Village

Location Type	Location Name
Tourist Attraction	Pantai Patihan
	Pantai Goa Cemara
	Pantai Pandan Sari
	Pantai Dewaruci Bandung
	Wisata Kebun Buah Naga wonoroto
	Romantic Garden Bantul
	Waduk Embung
	Miniatur Ka'bah Manasik Haji Dewaruci
	Mercusuar Pantai Pandan Sari
	Dek Lastri Garden Samas
	Bumi Perkemahan Dewa Ruci
	Camping Ground Pantai Pandansari
Hotel	Sunset Beach Bantul
	Homestay Goa Cemara, Kang Katno
Restaurant	De' Leyon Coffee
	RM Pangenggar Rasa
	Warung Seafood Bantul
	Mbak Ari Resto
	Rumah Makan Devian
	Vani Resto
	Lesehan KANG NODO
	Bakso Rajawali
	Warung Mak Syarif
	Soto Mak Tomblok
	Masakan Seafood Jogja
	Rumah Makan Dapur Cemara
	Cafe Laras
	RM Panorama
Parking Area	Cemara Cave parking area
Transportation	Bandar Udara Internasional Adisutjipto
	Stasiun Yogyakarta
	Stasiun Lempuyangan
	Stasiun Timoho
	Stasiun Maguwo

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b. Defining Nodes/Vertices/Nodes

After inputting the place name data to be entered into the map, the place that has been inputted will be symbolized into nodes that are sequential to make it easier to create sequential graphs. The node is denoted by the symbol N.

c. Create a Graph

The creation of nodes begins with the set of all nodes that have not been passed and the set of the initial node as the "Departure node". From the departure node, consider the neighboring nodes that have not yet been passed and calculate their distance from the point of departure. If the distance is smaller than the previous distance that has been

previously recorded) delete the old data, and re-save the distance data with the new distance. Graph images can be addressed in **FIGURE 4.**

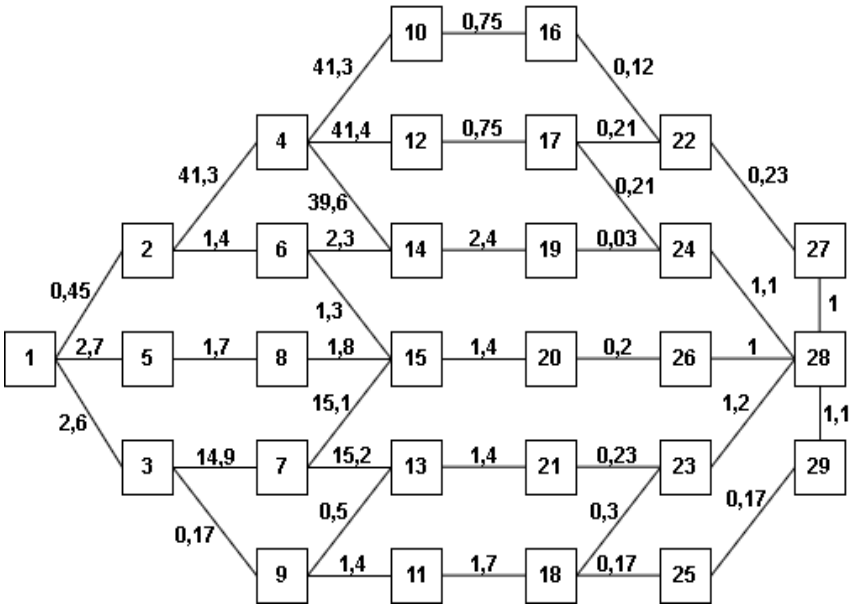

Figure 4. Graph Dijkstra

d. Define iterations between nodes/vertices/nodes

When a new point with the shortest distance is obtained, the distance of the known point (from the starting point) is updated at each iteration. Node/Node/Vertex N1 - N29. For example, in the first iteration, it is node 1 with node 2 with a weight of 0.45. Then node 1 with node 3 with a weight of 2.4. In the Algorithm, Dijkstra takes the shortest distance, namely on node 2. This node 2 is the path to be passed and as the second iteration. The iteration method is the same as taking the smallest distance value. Because node 2 is the second iteration, it will not be recalculated or skipped again. Here's the description:

1. The yellow column means the path to be traveled. A red column means a path that should not be passed back.

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2. Distances between nodes use distance data in units of kilometers (KM). Calculate the distance between nodes by looking at the nearest node. If the vertices are outside the path, then it can be said to be infinite (uncountable). If the inter-nodes are in the direction of the path, then it can be calculated.

If you count one node with another that has already been passed, then it can be said to be infinite. An example of Node iteration can be seen in **TABLE 2**

3. .

TABLE 2. Node Iterations

Iteration	From Node/ To Node	N1	N2	N3	N6
1	N1	0	0,45	2,6	-
2	N2	0	0,15	-	1,4
3	N6	0	-	-	0
4	N15	0	-	-	-

a. The iteration between nodes can be seen with the result of the distance for example from N1 to N2 resulting in a distance of 0.45 KM. This value is the smallest between the distance of N2 to other nodes. Then N2 is the second iteration. Likewise with the distance of other nodes. If there is the smallest value, then the smallest value is the iteration. If the Node has already calculated the distance value, it cannot be reused for calculations with the distance of other nodes. *The output of the result of the route to be traversed*

The output obtained from the results of the previous itertion from Node 1 to Node 29 results in a route to be traversed i.e. by order caper $1 -> 2 -> 6 -> 15 -> 22 -> 27 -> 29$ of . So the shortest path to be traversed is (Eq. (2)).:

$$\begin{aligned} \text{The Fastest Route} &= 1 + 2 + 6 + 15 + 22 + 27 + 29 \\ &= 0.x45 + 1{,}4 + 1{,}3 + 0{,}12 + 0{,}23 + 1 + 1{,}1 \\ &= 5{,}6\ K \end{aligned} \tag{2}$$

CONCLUSION

The resulting application consists of a geographic information system that has feature features such as the information feature for tourism places in Gadingsari Village which includes details of tourism places, photos of tourism places, and information about ticket prices in Gadingsari Village. The second is the fastest route feature with the use of the Dijkstra algorithm as an algorithm that searches for the fastest route. This geographic information system helps tourists in knowing the tourist attractions they will visit in Gadingsari Village and Gadingsari Village can increase economic income in the tourism sector

REFERENCES

1. Jonathan CJ, Tarigan R. The effects of e-tourism to the development of tourism sector in Indonesia. *CommIT (Communication and Information Technology) Journal*. 2016 Oct 31;10(2):59-62.
2. Utami BA, Kafabih A. Sector pariwisata Indonesia di tengah pandemi COVID 19. J*urnal*

https://doi.org/10.24912/ijaste.v1.i2.484-491

Dinamika Ekonomi Pembangunan (JDEP). 2021 Jan 28;4(1):383-9.

3. Asmin, Linna. (2017). Rancangan Rencana Pembangunan Jangka Menengah Desa (RPJM Desa) Tahun 2017- 2022. Gadingsari.
4. Edy H, Baiquni M, Triatmodjo B. Impact of Infrastructure Development Jalur Jalan Lintas Selatan (JJLS) on Changes in Land Use in Gadingsari Village, Sanden District, Bantul Regency, Yogyakarta, Indonesia. Geosfera Indonesia. 2019 Aug 1;4(2):78-89.
5. Trisnawarman D, Rusdi Z. Participatory GIS for collaborative decision making development of village resource potential. InIOP Conference Series: *Materials Science and Engineering* 2019 Apr 1 (Vol. 508, No. 1, p. 012117). IOP Publishing.
6. Chambers R. Participatory mapping and geographic information systems: whose map? Who is empowered and who disempowered? Who gains and who loses?. *The Electronic Journal of Information Systems in Developing Countries.* 2006 Jun;25(1):1-1.
7. Wang XZ. The comparison of three algorithms in shortest path issue. In *Journal of Physics*: Conference Series 2018 Sep 1 (Vol. 1087, No. 2, p. 022011). IOP Publishing.
8. AbuSalim SW, Ibrahim R, Saringat MZ, Jamel S, Wahab JA. Comparative analysis between Dijkstra and bellman-ford algorithms in shortest path optimization. InIOP Conference Series: *Materials Science and Engineering* 2020 Sep 1 (Vol. 917, No. 1, p. 012077). IOP Publishing.
9. Wahyuningsih D, Syahreza E. Shortest Path Search Futsal Field Location with Dijkstra Algorithm. *IJCCS (Indonesian Journal of Computing and Cybernetics Systems)*. 2018;12(2):161-70.
10. Fitriansyah A, Parwati NW, Wardhani DR, Kustian N. Dijkstra's algorithm to find shortest path of tourist destination in Bali. In *Journal of Physics*: Conference Series 2019 Oct 1 (Vol. 1338, No. 1, p. 012044). IOP Publishing.

https://doi.org/10.24912/ijaste.v1.i2.484-491