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Implementation of Dijkstra's Algorithm to Determine the Shortest Route in a City


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ABSTRACT

This study discusses the search for the shortest route from city A to city G using the Dijkstra algorithm based on distance traveled. Dijkstra's algorithm is one of the algorithms used to solve the shortest path and does not have a negative cost. The greedy strategy used in this algorithm is that each node in the graph will find the minimum value. This algorithm will look for a path with the minimum cost from one point to another. The purpose of this research is to understand the implementation of Dijkstra's algorithm on a graph to get the shortest route that is most optimal. The experimental results from city A to city G using Dijkstra's algorithm obtained the shortest route, which is 6 km with the route of city A - city C - city D - city E - city G.

Keywords: Dijkstra's Algorithm, The Shortest Route, City

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1. INTRODUCTION.

The problem of determining the shortest path is currently very interesting to discuss in everyday life. This problem is related to finding the shortest route and the minimum budgeted costs. Unintentionally, we experience this problem almost every day (Akram, Habib, & Alcantud, 2020; Luo, Hou, & Yang, 2020). For example, traveling from one place to another, telephone networks, electricity networks and so on. Another example is the online motorcycle taxi which is currently very popular in Indonesia. Online motorcycle taxi trips always look for the shortest path from the starting city point to the final destination city point. This is so that every online motorcycle taxi driver can quickly get customers according to the target set by the company every day.

Şahin, B. (2019) There it appears that information technology is increasingly advanced and sophisticated today. Therefore, many people who want to travel by looking for the shortest route or distance to reach the trip using technology. Qing, Zheng, & Yue (2017) So here we use Dijkstra's algorithm to help find the shortest distance in a city. Dijkstra's Algorithm is a greedy algorithm that is commonly used for searching the shortest distance where the input of this algorithm is a weighted directed graph with a point of origin from a set of lines (Makariye, 2017). The way this algorithm works is by visiting all the nodes and making their distances. If there are two distances to the same node, then the distance with the lowest weight is selected, so that all nodes have the optimal distance and this search is carried out until the destination node is found. In other words, Dijkstra's algorithm calculates the path based on the shortest distance traveled in a city.

2. RESEARCH METHOD

The research method is a way to get back the solution to all problems. The research methodology was carried out in several stages, namely:

1. Data Collection

In the shortest path problem, to determine the optimum value, variables such as the weight value on the edge, the number of vertices traversed, the total weight of all active vertices and the speed in the calculation notation are needed. This is very important as a basis for making conclusions to get the optimum decision in solving the shortest path problem (Lubis et al., 2019; Lubis et al., 2020; Al-Khowarizmi et al., 2020; Al-Khowarizmi et al., 2020 Al-Khowarizmi et al., 2020).

In conducting research, it is also necessary to have raw data to be used as a basis for testing. To get the results, it is necessary to process the data first. The initial stage is designing the graph, then determining the weight of each - each vertex based on distance.

2. Research Framework

The research framework is as follows:

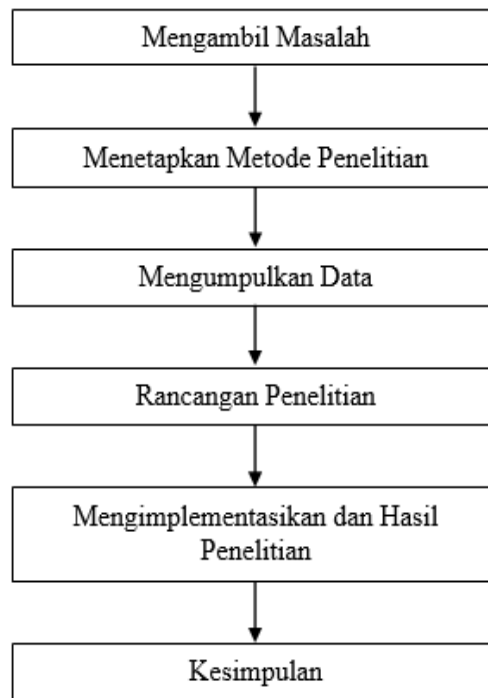


Figure 1. Research Work Design

3. RESULTS AND DISCUSSION

A. Implementation

This research will look for the shortest path from the starting city point to the final destination city point. The following is an example of a graph representation.

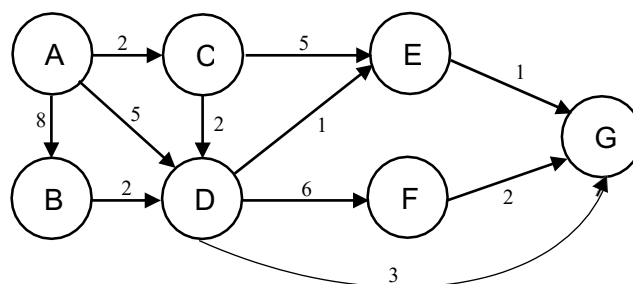


Figure 2. Graph with 7 Vertices and 11 Edge

The shortest route is obtained in the graph from Figure 2. It is as follows:

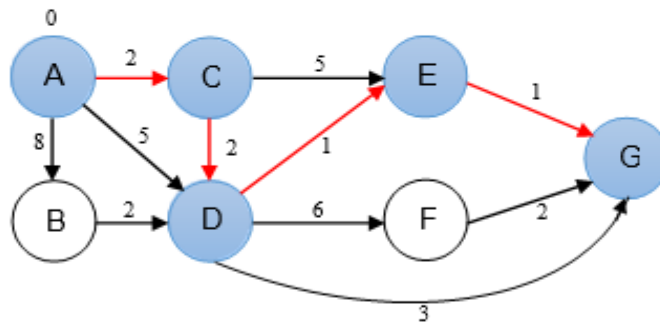


Figure 3. Graph with 7 Vertices and 11 Edge

Shortest route = A - C - D - E - G
 = 0 - 2 - 2 - 1 - 1
 = 6 km

B. Presentation of the System

Using Dijkstra's Algorithm software which is implemented using excel.

Algoritma Dijkstra untuk Mencari Jarak Jalur Terpendek



Figure 4. Display of Dijkstra's Algorithm Calculate

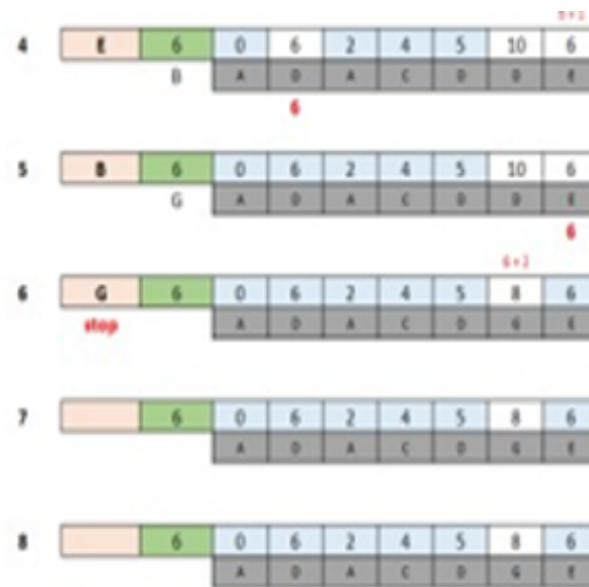


Figure 5. Display of Dijkstra's Algorithm.

Discussion of the image above:

For each step,

- (1) From selected city, add the previous smallest number with all the distances from the selected city to the connected city whose square is not blue.
- (2) Compare the sum in steps 1 with the value in the previous box, write into the box the smallest value of the two values.
- (3) From the box that is still white, select the smallest number, then the next city choice is the city with the smallest value.

From the picture, the shortest path distance is:

$$\begin{aligned}
 \text{Shortest route} &= A - C - D - E - G \\
 &= 0 - 2 - 2 - 1 - 1 \\
 &= 6 \text{ km}
 \end{aligned}$$

4. CONCLUSION

Based on the results of this study it can be concluded The problem of finding the shortest route can be solved by the Dijkstra algorithm. By using the Dijkstra algorithm in the process of finding the shortest route from the destination location the starting city to the destination location of the final city, if there are several locations adjacent to the location origin there is a possibility that the location will be at the end of the shortest route sequence. There is a need for deeper research in determining the shortest route by utilizing the advantages of each algorithm in achieving the optimum route.

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