

Parking Lots Space Detection With *Floyd Warshall* Algorithm At Kartini Shopping Mall Bandar Lampung

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Abstack--Mall Kartini is the second largest central place in Bandar Lampung City with a building area of 40,000 m² and consists of 4 floors and a parking capacity of up to 200 vehicles. With available space during peak hours, 11.00 AM to 1.00 PM for the parking space jumped to 50% from usual hours. Based on the survey results, 80% of the 100 vehicle users who will park have obstacle turning around to get a parking space. To determine this problem, this study used the Floyd–Warshall method to compare all possible paths in the graph for each side of all existing vertices. The result of this study stated that a designed application gave a displays information on space parking lots by applying the Floyd–Warshall algorithm in calculating the shortest path. Furthermore, it was able to compare all possible paths on the graph for each side of all existing vertices. Based on the results of the Black Box testing, several component were carried out, including: Device 1 with Android version 8.0, Device 2 with Android version 9.0 and Device 3 with Android version 10. All test components were successfully carried out. Moreover, the difference for the appearance of the application was impacted due to the difference device in screen size.

Keywords-- Android, Parking Space, Floyd-Warshall Algorithm

I. INTRODUCTION

Kartini Mall is one of the second largest shopping centers in Bandar Lampung City. This mall was founded around 2003 with a building area of 40,000 m² and consists of 4 floors and a parking capacity of 200 vehicles. Kartini Mall building operates from 10.00AM to 09.30PM. Based on the survey results, 80% of 100 drivers who will park have difficulty in turning around when they get a parking lot which turns out to be full when the vehicle is about to park because the information on the available parking space is not obtained by the driver in real time [1]. It is managed by 15 officers, each of whom is tasked with managing payment counters, arranging parking [2] spaces so that vehicles are more organized according to the available land.

In addition, in one day there are usually approximately 150 vehicles parked, but during peak hours at 11.00AM to 01.00PM the crowded parking area jumps to 50% from usual hours, this creates problems for motorists, especially female parking visitors or drivers who are not good at driving their vehicles.

II. LITERATURE REVIEW

A. Parking

The word parking comes from the word "park" which means park. According to the Indonesian dictionary, parking is defined as a place to store parking is defined as an activity to put or store vehicles in a certain place whose duration depends on the completion of the needs of the rider. Parking is placing vehicles from a place or area for a certain parking period (duration).

B. Android

Android [3] is an operating system [4] for smartphones and tablets. The operating system can be illustrated as a 'bridge' between the device (device) and its users, so that users can interact with their devices and run applications available on the device. A mobile phone is a mobile device such as a mobile phone or mobile computer that is used to access network services.

C. Algoritma Floyd Warshall Method

According the application of the Floyd Warshall algorithm is carried out based on the results obtained from the problem analysis stage. Floyd Warshall's algorithm is very efficient from a data storage point of view because it can be implemented by simply changing a distance matrix. For data acquisition, this study uses secondary data obtained through state of the art reviews of other similar studies as well as through internet access. The parking location suggested by the system is based on the location of the parking lot with the shortest path that can optimize the distance traveled by visitors to the building entrance. The shortest path problem is the problem of finding a path between two vertices such that the sum of the weights of their constituent arcs is minimized. To determine the shortest path in determining the parking layout [5] in this study using the Floyd Warshall method to calculate the shortest path from the entrance to the parking lot.

III. METODE ALGORITMA FLOYD WARSHALL

Floyd Warshall's algorithm[5] is one of the variants of dynamic programming, a method for solving the problem of finding the shortest route. This method performs problem solving by looking at the solution to be obtained as an interrelated decision. That is, solutions are formed from solutions that come from the previous stage and there is a possibility of more than one solution. This algorithm can also be applied to an application that finds the closest road route from one area to another. with this method the results obtained can be more optimal but require a large enough resource if used for complex searches. Floyd Warshall's algorithm is one of the variants of dynamic programming, a method for solving the problem of finding the shortest route. This method performs problem solving by looking at the solution to be obtained as an interrelated decision. That is, solutions are formed from solutions that come from the previous stage and there is a possibility of more than one solution. This algorithm can also be applied to an application that finds the closest road route from one area to another. with this method the results obtained can be more optimal but require a large enough resource if used for complex searches. The following is the application of the Floyd Warshall Algorithm Method in making the closest Empty Parking Land application.

Floyd-Warshall algorithm to find the shortest path is as follows:

- 1) $W = W_0$
- 2) For $k = 1$ until n , do :
 - For $i = 1$ until n , do :
 - for $j = 1$ until n , do :
 - if $W[i,j] > W[i,k] + W[k,j]$ then swap $W[i,j]$ with $W[i,k] + W[k,j]$.

Description:

W_0 = connectedness matrix graph to the initial weight

W^* = minimal matrix connectedness

$W_{i,j}$ = shortest path from point v_i to v_j

In iteration to find the shortest path, Floyd Warshall algorithm forms n matrix, corresponding to iterations- k . This will cause the process to be slow, especially for large n values. Although the processing time is not the fastest, Floyd-Warshall algorithm is often used to calculate the shortest path because of its simplicity.

The Floyd-Warshall algorithm here compares all possible paths in the graph for each edge of all vertices. This can happen because of the estimated decision making (choice of the shortest path) to determine the vacant parking lot for each floor of the building, at each stage between two nodes, until the estimate is known as which optimal value will be presented as information. In this case study, we are at the starting point where we will look for the nearest vacant parking lot from the 1st floor of the building, then we must pass at least one point, the point between A_1 , B_1 and B_2 , the network model is shown in the following figure:

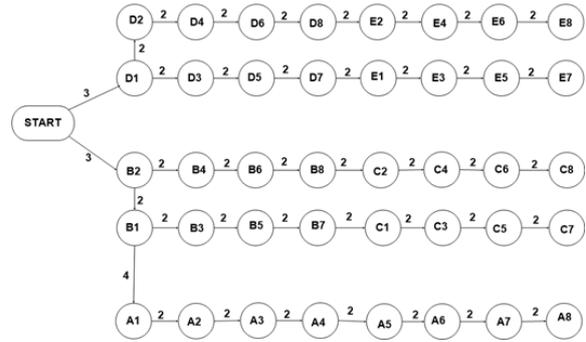


Figure 1. Parking Lot Graph Representation

	Start	B2	B4	B6	B8	C2	C4	C6	C8	B1	B3	B5	B7	C1	C3	C5	C7
Start		3								2							
B2	--		2	4	6	8	10	12	14	2	4	6	8	10	12	14	16
B4	--	--		2	4	6	8	10	12	--	--	--	--	--	--	--	--
B6	--	--	--		2	4	6	8	10	--	--	--	--	--	--	--	--
B8	--	--	--	--		2	4	6	8	--	--	--	--	--	--	--	--
C2	--	--	--	--	--		2	4	6	--	--	--	--	--	--	--	--
C4	--	--	--	--	--	--		2	4	--	--	--	--	--	--	--	--
C6	--	--	--	--	--	--	--		2	--	--	--	--	--	--	--	--
C8	--	--	--	--	--	--	--	--		--	--	--	--	--	--	--	--
B1	--	--	--	--	--	--	--	--	--		2	4	6	8	10	12	14
B3	--	--	--	--	--	--	--	--	--	--		2	4	6	8	10	12
B5	--	--	--	--	--	--	--	--	--	--	--		2	4	6	8	10
B7	--	--	--	--	--	--	--	--	--	--	--	--		2	4	6	8
C1	--	--	--	--	--	--	--	--	--	--	--	--	--		2	4	6
C3	--	--	--	--	--	--	--	--	--	--	--	--	--	--		2	4
C5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		2
C7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	

Figure 2. Distance between Block

In the application of the Floyd-Warshall algorithm above, the working stages of the algorithm are:

1. Looking for any nodes that can be passed to get to the destination node or D
2. Add up the edge value on the node with the edge on the node to be traversed starting from the initial node to the destination node. The starting node here is at node B4

$$B_4 = B_2 + B_4$$

$$= 2m + 2m$$

$$= 4m$$

$$B_4 = B_2$$

$$= 2m$$
3. Produce the smallest path information from the sum of the edges on the nodes that can be traversed. From the sum results above, the smallest value is obtained, namely on the B2 path with a total number of 2m edges.

IV. RESULT AND DISCUSSION

This research contains Unified Modeling Language (UML) modeling, namely the use of case diagrams, class diagrams, and activity diagrams. The explanation of each diagram is as follows:

1. Use Case Diagrams [6]

Proposed Software Use Case Diagram

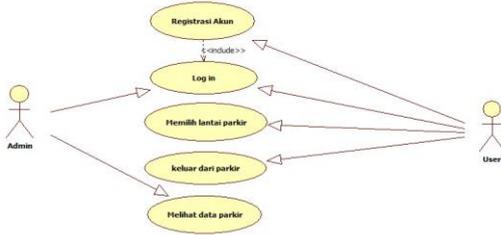


Figure 3. Use Case Diagram

2. Class Diagram

Activity Diagram of the Driver Running the System

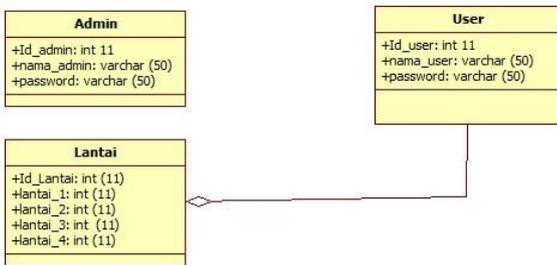


Figure 4 . Class Diagram

3. Activity Diagram

Activity Diagram of the Driver Running the System

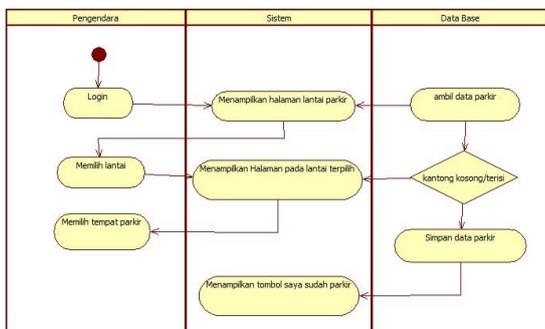


Figure 5. Activity Diagram

The closest vacant parking lot application based on Android [6] is designed using the Floyd Warshall Algorithm method as the implementation flow and is built using the Java programming language as the implementation of the functions of the Android [7] Application display. This application runs on Android devices and is operated online.

This application is used to help especially consumers in providing the nearest empty parking lot in the Kartini Mall area.

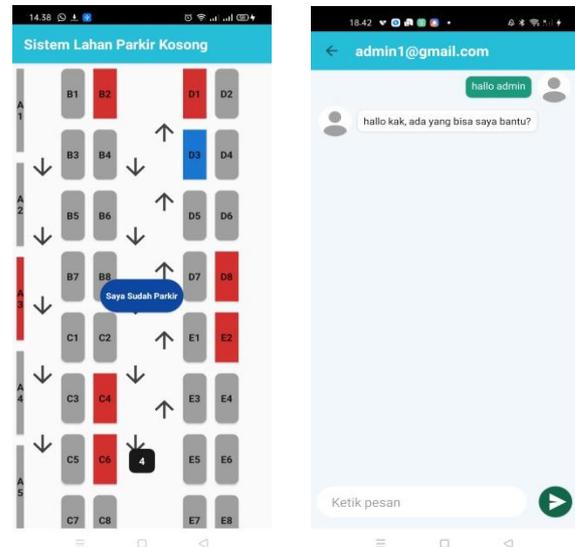
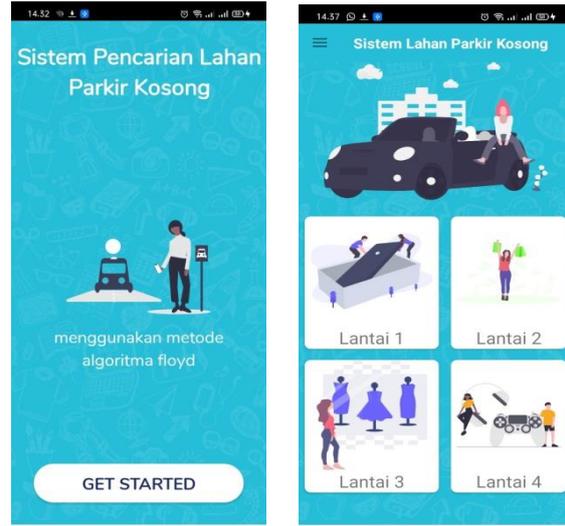


Figure 6. The display of the empty parking lot search system application.

5. CONCLUSION

Based on the results [8] of the implementation and testing that has been done on the vacant parking lot application, it can be concluded that the Empty Parking Land application can make it easier for consumers to find the nearest empty parking lot where consumers generally complain because they have to rotate the parking area many times.

This application displays information for vacant parking lots by applying the Floyd Warshall algorithm as a search that can be used in calculating the shortest path, and is able to compare all possible paths in the graph for each edge of all existing vertices.

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