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Mapping Diving Locations on Bali Island Based Mobile

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ABSTRACT

The Bali island is located in the central region of Indonesia has a very beautiful sea and diverse. There are many spot diving that can be found on this island of Bali. The underwater life of the fauna is numerous and diverse. Different locations make divers confused in choosing the appropriate location and having difficulty reaching the location. Divers should seek information first to come to the location of the diving. To overcome the above problems required a system design that can help to mapping the points of diving locations on the island of Bali. The information system is built on a mobile basis using the dijkstra algorithm to map the existing diving locations in Bali and look for the nearest route. The diving location mapping system in Bali island by using the dijkstra method is expected to make it easier to find diving locations on the Bali island.

Keywords: *Diving, Bali Island, Location Mapping, Dijkstra.*

1. INTRODUCTION

Human needs are increasing to meet the needs of various needs such as health care, safety, and tourism [1]. Tourism is an important sector to attract many visitors and revenues from around the world so as to demand appropriate policies on city governance in supporting tourism [2]. Tourism is one of the fastest growing industrial sectors in the economy [3]. The most common way to know any city is through the brochures provided by the Information and Tourism Office. In this way, an office can foster more interesting ways to learn about different aspects of the city [4].

Utilization and application of technology is a challenge in the XXI century especially an application that supports mobile devices [5]. Tourist information is one of the most important elements in tourism infrastructure. Tourism promotion activities of a region will be effective if supported by an efficient information system [6]. The latest information technology is a spatial information technology with the ability to manage and analyze data that has a temporal, geographic, and spatial [6].

Wireless technology and mobile phones become an integral part of everyday life and change the way people connect and interact with the world. The phone has various applications. Mobile devices have had a significant impact on banking, tourism (Web GIS), and health services [7]. Mobile devices have the ability to collect information about the surrounding environment by using guide apps to suggest tourist attractions, based on context factors such as location, weather conditions, and time available [8]. Travel online refers to the user to see information about the sights [9].

Indonesia is a country that belongs to the coral triangle area which is the best biodiversity level in the world. This makes Indonesia as an attractive place to serve as a tourist destination both domestic and international. One of the areas that have interesting sights and visited by many tourists is the island of Bali. One of the most popular tourist activities on the island of Bali is diving. Bali is one of the best diving spots in the world. Divers come to Bali to enjoy Bali's underwater paradise. Different locations make divers difficult to reach the location and still confused with which location to go. Divers should seek information first to come to the location of the diving. Divers need information about the location of the diving and the route to that location that can be reached effectively and efficiently.

The ease of access routes of tourist sites that can be reached optimally is important to attract tourists [10]. Route planning is a plan to travel from two gyroscopic sites. One of the methods that can be used is the dijkstra algorithm [11]. Dijkstra's algorithm is one of the classic shortest path search algorithms [12]. Shortest path calculations are a common prerequisite in many real-world applications such as travel information systems, making network routing tables, and basic data described as graphs [13]. This study aims to design a mobile-based application that presents the shortest route in achieving a diving location in Bali using the algorithm dijkstra.

2. CURRENT RESEARCH

In general there are several studies that discuss the tourism information system and dijkstra algorithm. Research conducted by Masron [7] with title The Conceptual Design and Application of Web-Based Tourism Decision Support System. This research aims to design conspual web application design as decision support system in tourism system in langkawi island with web-based GIS.
Research conducted by Rodríguez-Puente dan Lazo-Cortés [13] with title Algorithm for shortest path search in Geographic Information Systems by using reduced graphs. This study aims to compare the algorithm dijkstra with A * algorithm in finding the shortest route on a geographic information system.
Research conducted by Xiao [11] with title Tourism Route Decision Support Based on Neural Net Buffer Analysis. This study aims to produce a support and availability of tourist routes based on Neural net buffer analysis.
Research conducted by Zacarias [5] with title Smart Tourism in 1-Click. This study aims to produce a mobile application system that can be used for tour guides that can be accessed through mobile devices. SISTEM contains information on GIS-based tourist locations and locations and routes that can be passed to visit a tourist site in mexico city.

3. METODOLOGY

The method used in this study consists of five main steps, namely literature, analysis of needs, design of diving location mapping, coding information system with dijkstra algorithm, and evaluation system. Fig. 1 shows the design was made in several steps in this study

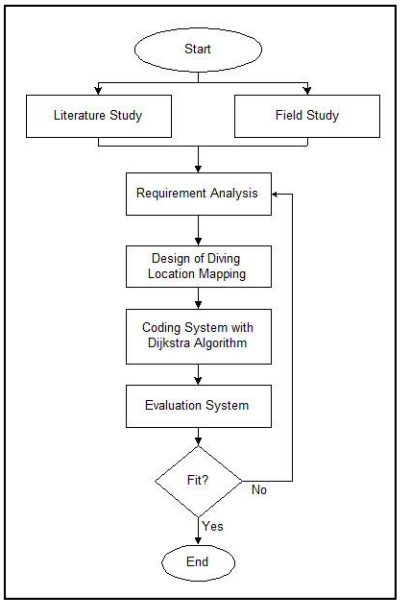

Fig. 1. Metodoly

3.1 Literature Studi and Field Study

Literatue study was conducted to obtain data of research support from existing library sources. Field study conducted by observing the object of tourism is the location of diving in Bali.

3.2 Requirment Analysis

Requirement analysis done to explore the reuirement of software that will be developed. The result of this stage is the software requirement specification.

3.3 Design of Diving Location Mapping

Design of diving location mapping is done to produce a design that describes the mapping of diving locations in Bali.

3.4 Coding System with Dijkstra Algorithm

At this stage done the process of making the application of the location of the diving system by searching the shortest route using the algorithm dijkstra.

The dijkstra algorithm aims to find the shortest path based on the smallest weight from one point to another. Suppose the point of illustrating the building and the line illustrates the path, the Dijkstra algorithm performs a calculation of all possible smallest weights of any point. Fig.2 is an example of inter-point connectivity in Dijkstra's algorithm.

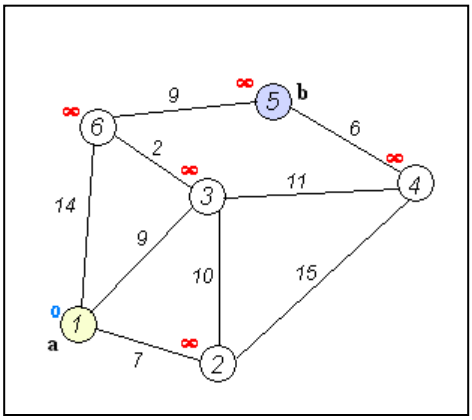

Fig. 2. Graph of the path

Here is the dijkstra algorithm:

1. Distance to source vertex is zero.
2. Set all other distances to infinity.
3. S, the set of visited vertices is initially empty.
4. Q, the queue initially contains all vertices.
5. While the queue is not empty, select the element of Q with the minimal distance.
6. Add u to list of visited vertices.
7. If new shortest path found then set new value of shortest path.

The algorithm when applied in pseudocode looks like the following:

```
dist[s]←0
for all v ∈V – {s}
      do dist[v] ←∞
S←Ø
Q←V
While Q ≠Ø
do u←mindistance(Q,dist)
      S←S∪{u}
      for all v∈neighbors[u]
            do if dist[v] > dist[u]+w(u,v)
                  then d[v]←d[u]+w(u,v)

Return dist
```

3.5 Evaluation System

At this stage testing the system functionality. Evaluation is done to find out whether the software in the design has been in accordance with the needs of the user or not. If the system developed has been appropriate then all stages in the study has been completed but if the system developed is not appropriate then the stages of research will be repeated through the analysis of needs.

4. DISCUSSION

4.1 Spesifikasi System

At this stage, the needs specification is divided into two parts: Information Needs Analysis and Analysis of Functional Requirements.
In the Information Needs Analysis, researchers make observations to obtain a list of user needs. The information required in mapping the diving location on the Bali-based island are as follows:

1. Diving location data
2. Coordinate data
3. Map data of Bali island

System functional requirements for mapping the location of diving in Bali based island are as follows:

1. Capability to connect mobile device to the Internet.
2. Capability to display a list of lokasi diving.
3. Capability to display shorther path to lokasi diving.
4. Capability to display the list of information about lokasi diving.

4.2 Usecase Diagram

Use case diagram is used to show the processes that are inside. Use case on mapping system of diving location in bali island based mobile can be seen in Fig. 3.

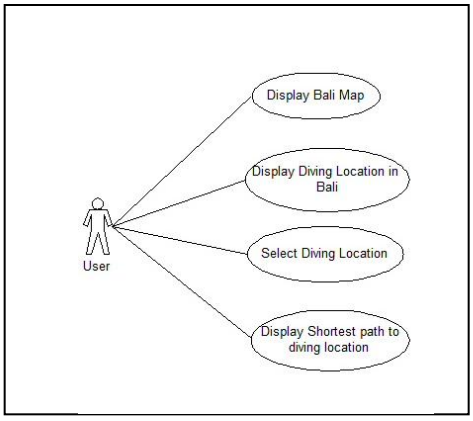

Fig. 3. Usecase Diagram

4.3 Database Conceptual

Conceptual database is a file structure that contains attributes as interpretations of the database system used as storage media. Under Fig. 4 is a conceptual database of diving site mapping systems on Bali island-based mobile.

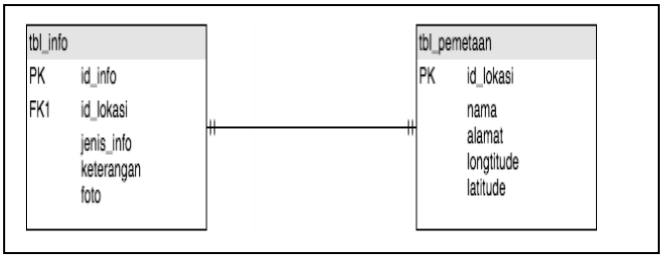

Fig. 4. Database Conceptual

4.4 Desain Interface

Main Page

The main page is the page that appears when the user accesses the diving location mapping system. On this page there are two choices of diving location info in Bali and mapping the location of diving path in Bali along with the shortest path. Fig. 5 The following are the views of the main page.

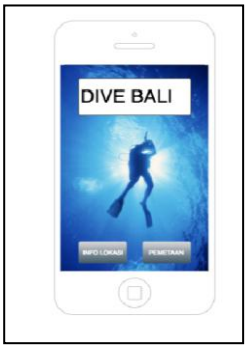

Fig. 5. Main Page

4.5 Search For Diving Locations

The diving location info page is used to display diving location information on the island of Bali. The search results will show the locations of diving available on the island of Bali. It looks as shown in Fig. 6.

Fig. 6. Search for Diving Locations

4.6 Detil of Diving Locations

This page displays information about the diving location described in detail and detail. Photo underwater objects on the diving location will provide additional information To be more clear. These search results display any criteria contained in one diving location. The look of this hamu looks like in Fig. 7.

Fig. 7. Detil of Diving Locations

4.7 Mapping the Diving Locations

This page shows information about mapping the location of the diving using the shortest path. Start points are available from two locations namely the airport and the port of Gilimanuk. The system will provide the shortest path information that will be passed to go to the diving location on the island of Bali. This page looks like in Fig. 8.

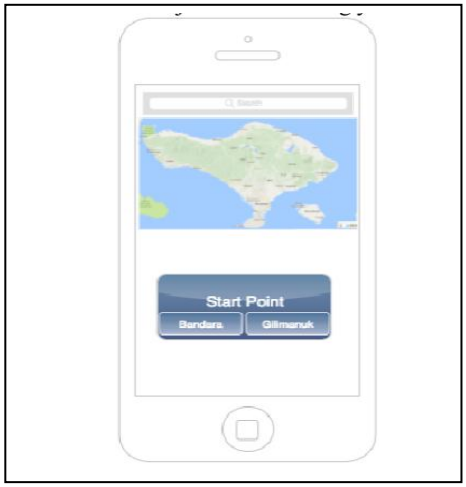

Fig. 8. Mapping the Diving Locations

4.8 Evaluation

This evaluation is conducted to determine whether the shortest route search done in this application has been in accordance with the dijkstra algorithm whose calculations are done manually. In this evaluation, the shortest route search between the international airport of ngurah rai and one of the diving locations is the secret bay. Ngurah Rai international airport as the starting point and secret bay diving location as the destination point.

The calculation of the shortest path from the international airport to the secret bay in accordance with the dijkstra algorithm is as follows:

Vertices = {v1,v2,v3,v4,v5,v6}
Initial node = v1
Destination node = v6
v adjacent = newEdge [] {(v2, 7)}
v2 adjacent = newEdge [] {(v1, 7),(v3, 12),(v4,20.3)}
v3 adjacent = newEdge [] {(v2, 12),(v4, 8.3), (v5, 17)}
v4 adjacent = newEdge [] {(v2, 20.3),(v3, 8.3), (v5, 10)}
v5 adjacent = newEdge [] {(v3, 17),(v4, 10),(v6,24)}
v6 adjacent = newEdge [] {(v5, 24)}

The shortest route:
v1 to v2 = 7km
v1 to v2 to v3=19km
v1 to v2 to v3 to 5 = 36km
v1 to v2 to v3 to v5 to v6 = 60km

The test result using the program shows the shortest route from Ngurah Rai international airport to secret bay diving location is 60km. Figure 9 below is the shortest location screenshoot from the Ngurah Rai international airport to the location of the diving secret bay.

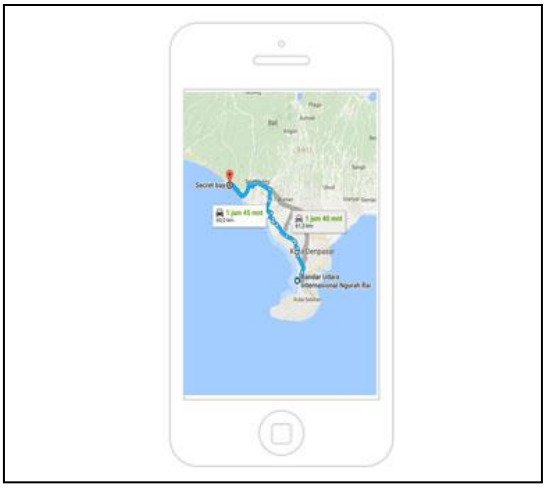

Fig. 9. Mapping the Diving Locations

5. CONCLUSSION

The result of this research is diving location information system mapping in Bali-based pulai. This system has the easiest shortest route search facility to go to the selected diving location. This system serves to facilitate the user in a travel tour to find a suitable diving location in the island of Bali.

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