

Implementation of Geography Information Systems in Searching System for The Closest Locations of Museum (Case Study In The City of Yogyakarta-Indonesia)

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Abstract - Museum as a place used to collect, maintain, and present and preserve the cultural heritage of the community or as a place to explore knowledge becomes one of the places to visit. One of the easiness that the user wants in the search process of a museum location is the existence of other museum information that the location of the existence of the museum is not far from the location of other museums. By implementing geographic information system and google map API, the built application can inform the location of adjacent museum. In this paper, a web-based application can be published which can provide information about the location of adjacent museums, especially museums in Yogyakarta. Applications developed with PHP and databases using Mysql.

Key words: Museum, haversine formula, Yogyakarta

I. INTRODUCTION

In the city of Yogyakarta there are many museums, the existence of this museum can certainly be used as a means of learning about history or familiar objects stored in a museum. The museum has two major functions as a place of preservation and as a source of information. The Definition of the museum according to ICOM (International Council Of Museum) is a permanent, non-profit, public service, public, collecting, maintaining, linking and exhibiting institution for the purposes of study, education and entertainment, goods of human and environmental proof of his [1]

Museum is expected not only to save the changes that exist, but also as a medium to show social change and cultural and economic growth. Museum plays a role in the transformation process that embodies the development of intellectual structure and life level. The development of museums in Indonesia, especially in Yogyakarta is quite good, but certainly requires improvements so that people appreciate the work of the predecessor and preserve the ancestral cultural heritage thus museum as a facilitator of society with cultural civilization can be realized.

One effort that can be taken among others by providing information facilities about the existence of

museum. The existence of information of a museum is expected to encourage the community to visit. Information-based website to be one solution to present the museum. Interesting and detailed information is expected to attract people visiting. In order for the museum location searching process to be easy, geographic-based information system support becomes a solution that facilitates the museum search process.

With location-based location bases system application support it is an alternative in the development of such applications. Location-based services (LBS) allow users on the go with access to geographic data using micro-laptops, tablet PCs, personal digital assistants (PDAs). [2]Sistem berbasis lokasi menjadi salah satu bidang yang paling populer di komputasi mobile. Dengan sistem berbasis lokasi memungkinkan berkembang nya aplikasi berbasis LBS, seperti museum, bank, pusat perbelanjaan [3]

In this paper it is discussed, the implementation of the search location of a museum and other museum positions closest to the initial position of the museum sought. With this application users get information about the location of the museum within a radius of 4 Km from the position of the first museum sought. The application was built by utilizing the google map API facility [4] as well as applying the formula haversine. The Haversine Formula is an important equation in the field of navigation, this formula can provide a large circular spacing between two points on a sphere shape of latitude and longitude [5].

II. RESEARCH METHOD

A. Analysis Stage

Stage analysis aims to identify the problems that exist in the system and the results of analysis of the system and related elements. This analysis is needed as a basis for determining system requirements. Initial data from this analysis is location data from museums in Yogyakarta. The results of the museum data search are listed in table 1

Table 1 Longitude and latitude

Museum Name	Longitude	Latitude
Sonobudoyo	110,363555	-7,802168
Affandi	110,396562	-7,780907
Wayang Kekayon	110,412975	-7,815136
Benteng Vrederbug	110,366028	-7,800289
Keraton Yogyakarta	110,366028	-7,800291
Batik Yogyakarta	110,377308	-7,795660
Dewantara Kirti Griya	110,378045	-7,805389
Perjuangan Yogyakarta	110,371782	-7,816462
Pusat TNI AD Dharma Wiratama	110,375502	-7,782878
Sasmitaloka Panglima Besar Jendral Sudirman	110,375505	-7,802368
Monumen Jogja Kembali Monjali	110,369563	-7,749711
Tembi	110,357815	-7,870327
Biologi UGM	110,374070	-7,801756
Anak Kolong Tangga	110,367737	-7,800149
De Mata Trick Eye	110,389749	-7,815585
TNI AU Dirgantara Mandala Yogyakarta	110,416383	-7,789745
Gallery Husodo	110,431358	-7,784132
Jogja National Museum	110,353214	-7,800188
Amri dan Galeri	110,353788	-7,799312

B. System Design

In the design of this system, it was used Use Case Diagram as a modeling system design. Use Case Diagram in this system consisted of 2 actors,

namely admin and user. Admin is an actor who acts as a data processor system and user is an actor who acts as a system user. Figure 1 is an explanation of the use case diagram user

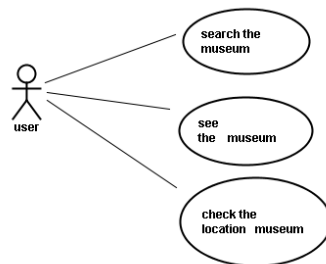


Figure 1 Use case diagram user

C. Relationships between tables

All data used for searching in-built application data is stored in the database. In this database besides storing museum data it also store

data articles and pictures / gallery from each museum. Figure 2 shows the relation between tables.

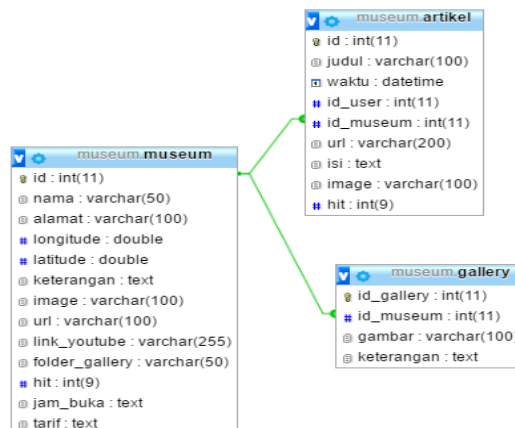


Figure 2 Relation among tables

III. RESULTS AND DISCUSSION

The application is built using PHP by optimizing google map API [6] and database using mysql. The process of getting the nearest location from a point by applying the harversine formula, the harversine formula is:

$$a = \sin^2(\Delta\phi/2) + \cos \phi_1 \cdot \cos \phi_2 \cdot \sin^2(\Delta\lambda/2)$$

$$c = 2 \cdot \text{atan2}(\sqrt{a}, \sqrt{1-a})$$

$$d = R \cdot c$$

Note :

ϕ is latitude, λ is longitude, R is the earth radius (radius = 6,371km).

From the above formula, in the application development it will be converted in SQL form. The function of finding a closest point is :

```
function get_museum_terdekat($lat,$lng,$id)
{
    $jarak =4;
    return $this->db->query("SELECT
        museum.nama,museum.id as
```

```
idmuseum,museum.latitude,museum.longit
ude,museum.url,artikel.id as ida,
( 6371 * acos( cos( radians($lat) )
* cos( radians( latitude ) )
* cos( radians( longitude )
- radians($lng) )
+ sin( radians($lat) )
* sin( radians( latitude ) ) ) )
AS distance FROM museum
left join artikel on
museum.id=artikel.id_museum
where museum.id!= $id GROUP BY
artikel.id_museum HAVING distance <=
$jarak ORDER BY distance ");
}
```

Manual calculation results, resulting in the distance between museums as in table 2. In the calculation as the starting point is museum Sonobudoyo with longitude position 110.3636 and latitude -7,802168

Table 2 The result of calculating the distance between museums

Starting Point Museum Name	Closest Museum Name	Longitude	Latitude	Distance
Museum Sonobudoyo	Jogja National	110,3532	-7,800188	1,160
	Batik Yogyakarta	110,3773	-7,795660	1,679
	Affandi	110,3966	-7,780907	4,337
	De Mata Trick Eye Museum	110,3897	-7,815585	3,248

From table 2, it shows the calculation result from Sonobudoyo Museum with longitude 110,3636 and latitude -7,802168 to De Mata Trick Eye museum with longitude 110,3897 and latitude -7,81558 about 3,248 Km. The result of the calculation is shown in the form of route travel to the location. Figure 3 shows the search results in the google map by displaying the route to the location and drawing the straight distance from the starting point to the desired end point.

The results of calculations from Sonobudoyo museum to Affandi museum:

$$\text{Jarak} = (6371,1 * ((2 * \text{ASIN}(\text{SQRT}((\text{SIN}((\text{RADIANS}(-7,780907) - \text{RADIANS}(-7,802168))/2)^2) + \text{COS}(\text{RADIANS}(-7,780907)) * \text{COS}(\text{RADIANS}(-7,802168)) * (\text{SIN}((\text{RADIANS}(110,396562) - \text{RADIANS}(110,36356))/2)^2))))))$$

$$= 4,33687682$$

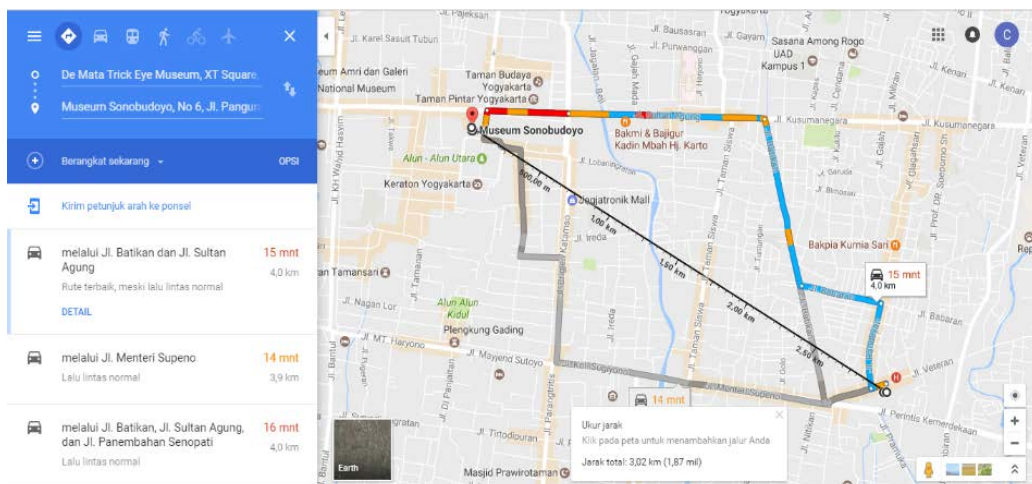


Figure 3 Calculation using google map

Results of Application

The developed system produces an application that displays the existing museum

information in Yogyakarta. The initial view shows the location of the museum in Yogyakarta. Figure 4 shows the information of museums in Yogyakarta.

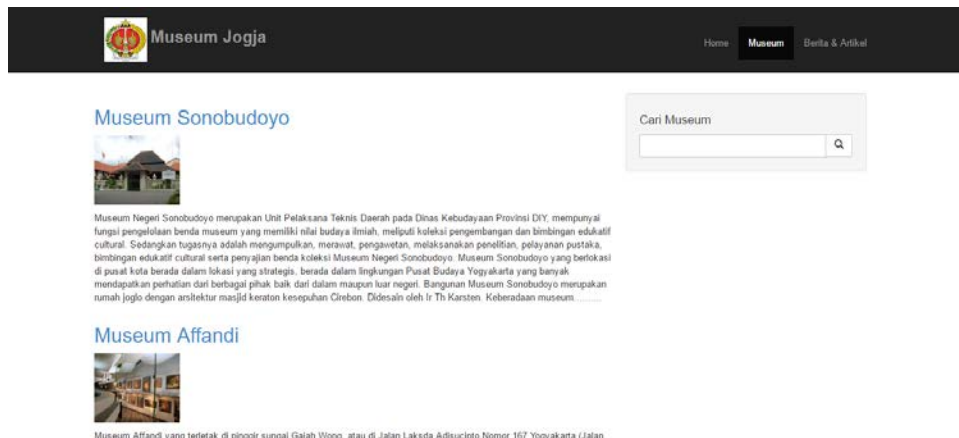


Figure 4 Initial view of e-Museum Application

The searching process of nearby museum location can be done by determining the initial location of the museum. Figure 5 shows the search results from nearby museum locations. In the picture, as a starting point is the Sonobudyo museum. The result of the nearest museum location is

- Museum Benteng Vrederbug
- Museum Anak Kolong Tangga

- Museum Amri dan Galeri
- Museum Biologi UGM
- Jogja National Museum
- Museum Dewantara Kirti Griya
- Museum Batik Yogyakarta
- Museum Pusat TNI AD Dharma Wiratama
- De Mata Trick Eye Museum

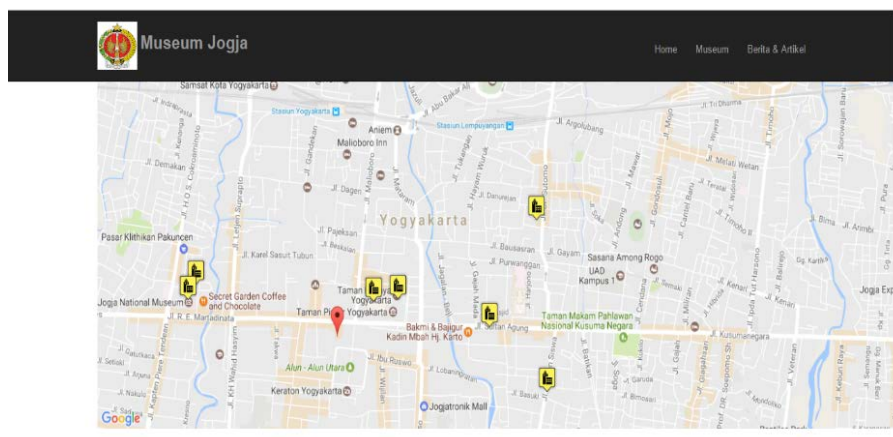


Figure 5 Results of Closest Locations

From Figure 5, users can check the distance to another adjacent museum location. The

result of tracking the distance of the location of the museum is shown in figure 6.

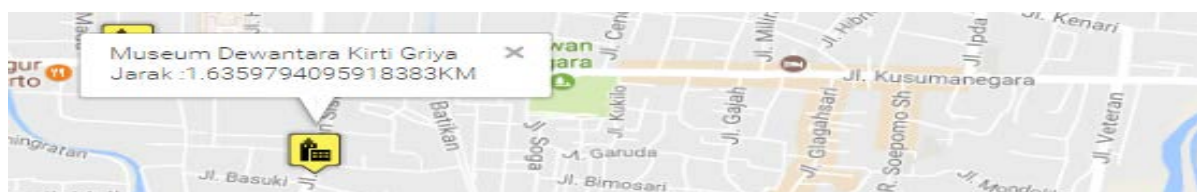


Figure 6 Distance location from the beginning of the museum to another museum

IV. CONCLUSION

Implementation of geographic information system using haversine formula and google map API produce useful applications for users in search process of museum location. The application of the haversine formula allows users who want a museum location search to get information on other museums whose radius distance is not far from the point of the museum sought.

REFERENCE

- [1] M. D. A. Vivi vibriani, Mengenal Museum, Jakarta: PT Widya Duta Grafika, 2005.
- [2] A. ESSAYAD, "Design and implementation of a platform for locationbased services: a case study of GIS of archaeological and handicraft of Fez Medina," *IJCSI International Journal of Computer*, vol. 8, no. 5, pp. 524-530, 2011.
- [3] V. K. B. P. Ganesh L, "Indoor Wireless Localization using Haversine Formula," *International Advanced Research Journal in Science, Engineering and Technology*, vol. 2, no. 7, pp. 59-63, 2015.
- [4] G. Svenneberg, *Beginning Google Maps API 3*, New York: Apress, 2010.
- [5] V. M. D. K. Mamta Gahlan, "GPS BASED PARKING SYSTEM," *An international journal of advanced computer technology*, vol. V, no. 1, pp. 2053-2056, 2015.
- [6] B. U. Alper Dincer, *Google Maps JavaScript API Cookbook*, BIRMINGHAM: PKACT Publisher , 2013.