

Geographic Information System (Gis) for Culinary in Pekanbaru using Haversine Formula

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Abstract: Pekanbaru is one of a big city in Indonesia with 897.767 inhabitants' population on 2010. There are various cultures of the population. That diversity presents the difference of culinary in Pekanbaru, so Pekanbaru be one of the cities which appropriate for culinary that give charm circumstance and worth to taste. One of the obstacles that often occur is the tourists still difficult to find the right and nice place to eat, close to tourism place and find information about culinary is difficult as well. Therefore a web-based GIS application built to give information about culinary in Pekanbaru. This application built through some steps, i.e. system analysis, design system, implementation, and testing. This application built using PHP as a programming language and haversine Formula as a method to find the closest distance. After it built the application, the data of culinary tested used black box. The result shows that testing using this application is similar with the manual test. Thus the application has been built correctly.

1. Introduction

Pekanbaru is one of a big city in Indonesia with 897.767 inhabitants' population on 2010. There are various cultures of the population. That diversity indirectly presents the diversity of culinary in Pekanbaru, so Pekanbaru be one of the cities which appropriate for culinary that give charm circumstance and worth to taste. Exploring culinary nowadays is very popular when we visited the place. If exploring culinary, people who are just looking for a satisfying need for their hunger, are now beginning to consider other factors in determining where they will eat such as distance, menu variations and other supporting information. (Sugeng Purwanto et al, 2012).

The problems that often occur from the many culinary tourism options in Pekanbaru is still lack of the information about the location and the menu which is offered. The software which containing map of a region that can be accessed using web-based system is expected to overcome the problems faced by tourists in getting information about culinary in Pekanbaru. On a web-based system a digital map that can be used is Google Map. Google maps are accessible with browsers on both computer and mobile devices. Google Map has a Geolocation feature that can be used to identify locations marked by latitude and



longitude. Harversine Formula is a method which is used for this application. Harversine Formula is a method of knowing the distance between two points by counting that the earth is not a plane but is a field that has a degree of curvature.

Harversine formula calculates the distance between 2 points by the length of a straight line between 2 points on longitude and latitude. (Ryan Herwan DWI Putra Et Al, 2015), this application is expected to provide information about culinary as well as culinary location in Pekanbaru City.

2. Method

In this research, the researcher used the method which developed by W. Royce that is waterfall method; the stages in this method can be seen on figure 1

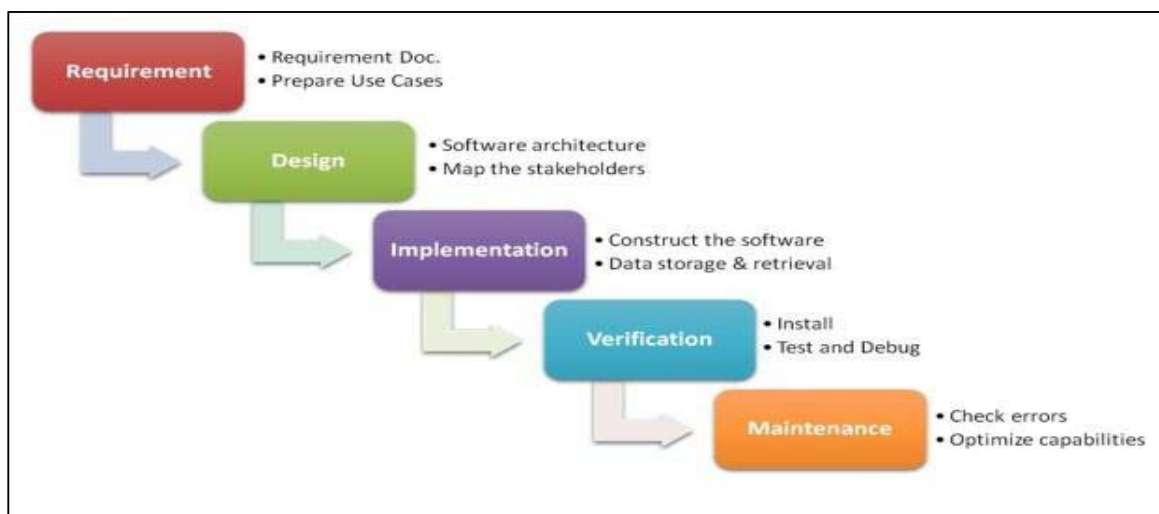


Figure 1. Research method

2.1 Need of Analysis

This step is an analysis of system requirements. Data collection in this phase can do a research, interview or literature study. Data collection in this stage can be done from a study, interview or literature study. Systems analyst digs as much information from the user so it created a computer system that can perform tasks desired by the user. This stage will generate user requirement document that is used as data related to what users want in making system. This document will be a reference system analyst to convert, it into the programming language.

2.2 Design System

This step, giving the opinion and system planning toward problem solving by using software of design system, such as flow data diagram, entity relationship diagram, structure and data material.

2.3 Writing the Program Code

Writing code or coding is a translation design in a language that can be recognized by the computer. Performed by the programmer who will translate the transaction requested by the user. This stage is the real step in working on a system. In the sense that the use of computers will be maximized in this stage. After the coding is complete it will be testing the system that has been made earlier. The purpose of testing is to find errors on the system and then fix it.

2.4 Program Testing

The final stage in which the new system is tested its ability and effectiveness so that the system deficiencies and weaknesses are found and then the review and improvement of the application becomes better and better.

2.5 Implementation and Maintenance

The software that has been submitted to customers usually change. The change could be due to an error because the software must adapt to a new environment (peripheral or new operating system), or because the customer needs a functional development.

3. Study Literature

This research is carried out not apart from the results of previous studies that have been done as a comparison and study materials. As the results of research that made the comparison cannot be separated from research topics related to information both from the web and mobile.

Bambang Yuwono, et al (2015) conducted research on geographic information system based on android for tourism in Magelang used Grapple method. Grapple method has 5 stages, namely: Requirement Gathering, Analysis, Design, Development, and Deployment. ut in this study, the authors only do stages of development or development. This system is built using eclipse software as an editor for coding android, Dreamweaver as coding editor of Code Igniter framework, MySQL as database server, and PHP as its server programming language.

3.1 Geographic Information System

Eko Budiyanto (2015), defined GIS (Information System) or Geographic Information System is a system of mutual series with each other. Bako Sutarnal (2016) describes GIS as an organized collection of computer hardware, software, geographic data and personnel designed to acquire, store, repair, manipulate, analyze and display all forms of geo-referenced information. Thus, the analytical basis of GIS is spatial data in digital form obtained through satellite data or other data digitized. GIS analysis requires experts as interpreters, computer hardware and software support.

3.2 Harversine Formula Method

The haversine formula method can be used to calculate the distance between two points, based on latitude and longitude. The method of the Haversine Formula is now undergoing development, by using a simple spherical law of cosine formula, which by calculating the computer can provide a very accurate sprecision level between two points.

Haversine Formula :

$$x = (\text{lon2} - \text{lon1}) * \cos((\text{lat1} + \text{lat2})/2);$$

$$y = (\text{lat2} - \text{lat1});$$

$$d = \sqrt{x^2 + y^2} * R$$

Keterangan:

x = Longitude (Lintang)

y = Lattitude (Bujur)

d = distance

R= Radius = 6371 km

1 degree = 0.0174532925 radian

4. Result and Discussion

After the design, then the application on the system does. The results of the implementation can be seen in Figure 2 below.

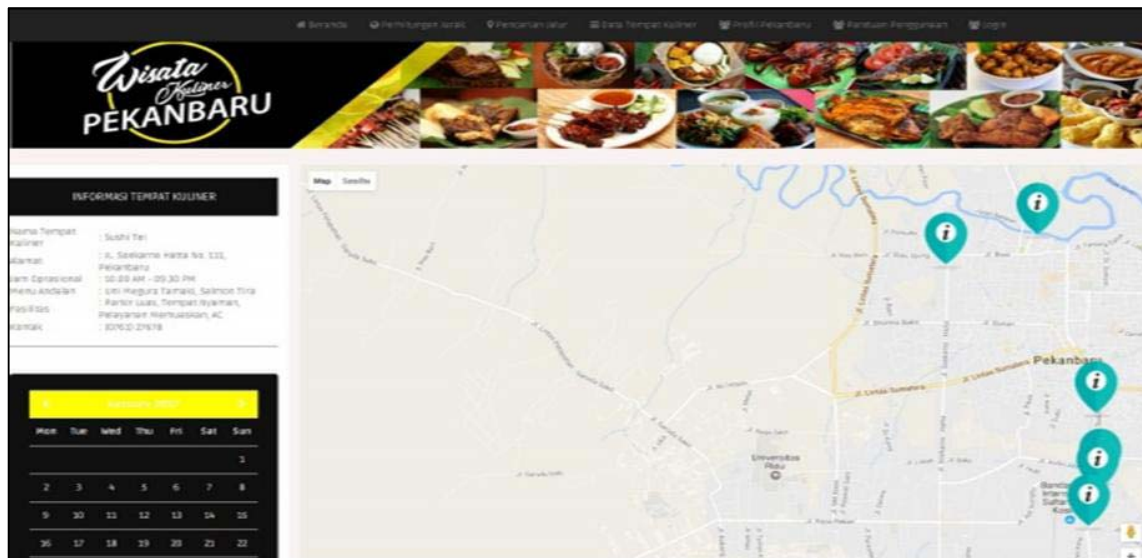


Figure 2. The implementation

This system is designed to determine the closest distance between the user positions to the location where the culinary is. Then this system will calculate the distance of each point where the culinary location of the user's position is. Manual calculations performed by calculating the distance of the user to the culinary place by using the method of Haversine Formula, as for the formula of Haversine Formula are:

$$d = \text{acos} (\text{Sin } 1 \cdot \text{Sin } 2 + \text{Cos } 1 \cdot \text{Cos } 2 \cdot \cos \quad) \cdot R$$

Steps to determine the distance between two points with Haversine Formulla are as follows:

- Determining starting point with coordinates (-7.561678783, 110.7965773)
- Specifies the destination point with coordinates (-7.564725, 110.80341)
- Convert the coordinates of start and destination points into radians.

$$\text{Radlat } 1 = \frac{-7.561678783}{180} \cdot 3.14 = -0.131909285$$

$$\text{Radlong } 1 = \frac{110.7965.773}{180} \cdot 3.14 = 1.932.784.738$$

$$\text{Radlat } 2 = \frac{-7.564725}{180} \cdot 3.14 = -0.131962425$$

$$\text{Radlong } 2 = \frac{11.080.341}{180} \cdot 3.14 = 193.290.393$$

- d. Enter the starting point and ending point into the Haversine Formula.

$$c = \arccos(\sin \phi_1 \cdot \sin \phi_2 + \cos \phi_1 \cdot \cos \phi_2 \cdot \cos \Delta\lambda)$$

$$c = \arccos(\sin(\text{Radlat1}) * \sin(\text{Radlat2}) + \cos(\text{Radlat1}) * \cos(\text{Radlat2}) * \cos(\text{Radlong21}))$$

$$c = \arccos(\sin(-0.131909285) * \sin(-0.131962425) + \cos(-0.131909285) * \cos(-0.131962425) * \cos(1.19192 * 10^5))$$

$$c = \arccos(1)$$

$$c = 0.00013$$

- e. Convert the result into Km by multiplying by R = 6371.

$$d = R * c$$

$$d = 0.00013 * 6371 \text{ Km}$$

$$d = 0.82539971 \text{ Km}$$

Thus, the distance between the starting point and the end point based on Haversine Formula is 0.82539971Km.

5. Testing

In the final stage the authors test the results of the system to the respondents who numbered 10 people to use the system then provide results or experience using this system by answering the questionnaire.

6. Conclusion

Based on the results of the implementation and testing system "Culinary Search in Kota Pekanbaru", can be drawn conclusion that is Haversine Formula for the calculation process determines the location of nearby Culinary Place can be applied and the calculation of the nearest culinary tour location done by manual and produced by the system is the same.

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