Use of Cartesius Method on Google Maps Api to Recommend Search for Batik Crafts and Andid-Based Crafts (Case Study of Bangkalan District)

Doni Abdul Fatah, Dewi Arini Yuliarti, Achmad Jauhari, Eza Rahmanita

Department of Informatics, Faculty of Engineering, University of Trunojoyo Madura, Indonesia

A B S T R A C T

ASmart City increasingly rife discussed in order to be a solution in solving problems arising from the dynamics of an increasingly advanced and modern city. The purpose of applying the concept of smart city to increase the sense of security and comfort for its citizens, making the city more effective and efficient. Madura is an island located north of Java island. The island is dubbed Salt island "Pulau Garam" is quite well known in the field of bull race and batik handicrafts, especially in Bangkalan regency. Bangkalan regency is a developing city to realize the concept of smart city. One way that can be done is to take advantage of the market needs of batik lovers by providing easy access to the location. Utilizing google maps location search technology with Cartesian method on smartphone electronic devices, consumers will be easier in terms of information search and location of batik craftsmen scattered throughout the district of Bangkalan.

Keywords: Smart City, Batik, Google Maps, Cartesian Method, Android Smartphone.

1. Introductions

Technological developments in making smart concepts are not only applied to various devices, but also to various systems, one of which is the concept of smart city.

This concept presents a smart city structure that can manage resources owned, both in the form of human resources and natural resources efficiently and effectively to achieve high livability, comfort, and sustainable development. With the application of this concept, the quality of human life that lives in one city will be better. There are many dimensions in the concept of smart city such as smart government, smart economy, smart environment, smart living, smart people, and smart mobility. In addition, almost all strategic sectors such as energy, industry, environment, tourism, governance, education, and knowledge and technology can play a role in building a smart city. [1]

Currently in Indonesia there are already 3 cities that can be called smart cities, namely Jakarta, Bandung and Surabaya. [1]

Madura is an island located in the north of the island of Java which is widely known as the island of salt land and the art of rapeseering. Madura is also known for its batik products which have superior artistic essence. Madura Batik is one of Indonesia's cultural heritages which has begun to attract many Indonesia due to the variety of written batik motifs that have their own uniqueness. Unique and free variety of styles while still maintaining traditional ways of making use of environmentally friendly natural coloring materials that make Madura batik much in demand of batik lovers. For

Madura batik is not only compared to a piece of cloth, but also used as a cultural icon that is often used as a lot of research objects. The motifs and colors contained in Madura batik cloth reflect the character of the community.

Bangkalan Regency itself has a place for processing and making batik which is famous among batik lovers, namely the Tanjung Bumi area. The potential of Tanjung Bumi batik was turned into a tourist attraction by the Bangkalan Regency government. Based on the statistical data of the Bangkalan Regency government in the book "Bangkalan in Numbers" issued by the Office of the Central Statistics Agency of Bangkalan Regency, since 2012 there have been 7.235 percent of domestic tourists and 15 percent of foreign tourists. Then in 2013 there were 13.469 percent of domestic tourists and 25 percent of foreign tourists, while in 2014 there were 11.562 percent of domestic tourists and 15 percent of foreign tourists. Based on the statistical data above there is an increase and decrease in the number of visitors who come to the tourist attractions of the earth's batik itself. [2]

In addition to Tanjung Bumi Madura batik tourism, there are also many batik tours in the form of batik handicrafts scattered in the Madura island region, especially in the Bangkalan Regency area. Of the many batik craft places in Bangkalan Regency, the writer tries to make a smart city in the field of smart living and smart mobility in order to advance and introduce various kinds of batik craft sites in Bangkalan Regency, so we need a system that displays the distribution map of batik crafts using technology Google Maps can help technology users find out the location of batik crafts in Bangkalan district. The use of Google Maps is now a good and very

appropriate solution to make it easier for users to find the location of the desired location. Google maps itself is a free and online virtual globe map service provided by Google, but it can make it easier for developers to use applications that can be used to find a location. Google released an application called the Google Maps API which is a simple Application Programing Interface service in the form of a world map that is used to view an area, where the API itself is a program code interface or an application or web interface created to be able to access or run or utilize features that are provided by Google [3].

Technological developments are also accompanied by high mobility needs. One of the supporters of mobility in human daily life is the presence of smartphones and the internet. Digital marketing research institute Emaketer estimates that in 2018 the number of active smartphone users in Indonesia will be more than 100 million people, making Indonesia the 4th most active smartphone user country after China, India, and America [4]. Besides the use of the internet for the people of Indonesia is also in the stage of better improvement with the support of the government which says the government will build internet access to the villages [4]. With the smartphone and the internet, it can make it easier for people to search for various desired locations. Coupled with the Global Positioning System feature or GPS for short. GPS itself is used to provide location information services or position instructions to smartphone users [5].

In addition to making it easier for users to find batik handicraft locations, a system that can recommend the closest handicraft location is also needed, using the Cartesian method.

The Cartesian method is a mathematical equation that is used to find the distance between two points in a flat plane and can also be used in a geographical coordinate system to find the distance between two coordinates [6].

Based on the problem above, the solution that can be done is to create a smart city-based system that can provide recommendations for good batik craft locations for batik lovers who will visit Bangkalan Regency by utilizing the development of smartphone technology, so researchers will conduct research under the title "Using the Cartesian Method on the Google Maps API to recommend searching for Android-based Batik Crafts (Case Study: Bangkalan Regency) ".

2. Methods

2.1. Batik

According to Dalijo & Mulyadi batik is a technique to decorate cloth with a process of closing and dipping into a dye which means that the closed part is not affected so that it will still have the color of the fabric [7].

2.2. Smart City

Smart City is a concept of developing smart city order that can manage resources efficiently and effectively to achieve the comfort and sustainable development of a city. A smart city is also one of the city development concepts that are currently still developing. The development of the concept of the smart city brings different definitions from various parties. Understanding the concept of a smart city is taken by looking and resuming

the right characteristics for a smart city that tends to be common from several sources [8].

The concept of a smart city has attributes that can be referred to as dimensions and there are 6 dimensions of the concept of a smart city, as shown in Figure 1 below [8]:
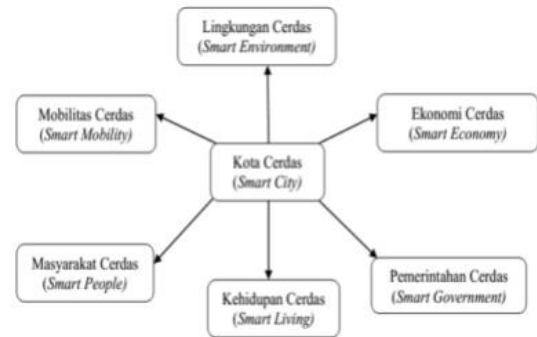

Figure 1. Six Dimensions of Smart Cities [8].

2.3. Google Maps API

Google Maps API which is a simple Application Programing Interface service in the form of a world map that is used to view an area, where the API itself is a program code interface or application or web interface that is made to be able to access or run or utilize features provided by Google [3].

2.4. Cartesius Method

The cartesian coordinate system of two-dimensional flat planes, the distance between two points can be searched through equation [6]:

$$D = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \quad \dots\dots\dots\dots(1)$$

Where:

D: Linear distance between 2 points

xi: Position of the point i (1, 2, ..., n) on the x-axis

yi: Position of points i (1, 2, ..., n) on the y-axis

because there is a comparability between different angles of latitude and longitude with different distances, it can be different positions in cartesian coordinates proportional to differences in position in latitude and longitude [6].

$$D \approx D_{\varnothing}$$
$$D_{\varnothing} = \sqrt{(\lambda_2 - \lambda_1)^2 + (\varphi_2 - \varphi_1)^2} \quad \dots\dots\dots(2)$$

Where :

DØ: Angular distance between 2 points

λi: Position of points i (1, 2, ..., n) at a latitude in degrees

φi: The position of the point i (1, 2, ..., n) on the longitude in degrees

The purpose of this formula is to find a search point, not to calculate the distance between them so that what is compared is the value of the angular distance between the specified coordinates and the coordinate points created in the database [6].

2.5. Android

Android is a java based system that runs on the Linux Kernel 2.6. Android was released by Google, under the Open Handset Alliance (OHA) in November 2007. Along with the launch, Google also created a Development Tool center and guide to become a developer on the system. Software Development Kit (SDK) and development community guide files can be obtained on the official Google Android website [9]

2.6. Web Service

Web Service is a software component that contains a modular, self-describing application that can be published, allocated, and implemented on the web. Web service is a technology to change the ability of the internet by adding web transactional capabilities, namely the ability of the web to communicate with each other with program-to-program (P2P) patterns. The focus of the web has been dominated by the program to user communication with business-to-consumer (B2C) interactions, while the transactional web will be dominated by program-to-program with business-to-business interactions [5].

2.7. System Analysis

The system is made using the concept of web service. where the admin is useful in managing data such as adding location data for new batik crafts, editing location data, deleting location data and seeing details of data entered into the server.

Then the server will send location data that has been entered by the admin to be accessed by the user using an Android smartphone that has been installed this batik location recommendation application. In addition, users also get a recommendation for the closest location from their position in the form of a list of 5 closest locations. Users can also see the entire mapping of batik craft locations in the Bangkalan district. In addition, users can also see details of the place of batik craft such as name, address, phone, and the advantages of these craft places. Users will also be directed to the google maps application if they want to find the closest route that will allow the user to get to the location of the craft.

Figure 2. Application Design

Explanation of Figure 2 application design using the web service system above, that is, the admin manages the data and enters it into the database server. While the user sees the recommendation data and detailed info data from the database server that was previously entered by the admin.

2.8. Admin System Flowchart

The following below is an overview of the system admin flowchart.
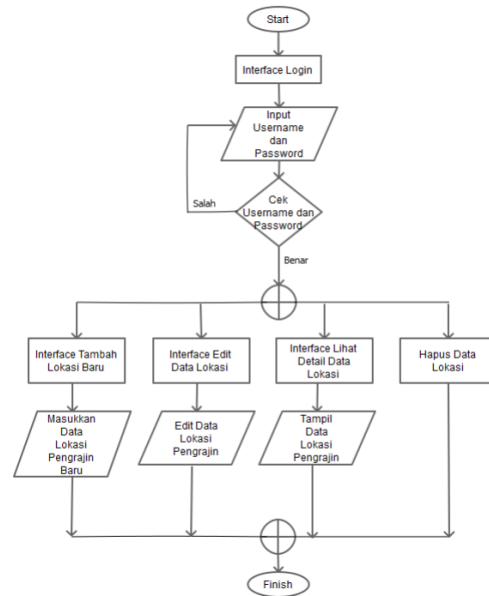

Figure 3. Admin system flowchart

In picture 3 above is the system admin work process. The following description from Figure 3.2:

1. Begin by entering your username and password to log in.
2. When you can log in there will be a check whether the username and password are correct.
3. If the username and password are correct, they will be directed to the admin dashboard page.
4. In the admin dashboard page, the admin can manage data such as adding new location data, editing location data, deleting location data, and viewing details of location data that has been entered into the server.
5. The process is complete.

2.9. User Flowchart

The picture below is a flowchart of the user's system. Where in the user system there are 2 main features namely Recommended Location Crafts and Handicraft Location Data
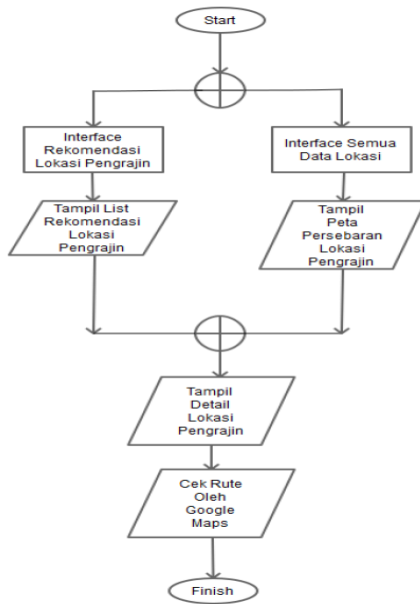
Figure 4. User system flowchart

In Figure 4 above is the work process of the user system. The following description from Figure 3.3:

1. The user will be directed directly to the craft location recommendation menu or craft location data.
2. If the user selects the craft location data, the system will display the position of the user and map the location of the existing batik craft.
3. After the craft location mapping appears, the user can see the details of the chosen batik craft location, then the user will also be directed to the google maps application when clicking on the route icon.
4. If the user chooses a craft location recommendation, the system will direct it to 5 list of the closest craft locations around the user.
5. In the location recommendation menu, this applies the Cartesian method to determine the distance.
6. After the craft location list appears, the user can see the details of the selected batik craft location, then the user will also be directed to the google maps application when clicking on the route icon.
7. The process is complete

3. Result and Discussion

3.1. Admin Dashboard Page

Figure 5. Admin Dashboard Page

Figure 5 is the admin dashboard page. This page contains data on the location of batik crafts in Bangkalan district. There are also several buttons that can be used to add new craft location data. Besides that in each table field, there are several action buttons that can be used to edit craft location data, view details of craft location data, and delete location data.

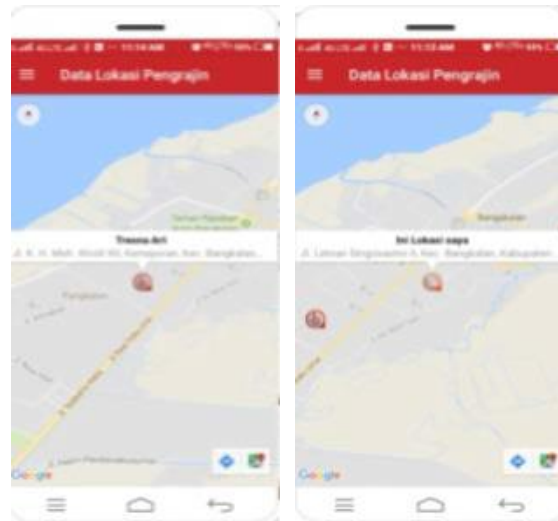### 3.2. Display Location Craft Data

Figure 6. Display Location Craft Data

Figure 6 Display of Craft Location Data Figure 6 is a display of craft location data. In the form of a map of the distribution of all craft locations in Bangkalan district. In this feature the user will know his position is on the map, and also can see several craft locations scattered in the Bangkalan district.

3.3. Analysis Of Results

Based on the results of the system analysis made using the Cartesian Method on the Google Maps API to recommend searching for android-based batik handicraft locations in the Bangkalan Regency case study, there are differences in the distance results obtained from calculations using the Cartesian Method with the Google Maps application.

The distance calculation using the Cartesian Method which calculates through the angular distance using the cosine law equation is closer than the distance calculation in the Google Maps application which calculates using the distance of the route. The above statement is supported by the picture below.
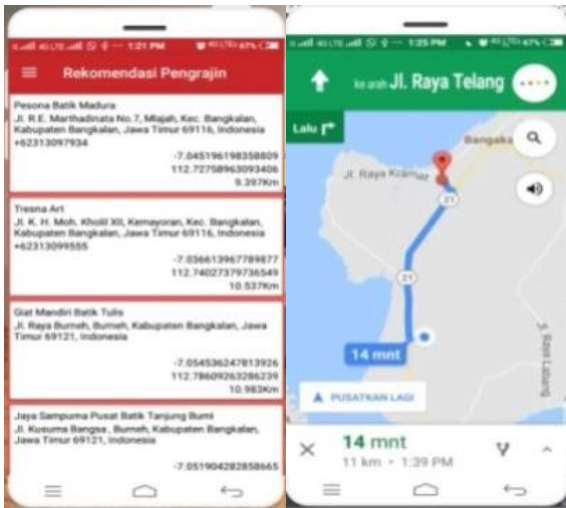
Figure 7. Distance Difference

Based on Figure 7 above the distance found in the location of Madura Batik Charms shows a distance of 9,397 Km from the user's position located on Jl. Raya Telang. While on the route application from google maps the distance listed is as far as 11 km. However, there is a drawback in this application because the resulting distance does not refer to the route to be passed because it only refers to the angular distance generated in the Cartesian method calculation.

4. Conclusion

The following conclusions can be drawn from the research made under the title Use of the Cartesian Method on the Google Maps API to Recommend Searching for Android-Based Batik Crafts Case Studies in Bangkalan Regency is a Research This uses the Cartesian method as a reference calculation to determine the distance of the nearest batik craft location using the cosine law equation of spherical coordinates. Based on the analysis of the results there are differences in the results of the distance of the location of batik crafts after doing the calculations as evidenced by the application screenshot that is running. By using the Cartesian method the distance can be less than the calculation of the distance of the route on Google Maps.

Suggestions that can be given from research for future system development are:

1. Many methods that can be used for comparison recommend the closest location point of the user.

2. The application is added by creating its own route, so it does not refer to the Google Maps application.

3. This application does not refer to the actual distance contained in the distance of the road to be traveled. That is because in the calculation of the distance used by using angular distance. So that some batik craft locations have visible distances close by using the Cartesian method, but when searching for locations using the actual distance away.

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