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Application for Electronic Services in Malang City Based on Android

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ABSTRACT

Most people have electronic units. Electronic units also have advantages and disadvantages. As the advantages, electronic is that it can simplifies human-work, for example, people used to wash their clothes in a bare hand. Since the existence a washing machine, people only need to put dirty clothes into the tub then the wash-machine does the rest. For the disadvantages, electronics have an expiration date. If the electronics are on the expiration period, the performance decreased. The problem can overcome by repairing the stuff. If someone cannot to repair electronics the item itself, then requires someone else who is capable to solve it in the field. To ease the time looking for services that are nearby to the user's current location is possible. The system has been implemented on smartphone devices with an Android and Web-connected to the internet. The system help users to get information on the location of the nearest electronic service service and display service progress in realtime.The results provide a reference to the implementation of the Haversine Algorithm for distance calculation formula using GPS on an Android smartphone. This system proposes a solution as a liaison between service buyers and service providers. For electronic service providers can be used as a medium for promotion. The application is convenience in getting the nearest location for service, displays the service progress and with distance and location information features in this system can provide a reference for buyers of electronic services.

Keywords: *Android, Electronic Services Application, Firebase, GPS, Haversine, Java Programming.*

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ABSTRAK

Hampir semua orang memiliki barang elektronik. Barang elektronik pasti memiliki kelebihan dan kekurangan. Salah satu kelebihan barang elektronik yaitu dapat mempermudah pekerjaan. Dulu, orang mencuci baju dengan cara mengucek pakaian menggunakan tangan. Sejak adanya mesin cuci, orang hanya perlu memasukkan pakaian kotor ke dalam mesin tersebut dan mesin akan melakukan tugasnya secara otomatis. Adapun kelemahan barang elektronik yaitu memiliki masa kedaluwarsa. Jika barang tersebut sudah melewati masa kedaluwarsa, kinerjanya akan berkurang. Tetapi, hal tersebut bisa diatasi dengan cara diservis atau diperbaiki. Jika orang tersebut tidak dapat memperbaiki barang itu, tentu saja memerlukan orang lain yang andal di bidang tersebut. Untuk menghemat waktu juga, harus dicari jasa servis yang terdekat dengan lokasinya. Sistem telah dikembangkan pada Android yang terhubung internet. Hal ini dapat memudahkan pengguna untuk mendapatkan informasi lokasi jasa servis elektronik terdekat dan menampilkan perkembangan servis yang sudah dilalui secara *realtime*. Hasil penelitian memberikan referensi implementasi algoritma Haversine rumus perhitungan jarak dengan menggunakan GPS pada Android. Sistem ini dapat menjadi solusi, penghubung antara pembeli dan penyedia jasa. Bagi penyedia jasa servis elektronik, dapat digunakan sebagai media promosi. Aplikasi juga memberikan kemudahan dalam mendapatkan informasi lokasi jasa servis terdekat dan menampilkan perkembangan servis yang sudah dilalui secara *realtime*.

Kata kunci: *Android, Aplikasi Pelayanan Jasa Servis Elektronik, Firebase, Haversine , GPS, Pemrograman Java.*

INTRODUCTION

Digital technology is an example of advances in science and technology inspiring by society to solve problems that occur in their environment and even make it easier to work. Currently, digital technology use in all aspects of human life. The world has entered an age of faster information because of rapidly evolving information technology. In industry, the internet has opened new avenues and possibilities. With e-commerce, there are many factors to consider that may not have been present in traditional business practices [1]. Digital technology is now used not only in communication and online information exchange, but also in other fields such as trade (e-commerce), industry (e-business), education (e-education), government (e-government), and others. The author's point of view on the use of e-commerce to enhance customer service and increase company productivity is the subject of this paper. Customers may use this electronic commerce (e-commerce) service to access and position orders from various locations.

In Malang City, there are many electronic service services. Customers who want to service electronic units must first find out which place is closest to the customer's location. In addition to the closest location to the customer, customers must also know which electronic service providers are trusted. Therefore, it is necessary to make an application for electronic service services in Malang city based on android.

This application provides electronic services to customers who want them. There are different types of electronic service providers in this application, including computer service, printer service, television service, and other electronic service providers. We can use a calculation based on a radius based on android [2] to determine the closest point. In this application, the Google Maps API will be used as a source of free maps that will be incorporated into the app, and calculations based on radius and haversine formulas will be used to calculate the closest distance. The Haversine formula gives a large circular distance (radius) between two points on the surface of a sphere (Earth) based on longitude and star (latitude & longitude) [3].

LITERATURE STUDY

E-Commerce

E-commerce is the distribution, purchase, sale, marketing of goods and services through electronic systems such as the internet or television, *www*, or other computer networks. Ecommerce can involve electronic funds transfers, electronic data exchanges, automated inventory management systems, and automated data collection systems [4].

Android

Android platform is an open framework and is allowed to use by anybody. A mobile handset manufacturer can utilize android in the event that they take after the assertion expressed in the Software Development Kit (SDK). Android platform was built from the ground up with the explicit goal to be the first free platform, open and complete platform created specifically for mobile devices [5].

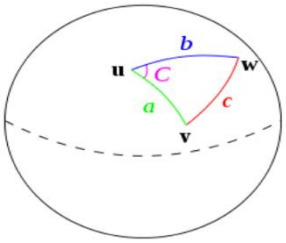
Distance

The distance traveled by someone is usually indicated in meters or kilometers. Distance is the sum of the differences between two coordinate points located at different locations. The distance position can be near or far from the variance position. This calculation serves to determine the difference in value between the two locations. For example, the distance between two coordinates on the map . Distance is different from position coordinates, and the distance may not be negative. Even though the coordinate system will produce a negative value after the distance calculation, the negative result will be absolute. Distance is a scalar quantity, while displacement is a vector[6].

Haversine Formula

The Haversine Formula is an essential equation in finding stright line distance between two coordinates on the earth using longitude and latitude parameters. The haversine algorithm is an

example of modeling calculation in the form of trigonometry, which is applied to a round shape. This algorithm discusses the shapes of sides and angles in spherical triangles [7].



Fisgure 1. The Law of haversines is used to solve a spherical triangle

The Haversine method applied to the earth is depicted in Figure 1. “i” "v" and "w" are the three coordinates. In a Haversine measure, these three coordinates make up the distance builder. The equation for Haversine calculations is as follows [8].

$$haversine(c) = haversine(a - b) + \sin(a)\sin(b)\,haversine(c).$$

$$\boldsymbol{a = sin^2\left(\frac{\Delta\varphi}{2}\right) + \cos(\varphi 1) \times \cos(\varphi 2) \times sin^2\left(\frac{\Delta\lambda}{2}\right)}$$

$$\boldsymbol{c = 2 \times a\, sin(\sqrt{a})}$$

$$\boldsymbol{d = R \times c}$$

Where

φ = Latitude

λ = Longitude

R = earth radius (6371 km)

To integrate the haversine formula method into maps (google maps) is as follows:

1. Adding a module containing id, name, distance, and image URL,
2. Displays the name, distance, and image url on the listview,
3. Send the parameters of the android device's earth coordinates to the web service, then the web service responds and calculates using the haversine formula of the distance between the location of the user's Android device and the locations in the database. After the calculation is done, the web service will display the JSON location data based on the closest location to the user's device, and the data will be displayed on the Android application listview.

RESEARCH METHODS

The following approach was used to perform this study: The Problem Identification and Determination of Research Objectives stage helps to clarify the context of the research as well as the goals that must be met. Data collection and processing take place at this point, and the data required for the research process is gathered. The information gathered will be analyzed using suitable methods to meet the objectives set forth at the previous level. Results Analysis and Interpretation: At this point, analysis and discussion of the obtained results will be carried out. Data review is the next step after data collection and processing to determine the research's results and administrative implications. Conclusion and Suggestion**:** The data processing and analysis findings will be used to conclude to arrive at solutions to the problem formulation and goals to be meet. The technique is show in the diagram below.

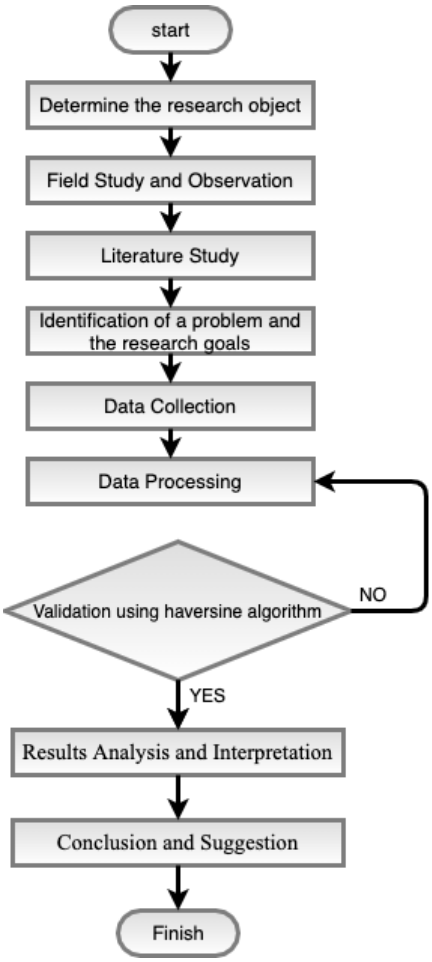


Figure 2. Research Methodology

RESULT AND DISCUSSION

By measuring a straight line between two points, the measurement of the haversine formula will be compared to the actual distance centered on Google fire using Google Earth. For research, the author will use a variety of samples.

Table 1. Distance Testing

User Location	Nearest Service	Service Provider Address	Haversine Distance (km)	Google API Distance (km)	Difference in distance
Jl. Titan V	Kharisma Computer Malang	Jl. Gajayana No.33, Ketawanggede, Kec. Lowokwaru, Kota Malang, Jawa Timur 65145	4.73	4.72	0.01
	GOLAPTOP STORE	Ruko Graha Jatimulyo, Jl. Saxsophone No.1A, Jatimulyo, Kec. Lowokwaru, Kota Malang, Jawa Timur 65141	5.08	5.33	0.25
	Khausar Computer	Jl. Mt Haryono 9 No.55, Dinoyo, Kec. Lowokwaru, Kota Malang, Jawa Timur 65144	4.67	4.67	0
	Laptopsecondmalang.com	Perum. Dirgantara Permai Jl. Dirgantara IV No. B4-36, Lesanpuro, Kec. Kedungkandang, Kota Malang, Jawa Timur 65138	3.48	3.34	0.14

User Location	Nearest Service	Service Provider Address	Haversine Distance (km)	Google API Distance (km)	Difference in distance
	GANKSAR	JL. S. Supriadi No.112 Depan Polsek Sukun, Timur Jalan, Bandungrejosari, Kec. Sukun, Kota Malang, Jawa Timur 65148	6.59	6.56	0.03
	Anto Service	Jl. Jaksa Agung Suprapto Gg. 1 No.197, Samaan, Kec. Klojen, Kota Malang, Jawa Timur 65112	2.71	2.70	0.01

Based on Table 1, it can be calculated the percentage error symbolized by the α symbol with the formula:

$$\left|\frac{Sum\ of\ Haversine\ Distance - Sum\ of\ Google\ API\ Distance}{sum\ of\ Google\ API\ Distance}\right| \times 100\%,$$

then the following results are obtained:

$$\alpha = \left|\frac{Sum\ of\ Haversine\ Distance - Sum\ of\ Google\ API\ Distance}{sum\ of\ Google\ API\ Distance}\right| \times 100\%$$
$$= \left|\frac{27.26 - 27.32}{27.32}\right| \times 100\ \%$$
$$= 0.22\ \%$$

The percentage of errors generated by Malang City's Service Application Services is 0.22%.

Based on the comparison between the distance provided by Google Api and the calculation of the Haversine Formula, it is found that the Application For Electronic Service Services In Malang City Based On Android has a reasonably good accuracy in determining the closest distance based on the results of the tests in table 1 and the calculation of the percentage of errors.

CONCLUSION

Based on the results of designing, implementing, testing, and discussing the application system that has been made, it is concluded that this service application has an accuracy rate of 99.78%.

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