Paper ICITECH

by Edy Win

Submission date: 12-Mar-2019 10:01AM (UTC+0700)
Submission ID: 1091804575
File name: Paper_Scopus_ICITECH2017.pdf (722.43K)
Word count: 2608
Character count: 13901

Location Based Service for Presence System Using Haversine Method

Edy Winarno, Wiwien Hadikurniawati, Rendy Nusa Rosso
Faculty of Information Technology
Universitas Stikubank Semarang Indonesia
edywin@edu.unisbank.ac.id, wiwien@edu.unisbank.ac.id, ren@mhs.unisbank.ac.id

Abstract— Location-Based Services (LBS) stands for the provision of information about the position of a device or a user often offered as a service via various means of media. Haversine formula is the method used to calculate the distance from two different points. In this research, Haversine method applied on calculating the distance for presence system based on the distance of location. This system allows users in presenting using mobile applications in addition to facilitate the presenting of data preservation. Use of LBS technology to detect users in an area of allowable locations. This detection is done by looking at the closest point from the predetermined center point. Center point will store the coordinates and radius of the presence area. This research develops Haversine method for measurement and estimation of distance with limitation in localization. Implementation model includes signal measurements with wifi position and GPS values to identify the precise location for human presence system.

Keyword: LBS, Haversine method, presence system

I. Introduction

Quick information is needed in all areas. The need for fast and accurate communication is also required to provide a genuine data, especially in a company. Location information is important in many computing applications. Location systems are one of the most popular fields in mobile computing [1][2]. A number of studies been done on location system due to its wide range of potential applications. Location systems allow developing location-aware applications. Positioning has a lot of applications where the well-known Global Positioning System (GPS) is ubiquitous for outdoor applications. GPS now found in everything has become increasingly popular for tracking location.

[3] It describes how GPS Tracking System works and where it is useful in real-world environment. GPS is the world widely used application to track the location of the objects or people in the outdoor environment. It is widely used in commercial and personal applications. For these indoor environments, there are multiple applications that can use positioning information [4][5]. Some examples are asset tracking, indoor navigation in large public buildings, Location Based Services (LBS). Although GPS has attracted numerous popular outdoor applications since its accuracy in indoor environments is considerably degraded, new technologies have emerged for indoor geolocation. [6] Examines Location Based Services (LBS), which is utilizing knowledge about geo-specific location. This research discusses LBS component and LBS architecture contained in the Android operating system. Location Based Services on Android uses technologies such as GPS, mobile network, and Wi-Fi. Android provides a variety of services to implement the application location-based.

Services utilizing Location Based Service (LBS), communications technology capabilities are useful for locating a person's geographic position or position from a mobile device at a time. This position information can evolve into the shortest route search service from one position to another using the shortest path algorithm. There are a lot of algorithms determine distance [7]. The purpose of that is to find the shortest distance. Each algorithm is related to a specific shape or representation. There are two widely used methods to calculate the distance on a sphere and elliptic shapes. They are Haversine and Vincenty method [8]. Some research that developed the method of Haversine has been widely practised. [8] The use of Haversine method is to measure the area of land in geographic information systems.

GPS feature considers user's location to calculate and get the nearest places by applying Haversine method and evaluating their performance in the presence system. This system utilizes haversine method formula which is used to know the distance between 2 points with the degree of earth curvature. The GPS has a Geolocation feature that can be used to identify the locations tagged by latitude and longitude. [9] in his research, he used the method of Haversine to know the number of visitors of an event that existed on a certain radius. This model is implemented in the Android application.

This research develops Haversine formula for measurement and estimation of distance with limitation in localization. Implementation model includes signal measurements with wifi position and GPS values to identify the precise location for human presence system. One of the most reliable attendance systems is the presence system for human [10]. This system allows users in presenting using mobile applications in addition to facilitate the presenting of data preservation. The use of LBS technology to detect users in an area of allowable locations. This detection is done by looking at the closest point from the predetermined center point. Center point will store the coordinates and radius of the presence area. On the other side, mobile devices send coordinates of users using LBS technology available on Android. The distance between the reference point coordinates and the user's position points can be calculated using the Haversine method. This paper is organized as follows: In Section 1, we give an overview of the background and related works. In Section 2, we present our method to find location user for the presence system. In Section 3, we discuss the testing and evaluation results. In Section 4, we talk about the conclusion

II. Method

A. Haversine method

Generally, Haversine is used for computing the great circle distances between two pairs of coordinates on a sphere. The approximate shape of the Earth is an oblate spheroid. There is no geometric shape that the Earth can fall perfectly under its calculations. Haversine formula perfectly applied to calculate distance on a spherical shape [7]. The shortest distance between two points on the surface of an earth or a sphere measured along the surface and can be displayed on the Google map. Haversine formula calculates the distance between the main location point and the point of destination based on the length of the straight line by taking the value of the input longitude and latitude. The latitude is represented by a symbol of phi, and it is defined as the angle between the straight line in the certain location and the equatorial plane. The longitude is represented by a symbol of lambda. The longitude is defined as an angle that points west or east from the Prime Meridian or Greenwich meridian. When longitude and latitude values have been identified at both locations, the decimal values are converted to radians (change the value of the latitude and longitude integer number into radians), then these numbers are calculated in the algorithm haversine. There are steps to calculate distance using Haversine method [11].
Step 1: Express location coordinates in decimal format
Step 2: Express Longitudes and latitudes
Step 3: Express Location coordinates as radians
Step 4: Determine the initial latitude and initial longitude
Step 5: Calculate the total distance from to the optimal location using the haversine formula.

The value of longitude and latitude is calculated using the Eq. (1).

$$a = sin^2\left(\frac{\Delta lat}{2}\right) + \cos(lat1)\ x\ \cos(lat2)\ x\ sin^2\left(\frac{\Delta long}{2}\right) \quad (1)$$

The next step is to calculate the intersection of the axis (c) as in Eq. (2).

$$c = 2\ a\tan 2\ (\sqrt{a}\ .\sqrt{1-a}\ ) \quad (2)$$

The last step in the haversine method is to calculate the actual distance at 2 point locations by using Eq. (3)

$$.d = R\ .\ c \quad (3)$$

The haversine method can be simplified using Eq. (4)

$$.x = (\Delta long2 - \Delta long1) \times \quad \cos((\Delta lat1 + \Delta lat2)/2)$$
$$y = \Delta lat2 - \Delta lat1$$
$$d = R(\sqrt{x \times x + y \times y}) \quad (4)$$

B. Proposed System

Client, Server, and Wireless Communication to connect Client and Server are the main parts of LBS applications. A client can make contribution to information acquisition by collecting data in the field by sending the user's request and the geographical location of the mobile device to Server. Server analyzes this information and put it into the database for service. There are 3 system components designed in the proposed Presence system (see fig 1) :

- *Distance radius,*

  Distance radius is an input of radius distance tolerance that can be accessed by the device, If a device is far from the radius of distance that has been determined by the system then the device can not access the next process.

- *Geofence radius,*

  Geofence is a fence of the earth. In the application of a system, geofencing itself has a function as a barrier area or region. Geofencing is a virtual fence surrounding a geographical area that uses features in software such as GPS. Geofencing is used as a notification when the device enters an area or exits a designated area of the boundary..

  Geofence radius is an input of indication value of the circle radius to be displayed on the screen so that the user can see its position (located on the distance radius). The magnitude of the circle radius must be equal to the predetermined distance radius. Latitude & longitude position is the value of latitude and longitude that will be fixed as a fixed point access location on a system. At this point, the radius of distance and the radius of a circle is formed.

The design of a LBS system focuses on the degree of accuracy in targeting a user's location. A number of geo-location technologies promise an accurate pinpointing of an object or person's position on earth LBS is applied to GPS technology Global Positioning System. GPS is a global coordinate system which can determine the position of the object coordinates anywhere on earth whether longitude and latitude. We need the location of each data point of the user to perform distance calculations using haversine formula. The latitude, longitude, and the radius area of the boundary presence are needed for calculating distance.

The design of systems built on this application based on client-server. Users access the Presence application system on the smartphone. Admin accesses the system through a web browser that has been connected to the database server to edit the schedule data and recap the data presence user. Users can also access the web browser with user access level, to view the schedule and ensure that the presence data is valid. In Figure 2, it can be seen the system architecture in the built application.

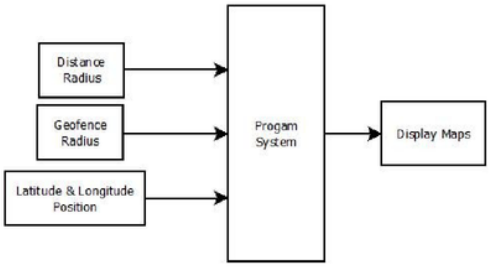


Fig 1. Proposed system

.

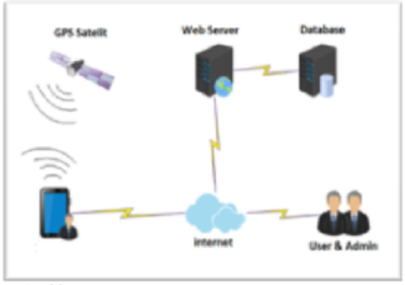


Fig 2. System Architecture

III. Results and Analysis

Presence systems designed using the haversine method will record and calculate the distance between the access point and the latitude-longitude value of a place with the value of latitude-longitude point on the user device. The system works well if the smartphone is connected to an internet connection and has a good network to open the Global Positioning System feature. In this research, we use Google Maps to display area and show the distance of a location. Users can access the presence system when entering the geofence area or access area that is visible on the Google Maps screen. Presence system is designed so that the process of a person's presence is done automatically. In Figure 3a. and 3b., show the interface results of the presence system created..

Testing the calculation of distance on the system, the known the latitude and the first longitude taken from a point in Semarang is -7.0038935, 110.417415. Latitude and the second longitude taken from the point of the user device is -7.0038421, 110.4174133. The decimal value must be converted first to the radian value as follows:

Lat1 = -7.0038935*0.0174532925
= -0.122241 radian
Long1 = 110.417415*0.0174532925
= 1.92714744 radian
Lat2 = -7.0038421*0.0174532925
= -0.1222401 radian
Long2 = 110.4174133*0.0174532925
= 1.92714741 radian

The calculation of the reference point distance to the user device can be calculated using Eq. 4 :

$x = (\Delta long2 - \Delta long1) \times \cos((\Delta lat1 + \Delta lat2)/2)$
= (1.92714741-1.92714744)*cos
(-0.122241+ -0.1222401/2)
= -0.0000000297761367

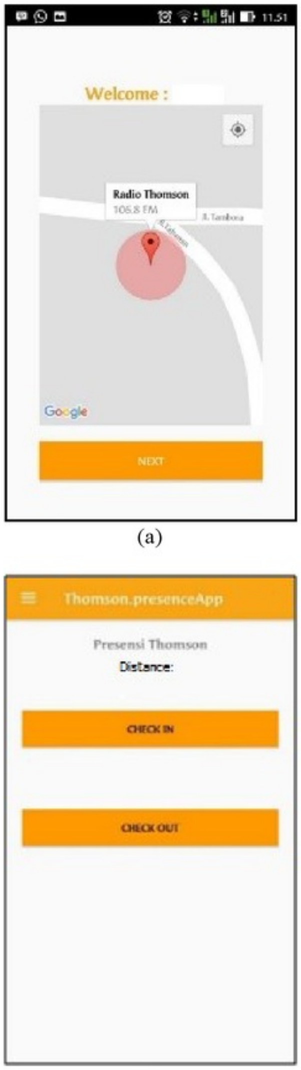
$y = \Delta lat2 - \Delta lat1$
= (-0.1222401- (-0.122241))
= 0.0000009

$d = R(\sqrt{x \times x + y \times y})$
= 3671*sqrt(-0.0000000297761367*
-0.0000000297761367)+
(0.0000009*0.0000009)
= 0.005737 km = 5.737 m

Haversine method can be applied to calculate the distance between the user and the point on a boundary area of presence by taking the latitude and longitude of the two points and then added to the calculation haversine. These results prove that haversine formula can be used to calculate the distance between two points. In this research, we use Google Maps to display area and show the distance of a location. These results prove that haversine formula can be used to calculate the distance between two points. Table 1 shows a list of the point that has been recorded to server and the calculating of the distance (application and manual computation).

IV. Conclusions

Presence system implements a global positioning service system with geofence method to detect the position of the device while performing the process of presence. The haversine method is used as a distance calculation between two coordinate points of location. Presence application that was successfully tested and can run on a smartphone with version 4.0 ice cream sandwich or above. Presence system can measure the distance between access point location with the user. Presence data generated in this presence system is recorded back in the web admin and can be justified. The result of using the distance calculation formula using haversine method on the system and manually is not much different, the difference is ± 0,2 meter. The experimental results are very satisfying and open the doors to a wide employment of the method.



(a)

(b)

Fig 3. Interface of presence system

TABLE 1. COMPARISON OF DISTANCE CALCULATION RESULTS

No	Latitude	Longitude	Distance Calculation on Application (m)	Manual Distance Computation (m)
1	-7.0038935	110.417422	3,283397759	3,533544
2	-7.0038935	110.417396	5,569435491	5,48379
3	-7.0038935	110.417409	4,386868489	4,504307
4	-7.0038935	110.417427	1,518194734	1,530106
5	-7.0038935	110.417423	7,586123216	7,703813

REFERENCES

[1] S. Vanjire, P. Wade, R. Taware, P. Nandawate, "Implementation of Android Application Reporting For Emergency Cases", International Journal of Technical Research and Applications, Vol. 3, Issue 4, pp. 328-333, 2015.

[2] M. Singhal, A. Shukla, Implementation of Location based Services in Android using GPS and Web Services, International Journal of Computer Science Issues (IJCSI), Vol.9, Issue 1, No. 2, pp. 237-242, 2012.

[3] A. Damani, H. Shah, K. Shah, "Global Positioning System for Object Tracking", International Journal of Computer Application, Vol. 109, No.8, pp.40-45, 2015.

[4] I. Bisjo, F. Lavagetto, M. Marchese, A. Sciarrone, "GPS/HPS-and Wi-Fi Fingerprint-Based Location Recognition for Check-In Applications Over Smartphones in Cloud-Based LBSs", IEEE, pp. 858-869, 2013.

[5] H. Nishinata, M. Otsuka, K. Asatani, O. Mizuno, H. Kataoka, M. Shimamura, "Proposed Presence System for Safety Confirmation", 16th International Conference on Intelligence in Next Generation Network, 2012.

[6] D. Pankti, J. Pooja, S. Abhishek, "Location Based Services and Integration of Google Maps in Android", International Journal of Engineering And Computer Science, Volume 3 Issue 3, pp 5072-5077, 2014.

[7] H. Mahmoud, N. Akari, "Shortest Path Calculation : A Comparative Study for Location-Based Recommender", Word Symposium on Computer Application and Research, 2016.

[8] I.N. Piarsa, E.S. Hadi, N.A.K. Wirdiani, "Rural Road Mapping Geographic Information System Using Mobile Android", International Journal of Computer Science Issues, Vol. 12, Issue 3, pp, 95-100, 2015.

[9] C.N. Alam, K. Manaf, A.R. Atmadja, D.K. Aurum, "Implementation of Haversine Formula for Counting Event Visitor in The Radius Based on Android Application", IEEE, 2016.

[10] E. Winarno, W. Hadikurniawati, I. H. Al Amin, M. Sukur, "Anti-Cheating Presence System Based on 3WPCA-Dual Vision Face Recognition", Proc. 4th International Conference on Electrical Engineering, Computer Science and Informatics (EECSI), pp 228-232, 2017.

[11] L. Ganes, V. Khumar, "Indoor Wireless Localization using Haversine Formula", International Advanced Research Journal in Science, Engineering and Technology, Vol.2, Issue 7, 2015.

Paper ICITECH

ORIGINALITY REPORT

12%	6%	7%	4%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	ishitvtech.in Internet Source	2%
2	Steven De Lausnay, Lieven De Strycker, Jean-Pierre Goemaere, Bart Nauwelaers, Nobby Stevens. "A survey on multiple access Visible Light Positioning", 2016 IEEE International Conference on Emerging Technologies and Innovative Business Practices for the Transformation of Societies (EmergiTech), 2016 Publication	2%
3	Edy Winarno, Wiwien Hadikurniawati, Ahmad Ainun Nirwanto, Dahlan Abdullah. "Multi-View Faces Detection Using Viola-Jones Method", Journal of Physics: Conference Series, 2018 Publication	2%
4	117.239.73.132 Internet Source	2%
5	Edy Winarno, Wiwien Hadikurniawati, Imam Husni Al Amin, Muji Sukur. "Anti-cheating	1%

	presence system based on 3WPCA-dual vision face recognition", 2017 4th International Conference on Electrical Engineering, Computer Science and Informatics (EECSI), 2017 Publication	
6	Submitted to University of Arizona Student Paper	1%
7	"Table of contents", 2017 International Conference on Innovative and Creative Information Technology (ICITech), 2017 Publication	1%
8	www.ijcaonline.org Internet Source	1%

Exclude quotes	Off	Exclude matches	< 1%
Exclude bibliography	On		