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Journal of Theoretical and Applied Information Technology

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Title:	A NOVEL APPROACH TO GENERATE TEST CASES FOR COMPOSITION & SELECTION OF WEB SERVICES BASED ON MUTATION TESTING
Author:	ASHOK KUMAR. P.S, KAARTHICK .B, GOPAL KRISHNA. C
Abstract:	Now a day's Web Service has become a significant part of the web. The importance of Web Services is to support interoperable and Application – to – Application interaction over a network with proper URI, so that Web Services provide high value to online business transactions. Testing (Verification & Validation) is a critical activity in software product design. Rigorous software testing is not possible so different software testing techniques are invoked before releasing the product. Based on Prim's algorithm we created all possible test cases from directed weighted graph. Mutation testing is a structural testing method; it generates software tests and evaluating the quality of software testing by fault insertion in original code. A case study has been presented here in order to create the efficacy of our test approach in mutation analysis.
Keywords:	Mutants, web service, testing, URI, SRS
Source:	Journal of Theoretical and Applied Information Technology January 2014 -- Vol. 59. No. 2 -- 2014

Full Text

Title:	TOWARDS A NEW ALGORITHM MORE EFFICIENT FOR UPDATING FIREWALL POLICIES
Author:	A. KARTIT, Z. KARTIT, M. EL MARRAKI
Abstract:	Firewall is one of the most widely utilized component on any network architecture, since that a deployment is a very important step to turn the initial policy to a target policy. This policy requires

Title:	CORRECTION POSITION OF COORDINATES FROM DATA GPS LOGGER IN GOOGLE MAPS BY USING LAGRANGE INTERPOLATION METHOD
Author:	NGAKAN MADE SATRYA WIBAWA, I MADE SUKARSA, I KETUT ADI PURNAWAN
Abstract:	Development of navigation technologies increase rapidly. People need a GPS to indicate a location or street. The accuracy of the GPS position is often less precise. This problem is used as a discussion of issues in the design of GIS to fix the GPS coordinates to the coordinates of the path using interpolation polinom lagrange method. This study uses PL/SQL to MySQL engine to perform the calculations haversine formula and interpolation polinom lagrange. Coordinates improvements value obtained from the results of these calculations.
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Full Text

Title:	COMPARATIVE STUDY OF DATA MINING MODEL FOR CREDIT CARD APPLICATION SCORING IN BANK
Author:	EVARISTUS DIDIK MADYATMADJA, MEDIANA ARYUNI
Abstract:	The growth of credit card application needs to be balanced with the anticipation of bad credit risk because it does not use security collateral as warranty. The usage of credit scoring can be used to help the credit risk analysis in determining the applicant's eligibility. Data mining has been proven as a valuable tool for credit scoring. The aim of this research is to design a data mining model for credit scoring in bank in order to support and improve the performance of the credit analyst job. The proposed model applies classification using Naïve Bayes and ID3 algorithm. The accuracy of Naïve Bayes classifier is 82% and ID3 is 76%. So we can conclude that Naïve Bayes classifier has better accuracy than ID3 classifier.
Keywords:	Credit Scoring, Data Mining, Credit Card, Bank, Naïve Bayes, ID3, Classification
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CORRECTION POSITION OF COORDINATES FROM DATA GPS LOGGER IN GOOGLE MAPS BY USING LAGRANGE INTERPOLATION METHOD

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ABSTRACT

Development of navigation technologies increase rapidly. People need a GPS to indicate a location or street. The accuracy of the GPS position is often less precise. This problem is used as a discussion of issues in the design of GIS to fix the GPS coordinates to the coordinates of the path using interpolation polinom lagrange method. This study uses PL/SQL to MySQL engine to perform the calculations haversine formula and interpolation polinom lagrange. Coordinates improvements value obtained from the results of these calculations.

Keywords: *GPS, GIS, PL/SQL, Correction Coordinate, Interpolation Polinom Lagrange*

1. INTRODUCTION

Kaplan and Christopher define navigation as the science of getting the objects from one place to another [6]. GPS provide accuracy, the position of the object directly, and track in realtime. Hoffmann – Wellenhof et al describe the GPS satellites placed at least five to eight satellites revolve around the earth and can be accessed at any time [3]. In accord with statement by Yun Young-Sun, GPS has many technical and economical benefits for virtually all industries and nowadays many companies are developing GPS enabled applications and navigation system [14].

The popularity of GIS application in mapping numerical information from satellite imagery as to assist for collecting relevant data of landmark in traveling and directions. Google maps is one of the popular digital map that provides many advantages for the research of GIS. Problem of accuracy GPS coordinates will be used as data samples to the next process with GIS application.

GPS has several sources of error that can degrade the level of accuracy from few meters to tens of meters [9]. These error sources are Ionospheric, Atmospheric delays, Satellite and Receiver Clock Errors, Multipath, Dilution of Precision, Selective Availability (S/A) and Anti Spoofing (A-S) as described by Kaplan and Christopher [6].

This paper discusses the GPS coordinates of the error correction in using interpolation polynomial lagrange method to coordinate road. Error correction has been performed by several researchers, but different in the data processing, the tools used, and the lack of provision for the integration of digital maps**.** This study utilize the Google API, including digital map and geographic coordinates. Data GPS coordinates (latitude and longitude) were recorded by using a GPS Logger application**.** This data is stored in a database and processed through lagrange polynomial interpolation calculation by using PL/SQL**.** Correction results displayed in the form of a comparison of data the GPS coordinates, the coordinates of the reference, and the interpolation results on Google maps**.**

2. THEORITICAL BACKGROUND

2.1 GPS (Global Positioning System)

GPS is the abbreviation of Global Positioning System that is known as a system for determining the position and global navigation using satellite. The GPS system was originally presented in the 1960s, several U.S. government organizations including the Department of Defense (DOD), the National Aeronautics and Space Administration (NASA) and the Department of Transportaion (DOT), which are interested in developing a satellite system to determine the 3-dimensional position**.** Surname GPS system that is NAVSTAR GPS (Navigation Satellite Timing and Ranging Global Positioning System).

The satellite constellation is the set of satellite that orbit within a few point as to provide the signal

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coverage and data messages to the receiver equipment. Kaplan and Christopher described GPS has three different segments i.e. satellite constellation, ground-control or monitoring network, and user receiving equipment [6]. The GPS constellation which served as a reference points on the earth there are 24 GPS satellites in 6 orbital planes. Each orbit is occupied by 4 satellites with the different intervals. The monitoring network segment is a part of controlling and monitoring every movement of the GPS satellite and signal integrity. The user receiver equipment segment, there is receiver that receive signals from GPS satellite. Receiver signals consist of antenna receiving signal, filtering, amplification circuit, and composition of the tracking signal.

Determining position of GPS is done by measuring the distance simultaneously to multiple satellites**.** Determination of the coordinates of a point on the earth, the receiver requires at least four satellites with good signal. In general, the position or coordinates obtained datum is referenced to World Geodetic System 1984 or shortened by WGS'84 [7].

GPS positioning process consist of two methods : the method of absolute and relative methods. This study uses a GPS logger application with absolute method because it only used for navigational purposes. Some errors in GPS positioning, namely : multipath effects, the effects of selective availability (SA), anti-spoofing, the inaccurate position due to receiver settings are not in accordance with the parameters of GPS**.** In general, the performance of GPS accuracy depends on the level of measurement noise on the navigation system i.e. measurement accuracy of pseudorange and carrier measurements [12].

2.2 GIS (Geographical Information System)

Jean define is a computer based system that is used to capture the image so it can be stored, manipulated, and analyzed for the research of geographic information [5].

Hurvitz stated that GIS have different functionality from other analytical environment is rooted in the spatially explicit nature of the data [4]. Geographic data is divided into four types : points, lines, polygons (or areas), and surfaces. Each data's type has a particular dimensionality and are associated with a set of descriptive. GIS contains DBMS (database management system) which is used to store descriptive information about points, lines, and areas**.**

The development of internet makes web-based GIS application services is growing rapidly. The advantage of using the Maps APIs in GIS is able to display and process the data between raster and vectors data. One of the applications that are used in this study is Google Maps API.

2.3 Google Map

Google Maps API is source code interface that provide program library and service for generating a map over the internet [13]. Google Maps API provides the key API to request spatial data about geographic information and process the map as an object in any external website. Google Maps API also allows to customize the map controls including navigation slide bar, polyline, marker, button to switch between map or aerial and hybrid views.

Google has released and develop a mapping based on web. Google as a leader in the product development map with Google Maps provide a slick, highly responsively visual, detail street and aerial imagery data. Google Maps API has many advantages including the availability of extensive data coverage, open spesification, ease of implementation, dynamic navigation, and querying capability. Google maps api are mainly based on Javascript and eXtensible Markup Language (XML), it enables customize the map interface into existing web sites.

2.4 Polynomial Lagrange Interpolation

Numerical analysis is the branch of mathematics and computer science that proposes, develops, analyzes and applies numerical method for solving all kind problems of mathematical [1]. The interpolation formula are derived which find the interpolated value of a function in terms of certain of its values [11]. Polinom lagrange interpolasi is known as popular method because it uses the function in the form of polynom. If the unknown function is f(x) and census data is n then :

$$f(x) = \sum_{i=1}^{n} y_i L_i(x) \quad \text{.....(15)}$$

Then the calculation of polynomial lagrange interpolation together with two points $(x_0,f(x_0))$ and $(x_1,f(x_1))$ as follows:

$$p_1(x) = y_0 \frac{(x-x_1)}{(x_0-x_1)} + y_1 \frac{(x-x_0)}{(x_1-x_0)} \quad \text{.....(15)}$$

Can be simplified in a similar manner :

$$p_1(x) = a_0 L_0(x) + a_1 L_1(x) \quad \text{.....(15)}$$

Where $a_0 = y_0$, $a_1 = y_1$ is longitude form coordinate road. While $L_0 = \frac{(x-x_1)}{(x_0-x_1)}$, $L_1 = \frac{(x-x_0)}{(x_1-x_0)}$,

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where x = latitude form coordinate GPS and x_0,x_1 = latitude from coordinate road.

2.5 Haversine Formula

The haversine formula is an equation commonly used in navigation which gives great circle distance between two different points on the surface of the sphere (Earth) based on longitudes and latitudes [10].

Then the calculation using haversine formula can be modeled as follows :

$$d = 2r\sin^{-1}\left(\sqrt{\sin^2\left(\frac{\theta_2-\theta_1}{2}\right)+\cos(\theta_1)\cos(\theta_2)\sin^2\left(\frac{\varphi_2-\varphi_1}{2}\right)}\right) \quad .....(8)$$

These are explanations of haversine formula as below :

d = distance between two points.

r = radius of the earth.

θ = latitude

φ = longitude

Haversine function on the above arguments are in radian. Simplify haversine equation in the form of degrees will make the process faster calculations on database.

Translation to SQL statement in degree :

```
SQRT(POW(69.1*ABS(latitude - lat_obj),2) +
POW(69.1*ABS(long_obj-
longitude)*COS(latitude/57.3),2)
```
.....(2)

3. SYSTEM OVERVIEW

This section explain about the overview of the error correction, the result calculation of haversine and polynomial lagrange interpolation.

3.1 System Overview

System overview of the process in making the determination of the position of the error correction can be modeled as shown in figure 1.

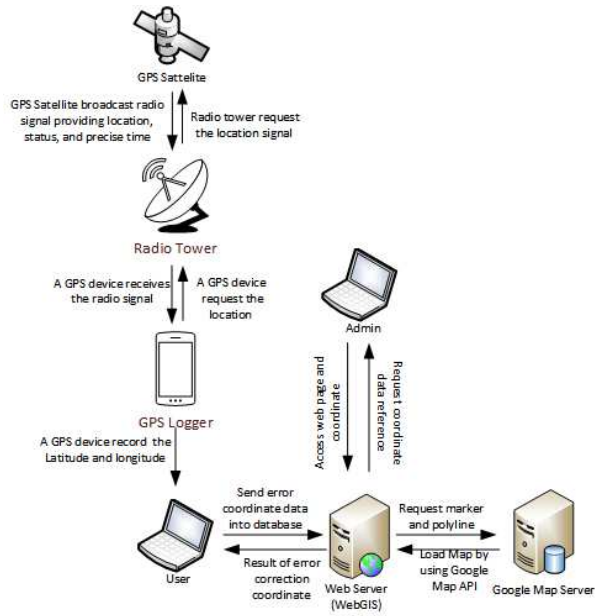

Figure 1 : System overview

There is general description of the system that is useful to describe the flow system of error correction. These are explanations of system overview on figure 1 as follows :

1) GPS logger request data coordinates location to the radio tower.
2) Radio tower request the location signal to the GPS satellite.
3) GPS satellite broadcast radio signal providing location, status, and precise time to the radio tower.
4) The radio tower invert signal location to GPS logger.
5) GPS Logger application record data coordinate from the radio tower.
6) User use coordinate data from GPS logger to analyze with the coordinate data from the Administrator.
7) Analysis results request polyline and marker from Google Map Server.
8) Web GIS will display result to the user and they can observe the correction points.

3.2 Design of System

The design of the application made by the flowchart concept. This flowchart describes the process in detail after the user input data coordinates.

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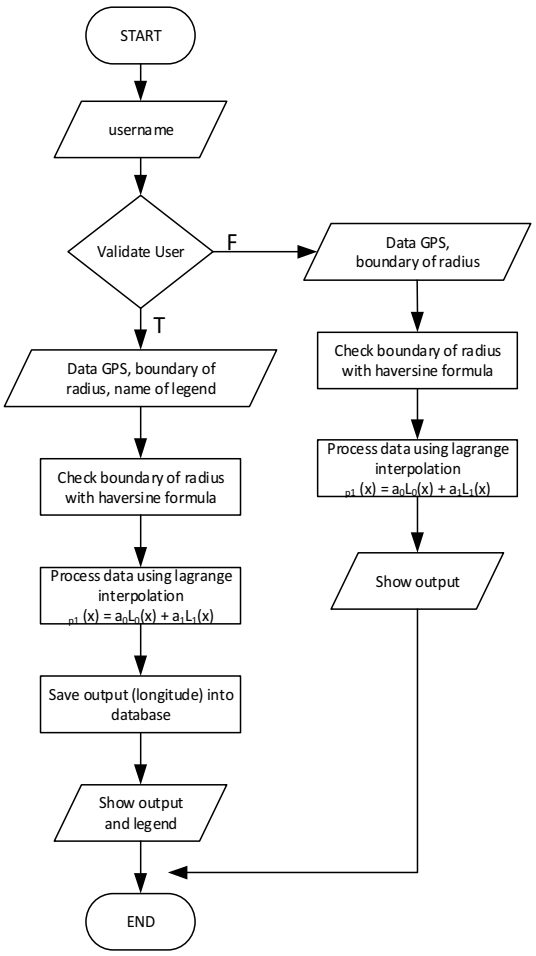

Figure 2 : Flowchart of system

First, the user can choose to be a registered user or regular user. Then the user input the data coordinates of GPS logger and select multiple coordinate points within radius. Select multiple points within radius by using haversine formula. Further, interpolation process to calculate the coordinates of the GPS logger, reference, and many points in radius. Interpolation formula is used as follows : $p_1(x) = a_0L_0(x) + a_1L_1(x)$ where latitude (X) and longitude (Y). Interpolation results in the form of a new longitude because interpolation can only process one of the coordinates (longitude only or latitude only).

The following polynomial lagrange interpolation formula in the form of PL/SQL syntax that is divided into 3 function :

1) Function L

```
loop_:LOOP
        FETCH   kur_koor   INTO   id_,   lat_,
long_;

            IF done = 1 OR i = lim THEN
                LEAVE loop_;
            END IF;

            IF id_ <> curr_point THEN
               SET numb_atas = numb_atas *
(lat_obj - lat_);
            ELSE
               SET numb_bawah = bawah(lat_,
                curr_point, lat_obj,
                long_obj, lim);
            END IF;

        SET i = i + 1;
END LOOP;
```

2) Function Bottom

```
loop_:LOOP
        FETCH   kur_koor   INTO   id_,   lat_,
long_;

            IF done = 1 OR i = lim THEN
                LEAVE loop_;
            END IF;

            IF id_ <> curr_point THEN
                SET  numb_bawah  =  numb_bawah
*
                     (lat_point - lat_);
            END IF;

        SET i = i + 1;
END LOOP;
```

3) Function Interpolation

```
loop_:LOOP
        FETCH   kur_koor   INTO   id_,   lat_,
long_;

            IF done = 1 OR i = lim THEN
                LEAVE loop_;
            END IF;

            SET new_long_obj = new_long_obj
                    + (long_ * l(lat_obj,
                    long_obj, id_, lim));
            IF ISNULL(new_long_obj) THEN
                SET trace = CONCAT(trace,
                            'NULL', ' ');
            ELSE
                SET trace = CONCAT(trace,
                    l(lat_obj, long_obj,
                    id_, lim), ' ');
            END IF;
        SET i = i + 1;
END LOOP;
```

4. IMPLEMENTATION

Experimental phase was taken to measure the accuracy level of the calculation of the coordinates from the GPS coordinates. System of error correction coordinates was built with software such as PHP, AJAX, Javascript, MySQL and hardware such as Intel Core i5 Processor, 2 GB RAM, and Windows 7 OS.

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4.1 The Experiment Results

GPS coordinate data that is used around the area of Denpasar and Badung. Data GPS that stored i.e. latitude and longitude by using the assistance GPS logger application. After inputing coordinate data and select the amount of coordinate used, then it processed through haversine formula and polinomial lagrange interpolation is done in MySQL. Google Map is used to display the comparison of data GPS coordinates, road, and results of the interpolation.

For example, if the GPS coordinate data as below :

Table 1 : GPS Coordinate

Latitude	Longitude
-8.779101	115.177334

If the user select the amount of coordinates is 3 points, then the following works will be calculated by haversine formula to find the point closest to the GPS coordinates and it uses only 3 coordinate road.

Table 2 : Reference Road Coordinate

latitude	Longitude
-8.7791615097	115.1776599884
-8.7783518599	115.1776707172
-8.7782284325	115.1776814461

After the specified coordinates reference data have been determined by haversine formula and calculate by interpolation method as follows :

Table 3 : Interpolation Result

latitude	longitude	Longitude interpolasi
-8.779101	115.177334	115.17765740396067

Correction result display on Google Map as figure 3:

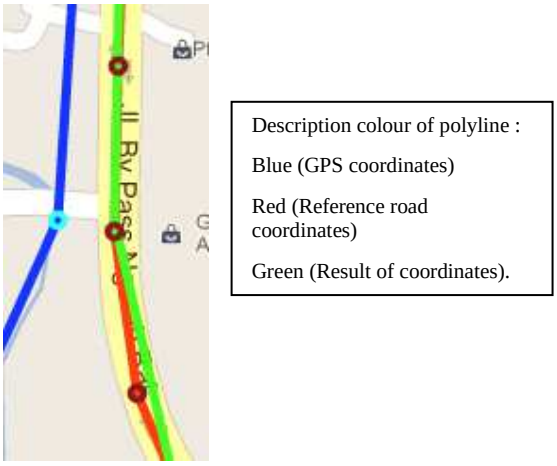

Figure 3 : Correction result on Google Maps

4.2 Discussion

The purpose of developing system of error correction GPS coordinates is to correct errors of the coordinate GPS of the coordinate road.

System of error correction coordinates built with the programming language including PHP, AJAX, Javascript, and MySQL.

The first step is to input the data GPS coordinates and select the amount of coordinates. After that, it processes by using haversine formula and polynomial lagrange interpolation which is done in MySQL database. Starts from calculating the closest distance with haversine formula until the calculation with polynomial lagrange interpolation.

The correction result shows that the value of interpolation coordinate almost close to the value of coordinates road. However, the results of the correction depends on several factors including the amount of selected coordinates and the exact location of coordinate road.

5. CONCLUSION

In this paper, we discuss the error correction of data GPS coordinate by using the polynomial lagrange interpolation. We try to compare the data GPS coordinates with coordinate road. We founded that there are some the conclusions of the test result as follows :

1) The calculation of the radius of the generate value much beyond the capacity of the data type range that are used as a result reveal null values.
2) If we use a lot of radius point then it is required road points with high density of coordinate road.

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3) The optimum radius point that can be used between range 1 and 30 points.

The accuracy of calculation it is due to several factors, including the location coordinates of complete road points and the amount of points within radius. So that can minimize errors in the calculation of interpolation.

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