

Integration of Mapbox and Google Maps to Support Additional Features in Geographic Information Systems

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Article Info :	ABSTRACT
<p>Article History :</p> <p>Received :</p> <p>14 July 2022</p> <p>Revised :</p> <p>12 Nov 2022</p> <p>Accepted :</p> <p>14 Dec 2022</p> <p>Available Online:</p> <p>21 Dec 2022</p> <p>Keyword :</p> <p>GIS ,</p> <p>Google Maps,</p> <p>Mapbox</p>	<p><i>An integrated geographic information system is a geographic information system that aims to facilitate the creation and integration of mapping data so that researchers from various backgrounds can present their research results in the form of a map and can be combined on a larger scale. In making an integrated geographic information system, the use of the maps box was chosen because the maps box is a tool for making mapping that is free of charge both in making mappings and displaying mapping results so; it can save costs because the number of accessors and mappings made will incur substantial costs if using a paid alternative. However, the Maps box has many shortcomings in terms of features, so we researched to integrate third-party applications to fulfill the features that need to be added in the maps box. To overcome the shortcomings of the map box, the researcher integrates the route feature of Google Maps, integrates the location details feature on Google Maps, and integrates Google Maps coordinate data via the Google Maps link, which can be stored in the system so that these features can be used in an integrated geographic information system. Integrating third-party applications can create an integrated geographic information system using a map box but can also have more features.</i></p>

1. INTRODUCTION

A geographic Information System (GIS) is a specialized information system that manages data that has spatial information. GIS is software that can enter, store, manipulate, display, and output geographic information (Ambarita 2017).

Making geographic information systems requires many features to process, analyze and present data in an informative manner and requires much money if you use a paid alternative. In order to maximize a GIS-based database system and present exclusive features at an affordable cost, this research uses Mapbox as the primary tool for making geographic information systems. However, Mapbox has many features that could be improved in terms of features.

Therefore, this research integrates the Mapbox and google maps applications, which can support the route display feature on Google maps, detail the location of Google Maps and get coordinates from the Google Maps URL. By utilizing Google Maps, users can display coordinates from Mapbox in the form of Google Maps mapping, which has complete information, and can display route locations from Mapbox coordinates on Google Maps with more updated satellite data and provide real-time GPS information, and can enter coordinates. From the google maps URL to make it easier to add a location.

Previous researchers have also conducted research, including compiling a Web-based Museum Tourism Atlas for the Special Region of Yogyakarta (Daru Prasetyaningrum & Rahardjo, 2017), which can display maps from Mapbox equipped with additional features by calling data via `id_map` and `id_token` Mapbox to display on website pages. Geographic Information System Searching for Travel Location Routes in Palangkaraya City Based on a Website (Pranatawijaya et al., 2019) can display travel locations and show routes with Google map software.

2. FOUNDATION OF THEORY

In completing this research, a theoretical basis is used, which discusses the theory used as a reference in solving problems. From the title of this final project, the researcher describes several studies as follows.

2.1 Geographic Information System

Geographic Information System (GIS) or Geographic Information System (GIS) is a computer system that can record, store, write, analyze and display geographic data (Sasmito, 2017). Geographic Information System Is a field of science that discusses the field of earth geography, which can be applied in various institutional fields, for example, in the military, medical, educational and agricultural fields. strategic (Masykur, 2014).

2.2 Mapbox

Mapbox is an application that provides tools that are easy to integrate into mobile applications. To improve the user experience, many developers include maps in the app, which are constantly connected to the internet and are continually updated with changing local locations.

Mapbox's strengths include building maps relying on open-source software. Then it becomes a license to the developer so it can be included in the application. Mapbox combines various data sources from government and open-source circles such as the U.S Geological Survey, NASA and Open StreetMap (Hadi, 2015).

2.3 Google Maps

Google maps is an information service application about maps of various parts of the world. This service is an area mapping site that users can access through <https://maps.google.com> site with various exciting features such as location, area or road search, direction or navigation, measuring mileage, and monitoring road and traffic conditions. traffic monitoring) for various regions of the world (Utari, 2013).

2.4 MySQL

MySQL (My Structured Query Language) is a program for creating and managing databases; the nature of this DBMS is open source. MySQL is a product that runs on the Linux platform, with the development and number of users, and the license for this database is Open Source; the developers released the Windows version (Rahardian, 2014). MYSQL can be used without having to pay for it. Although we sell products, including MySQL software, we do not infringe on copyright.

2.5 Codeigniter

Codeigniter is an open-source application in the form of a framework with the MVC (Model, View, Controller) model for building dynamic websites using the PHP programming language: Model View Controller (MVC) is a concept that is quite popular in web application development, MVC separates application development based on components The main components that build an application such as data manipulation, user interface, and the part that controls the application.

3. METHOD

3.1 Data Collection and System Requirements Analysis

At this stage, the methods used are interviews and literature studies. Interviews were conducted with supervisors. The data obtained in this study is in the form of data regarding features on Google maps which are more complete and can be integrated into Mapbox. The data obtained is processed and analysed to add features to the geographic information system.

3.2 System Design Design

At this stage, the method used is system design based on the needs analysis results using UML (Unified Modeling Language), which consists of use case diagrams and activity diagrams. The Unified Modeling Language (UML) is an industry standard for designing, visualising and documenting a software system. UML offers a standard for modelling a system. UML can be used to model all types of software applications, which can run on any hardware, network and operating system and be written in any programming language. Other design additions are database design and interface design.

3.3 System Design Implementation

At this stage, the method implemented is to implement the system design using the Codeigneter 3 framework, both frontend and backend, Bootstrap as the display design, and JQuery as a component. The method used in application development is the prototype method. A *prototype* is a method developed by communicating with the client so that the resulting application matches the client's wishes. The prototype method also makes it easier for software developers to form a model of the software that must be made.

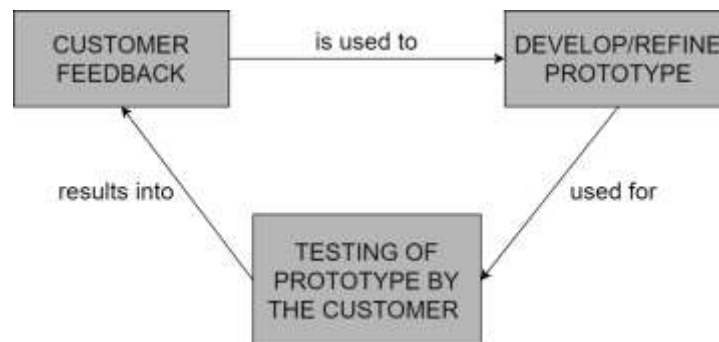


Figure 1. The prototype method

3.4 System Testing and Analysis of Test Results

At this stage, the method used is testing the application using beta testing and analysis of the results of system testing. Alpha testing is a test carried out on the developer side. In this case, alpha testing is carried out using a black box testing technique which can be defined as a test to determine whether all software is running properly according to the defined functional requirements. Beta testing is a test carried out by the user to test whether the application is appropriate according to the user's wishes.

4. RESULTS AND ANALYSIS

The results of this study are the formation of a geographic information system that is integrated with third-party applications and has features that can add location coordinates using the google maps URL and display more complete location details and routes to locations using more updated satellite real-time GPS.

4.1 Discussion

To display mappings and a list of coordinates, we can see the mapping data table (Figure 2), which displays a list of mapping data. To add a mapping, we can click on the green button. Moreover, we can view and change the mappings on the options button.

No.	Pembuat	Jenis Pemetaan	Kategori Pemetaan	Keterangan	Opsi
1	Art, richman	Club Sepak Bola Indonesia Home	gedung	Mensympati lokasi kandang setiap club sepak bola indonesia	Tampilkan Pemetaan Koordinat List
2	Mahmad Indryakalah	Covid	covid-19	Covidtdid	Edit Koordinat Pemetaan Tampilkan Pemetaan Koordinat List

Figure 2. Mapping List

Adding mapping coordinates (Figure 3) can be done on the current form in the change mapping function. If we already have a location point on Google Maps, we can click on the input text from the URL below the coordinates form.

Nama Lokasi

Nama Lokasi

+

Batal Simpan

Nama Lokasi

Mojokrapak

Input URL

Https

Input URL

Keterangan

Mojo krapak loh

Figure 3. Coordinate Data Input

To display a detailed list of coordinates, we can do this on the View Mapping List page (Figure 4), which functions to view a list of mapping location points. If we want to see the exact locations and routes to the application, we can select the options button at each location.

No.	Nama Lokasi	Bujur	Lintang	Keterangan	Opsi
1	Masinapak	112.2315473015038	-7.508297319308561	Meja H	Lihat Lokasi Cari Rute
2	Tembak mes	112.23416119426803	-7.5193056871274	Tenda H	Lihat
3	Jombang	112.23603748972042	-7.538346000884558	Ringin contong	Lihat

Figure 4. Coordinate List

To display the mapping, we can look at the view mapping location page (Figure 5) which functions to see a list of mapping location points on the Mapbox tolls which can display a popup description of the location and if we want to see location details and routes to the application, we can select the options button on each location.

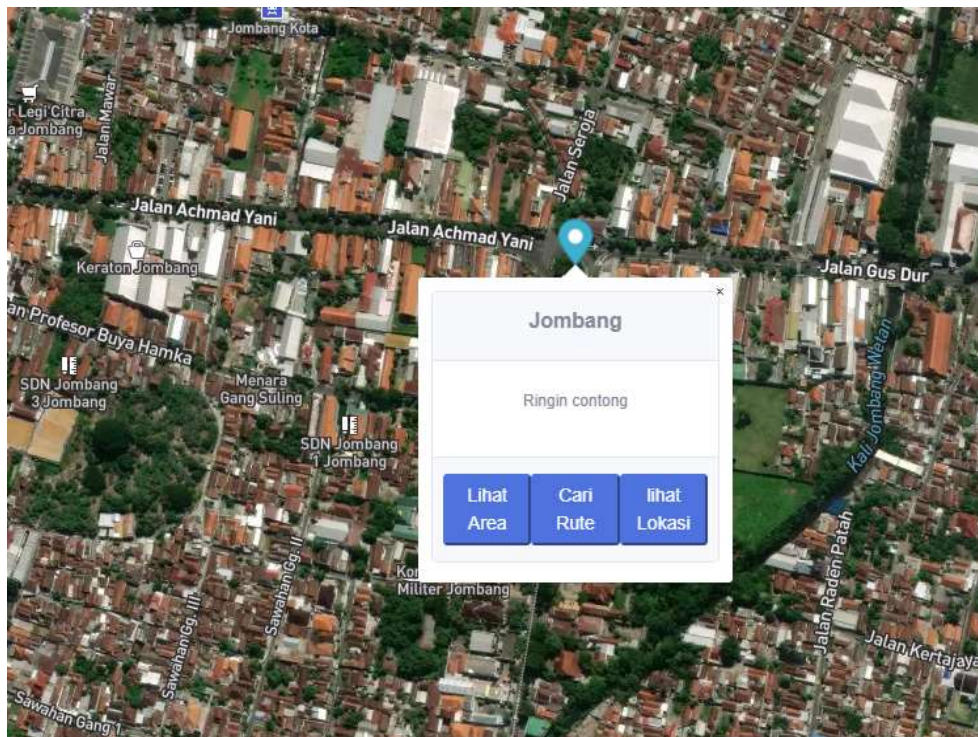


Figure 5. Mapping View

The appearance of route search button (Figure 6) is integrated with third-party applications to display routes to the selected location with a starting point according to the device's location.

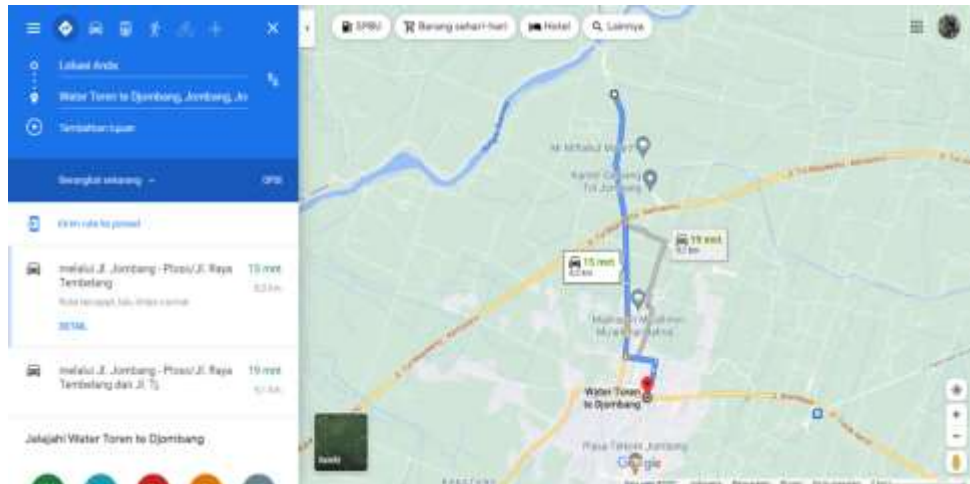


Figure 6. Location Details Integration

The display of the view location button (Figure 7), which is integrated with third-party applications, functions to display details of the selected location with more and more accurate information.

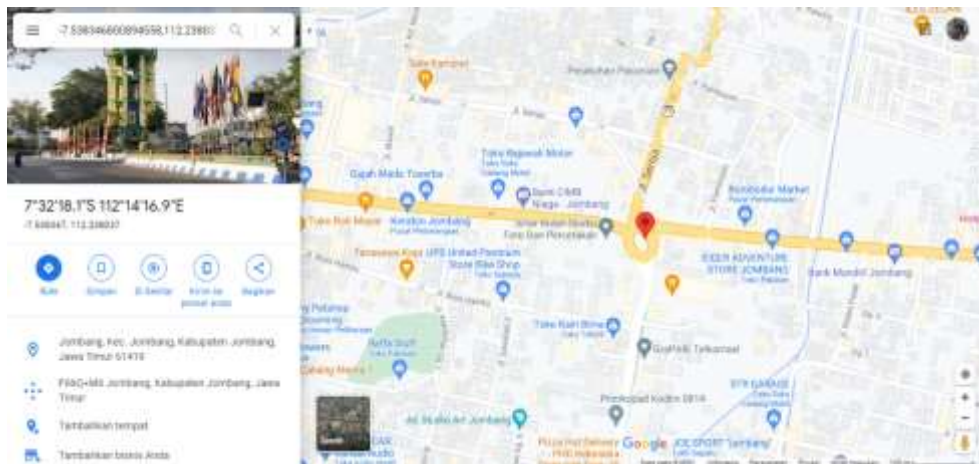


Figure 7. Location Route Integration

5. CONCLUSION

Based on the results of this study, it can be concluded that the integration of third-party applications in Mapbox. in this study has succeeded in adding features for displaying routes on Google Maps by using updated satellites and having real-time GPS, displaying detailed Google Maps location details, and being able to get coordinates from Google URLs Maps.

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DECLARATION OF COMPETING INTEREST

We declare that we have no conflict of interest.

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