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Geographic Information System for the Location Veterinarians Based on Android

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Abstract

Geographic information systems (GIS) have the ability to connect various data at a certain point on the earth, combine them, analyze and finally map the results. The data to be processed in (GIS) is spatial data, which is geographically oriented data and is a location that has a certain coordinate system, as the basis for reference. So that the application (GIS) can answer several questions such as; location, condition, trend, pattern and modeling. This capability is what distinguishes (GIS) from other information systems. The problem in this study discusses the design of a GIS to track the location of veterinarians in the city of Padang. GIS is a concept that can map locations on the earth's surface. The results of its interpretation can be used as information for users in overcoming a problem. The data used in this GIS design is taken from the location of veterinarians in the city of Padang. Gis results provide accuracy in presenting information to users. By building a geographic information system, it is expected to find out where the location of the veterinarians in the city of Padang based can help the android community. So that the public can more easily find out the location of the veterinarians in the city of Padang quickly and accurately which can be accessed via mobile phones (Smartphones). In making this geographic information system, additional application programs used are Android Studio, and other supporting applications.

Keywords: (GIS), Android, Veterinarian, Smartphone, Location

1. Introduction

The development of information technology is currently growing very rapidly with the existence of technological products that are the needs of society in general to carry out daily activities [1]. Information technology that is currently widely used by the public in general is a smartphone or commonly referred to as a smartphone. Smartphone is a multifunctional mobile phone that combines several functions of a PDA, such as personal scheduler, calendar and phone book [2]. A smartphone equipped with the ability to access the internet, check email, play online games to write and convert spreadsheet documents such as Microsoft Word and Excel like a mini computer. Therefore, just like on a computer, on a smartphone it is also possible to create an application which can then be run on a smartphone [3].

Android is a Linux-based operating system that is used as a hardware resource manager, both for mobile phones, smartphones, and tablet PCs. In general, Android has a platform that is open (open source) for developers in creating the latest applications for use on Android smartphones [4]. Android-based applications on smartphones are currently in great demand by the public in general because their use is not difficult and can be accessed offline and anytime [5]. Geographic Information System is a computer-based information system that is used to combine map elements (geography) and information about the map (attribute data) designed to obtain, process, manipulate, analyze, demonstrate and display spatial data to complete planning, processing and researching the problem [6].

The use of geographic information systems in daily life can aim to facilitate the search for the location of a location through a visualization guide that is owned by a geographic information system [7],[8]. The need for animal breeders for veterinarians is something that cannot be separated to achieve the goal of having livestock with good health [9],[10]. In the city of Padang there are many animal breeders, therefore it is very necessary to have a consultation with a veterinarian for health care for livestock. However, the wide map of the city of Padang causes problems for animal breeders to find the location of the veterinarian quickly and precisely [11],[12].

In order to be able to solve the problems described above, the authors design and build a geographic information system with the aim of facilitating the process of finding the location of a veterinarian in the city of Padang. This geographic information system is designed and built using the android programming language that can be operated on smartphones supported by the android operating system.

2. Research Method

The research framework made by the research to be carried out can be seen in Figure. 1 as below:

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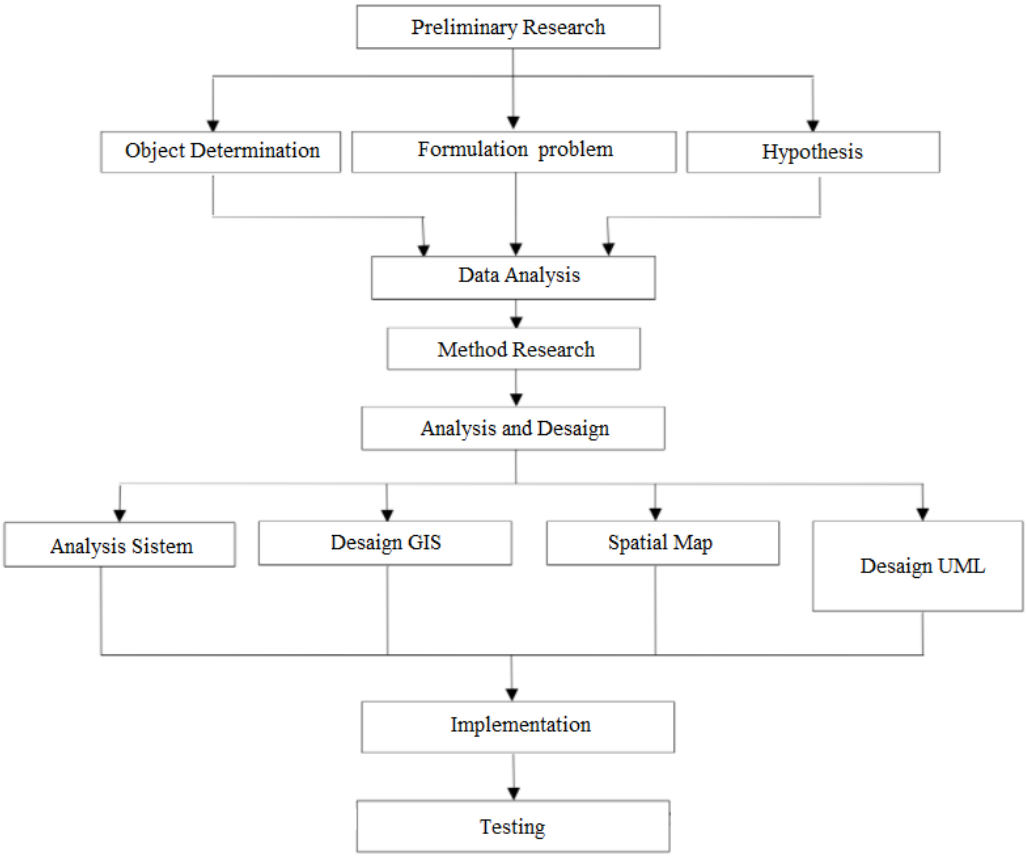

Figure. 1 Research Stages

This preliminary research that must be done is to find out on the internet related to GIS which can later be poured into a GIS application, the constraints and problems that occur in the design of this application, so that the discovery of these problems the author will try to find a way out for these problems. At this stage the author uses UML as a tool in explaining the system design flow. UML (Unified Modeling Language) is one of the most powerful tools in the world of object-oriented system development. This is because UML provides a modeling language that allows system developers to make designs that are effective and in accordance with the system that will be made later.

2.1 Software Engineering

Software engineering (software engineering) is development using engineering principles or concepts with the aim of producing software that has economic value that is trusted and works efficiently using machines [13]. Software engineering is a profession performed by a software engineer that is concerned with the creation and maintenance of software applications by applying technology and practice from computer science, project management, and other fields. Software is a computer's direct instructions for doing work and can be found in every aspect of modern life from life-critical applications. All software also requires high reliability and must be produced economically.

2.2 Geographic Information System (GIS)

A geographic information system (GIS) is a specialized information system that manage data that has spatial information (spatially referenced). Or in a narrower sense, is a computer system that has the ability to build, store, manage and display geographically referenced information [15]. GIS is a complex system that is generally integrated with other computer systems at the functional & network level. If described, (GIS) consists of components with various characteristics [16]:

1. Hardware (GIS) is available on various hardware platforms; ranging from desktop PC classes, workstations, to multi-user hosts. However, functionality (GIS) is not strictly tied to the physical characteristics of the hardware until the memory limitations of PCs can be overcome.
2. Software (GIS) is a software system in which the database system plays a key role. In the old (GIS), sub-systems are implemented by software modules so it is not surprising that there are tools (GIS) consisting of hundreds of program modules (*.exe) that can be executed separately.
3. Geographical data & information (GIS) can collect & store the required data/information

either indirectly (by importing it) or directly by digitizing its spatial data from analog maps and entering its attribute data from tables/reports using the keyboard.

4. Project Management (GIS) will be successful if it is managed well and done by people who have the right skills at all levels.

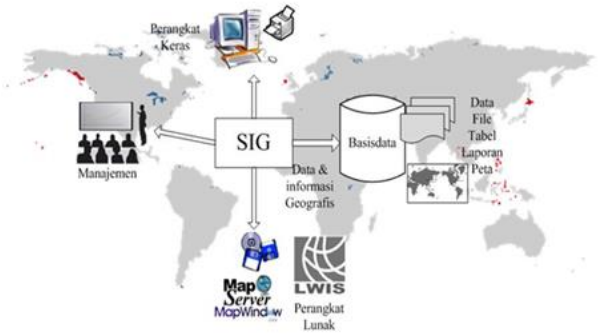

Figure. 2 Geographic Information System Components

2.3 Vector Data

Spatial data can be represented in two formats, namely: Vector, In vector format data, our earth is represented as a mosaic of lines (arc/line), polygons (areas bounded by lines starting and ending at the same point), points/ point (a node that has a label), and nodes (a point of intersection between two lines) [17].

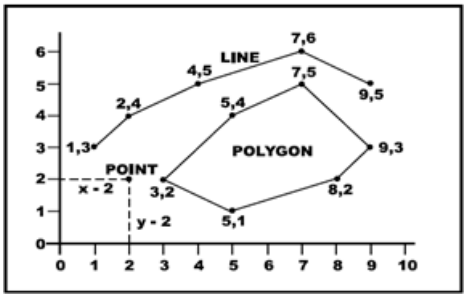

Figure. 3 Vector Data Model

The main advantage of the vector data format is the accuracy in representing point features, boundaries and straight lines. This is very useful for analyzes that require positional accuracy, for example in cadastral boundary databases. Another example of use is to define the spatial relationship of several features. The main weakness of vector data is its inability to accommodate gradual changes.

2.4 Raster Data

Raster data (also known as grid cells) is data generated from remote sensing systems. In raster data, geographic objects are represented as grid cell structures called pixels (picture elements). In raster data, the resolution (visual definition) depends on the pixel size. In other words, pixel resolution describes the actual size on the earth's surface represented by each pixel in the image. The smaller the size of the earth's surface represented by a single cell, the higher the resolution. Raster data is very good for representing gradually changing boundaries, such as soil type, soil moisture, vegetation, soil temperature, and so on. The main limitation of raster data is the size of the file; the higher the resolution (GIS) rid the bigger the file size [18].

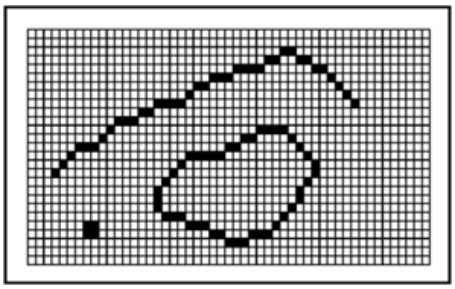

Figure. 4 Raster Data Model

Each data format has advantages and disadvantages. The choice of the data format used is highly dependent on the intended use, the available data, the volume of data produced, the desired accuracy, and the ease of analysis. Vector data is relatively more economical in terms of file size and precision in location, but is very difficult to use in mathematical computations. On the other hand, raster data usually requires more file storage space and lower location precision, but is easier to use mathematically.

3. Result and Discussion

3.1 Data analysis

With the limited number of veterinarians in the city of Padang and the lack of available information, the problem arises that not everyone knows where the location of the veterinarians in the city of Padang is, especially those that are rarely heard by the public. For that we need a geographic information system application that is useful as a container of information and directions from the location of veterinarians in the city of Padang. The list of scattered veterinarians can be seen in Table 1 below:

Table. 1 Vet Locations In Padang City

Lokasi	Alamat	Coordinat	
		Latitude	Longtitude
Dinas Peternakan dan Kesehatan	Jl. Gandaria No.68, Jati	-0.932122	100.36285
Puskeswan Air Pacah	Aie Pacah , Kec Koto Tangah	-0.860113	100.385187
Praktek Dokter Hewan Andalas	Jln. Andalas No. 74, Andalas , Kec	-0.940547	100.384118
Delta Pet Shop	Jl. Ujung Gurun No.41,	-0.934417	100.36069
Klinik Zech Vet Care	Jl. Rawang Timur IV	-0.979592	100.383478
Dr. Lora Menza	Jl. Pisang, Perumahan	-0.945522	100.407062
Sahabat Satwa	Jl. Veteran no.50, Purus,	-0.937175	100.354608
Dr. Sovia Hariani	Jl. Adinegoro No.1, RT.01,	-0.848845	100.334073

3.2 GIS Design

The design of the application is made to implement a system that is easy to use by the general public (user friendly), namely the display contained in this application is made as simple as possible. The buttons are simple and with the presence of every information contained in the button that will be selected by the user. This application is equipped with several buttons. In the initial view, having a button in the right-hand header, clicking on it will bring up the first button, namely the home button, which is used so that users can return to the main page quickly. The second is the vet location button, where this button shows the location and name of the vet clinic and the distance from the user. The third is the map button, where on this button there are descriptions and directions made by the researcher or admin. The fourth is the news information button which contains information from various veterinary clinics in the city of Padang. The fifth is the about us button, an understanding of veterinarians. The sixth is the setting button, it is used for setting.

3.3 Map Design

In making this Geographic Information System, a workflow is needed so that the process runs smoothly and does not deviate from the goals that have been made from the beginning. The following is a guide to the creation process using the Google Maps API. The map results can be seen in Figure. 5 the following:

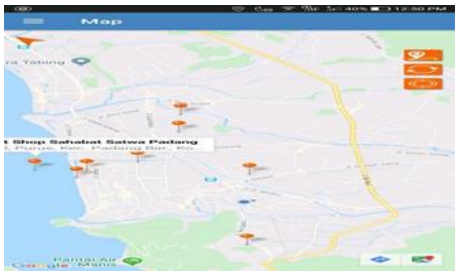

Figure. 5 Map Design

3.4 UML Design

UML design is used to determine the workflow of the system to be created, so that the system will run according to the wishes of the author, with the aim that the system does not deviate from the previous goal. The form of the system design can be seen in the Figure. 6 below:

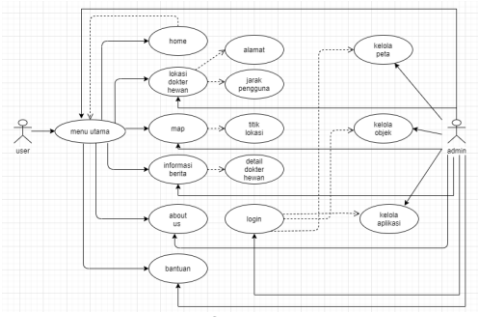

Figure. 6 UML Design

Use case diagrams describe an interaction between one or more actors and the system to be created. Use Case is used to find out every function of the system and who can access or use that function.

3.5 GIS System Design

Is a system design that can be accessed by the admin Which admin can fill, edit, save, delete data on the veterinary location search system in the city of Padang the following is the system design that has been created:

Figure. 7 GIS System Design

3.6 GIS Application Work Results

In the results of testing the system that has been designed, basically the work concept is in accordance with the previous design. The results of the system provide information for users about the location of veterinarians in Padang City. The results of the work of the system can be seen in Figure. 8 below:

Figure. 8 GIS Application Work Results

4. Conclusion

Based on the analysis that has been carried out on making GIS and information systems for Veterinarians' Locations in the city of Padang based on Android, the following conclusions can be drawn: This geographic information system application is designed to find the location of veterinarians by making details of every place where there is a veterinarian's location in it. along with the veterinarian's information. This geographic information system application is a medium that was built to find the location of doctors in the city of Padang by making it easier for users to be able to access anywhere and anytime and a display that is very easy to understand even for the general public. Geographic information system application contains procedures for finding the location of a veterinarian that can help the general public to obtain information contained on each map or object and can be accessed anywhere and anytime because it is online.

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