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Development of the 3-Dimensional Map in the Bandung Regency Government Complex

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Abstract. The purpose of this research is the development of 3-D Maps in the Government Complex of Bandung Regency to facilitate the people in Bandung Regency to find the location of official offices related to administrative needs. The research method used was qualitative and quantitative methods and there are several stages carried out in this study consisting of 4 stages. The first stage is data collection and analysis, software development, system testing and the last stage is drawing conclusions. The application built models the agency office and environment in 3D. The application built also has the closest route search feature using the Dijkstra algorithm. The results of this study are that the system also provides information relating to the agency office. Based on the results of user acceptance tests conducted on residents, more than 70% of the population agree that this 3D map makes it easy for residents to find the location of a building and determine the closest distance to that location. With this 3D Map, residents no longer need to worry if they get lost in the complex area of the Bandung Regency Government and can also quickly find the location of an official service office.

1. Introduction

Government activities and services to the residents of Bandung Regency are carried out in the complex of the government of Bandung Regency. This complex is centered on an area of 33,194 ha. In the complex, there are 32 agency offices and also public facilities such as sports fields, religious facilities, and playgrounds. Based on observation, centralized government activities and public services should provide a lot of convenience to the residents of Bandung regency [1].

The process of collecting data uses qualitative and quantitative methods [2-6]. The problem that occurs is because of the large of the government complex as well as the number of agency offices resulting in residents of Bandung regency feel confused to find the location of agency offices related to their needs. The lack of road signs in the complex area also makes people get lost in the direction of the complex. This was confirmed by the results of interviews with Ratna Nurhayati as officers of the Library, Archives, and Development of information systems (BAPAPSI) in Bandung Regency. Ratna said that the security officers in the government complex were few in number. This causes the population difficulty in finding people who provide information about what agencies and services exist in the agency. Another problem is that existing Map Applications such as Google Map are only able to describe maps outside the region so that information obtained by residents of Bandung Regency is not enough. Based on the problems that have been explained, it requires a system that provides information and an overview of the location of agencies in the Bandung Regency complex. With interactive Map, the user is expected to get clear information about the Map [7-8]. Applications that are built must also have a search feature so that it makes it easier to conduct information searches.

The purpose of this research is the development of 3-D Maps in the Government Complex of Bandung Regency to facilitate the people in Bandung Regency to find the location of official offices related to administrative needs. The research method used was qualitative and quantitative methods and there are several stages carried out in this study consisting of 4 stages. Based on the results of user acceptance tests conducted on residents, more than 70% of the population agree that this 3D map makes



it easy for residents to find the location of a building and determine the closest distance to that location. With this 3D Map, residents no longer need to worry if they get lost in the complex area of the Bandung Regency Government and can also quickly find the location of an official service office

2. Research Methodology

The method used is a descriptive method [9-10]. The stages of research are divided into 4 stages. The stages carried out are explained in Figure 1 of the research stage.

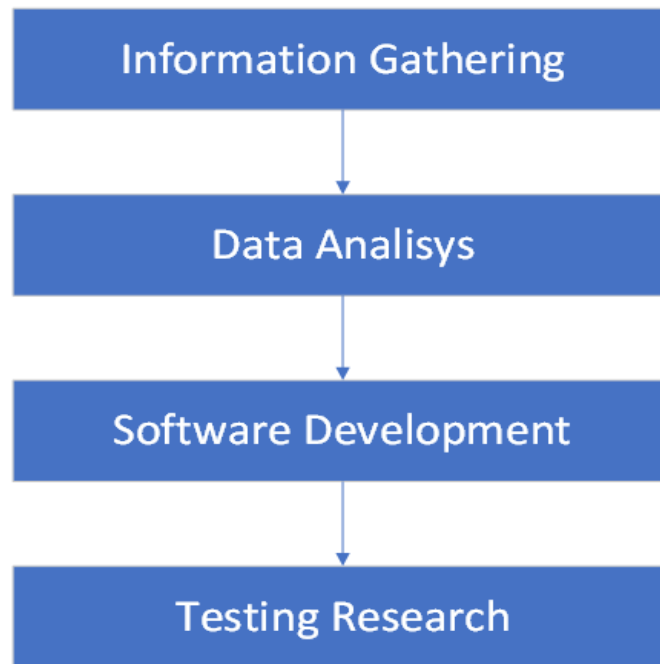


Figure 1. Research Methodology

1. Information Gathering
At this stage, data related to research is collected. The method used is the technique of observation, interviews, and literature. Observations were made to observe the spatial structure of the Bandung district government complex. While interviews and literature studies are used to collect information data which will later be presented in the application [9]
2. Data Analysis
At this stage, the data that has been collected at the previous stage is analyzed to then be categorized based on data requirements for the application creation process
3. Software Development
At this stage, Luther's multimedia development method will be applied according to Sutopo. Multimedia development stage according to Sutopo consists of determining concepts, application design, collecting materials, assembly, testing, distribution [10].
4. Research Testing
The method used in testing this study was an interview to get a direct response from the residents of Bandung regency

3. Results and Discussion

3.1. System Architecture Analysis

The system that is built has the ability to display 3-dimensional objects using the mobile device of the population. With that mobile population, devices can display interactive content in the form of 3D maps. The architecture of the system that was built is explained in Figure 2 - System architecture.

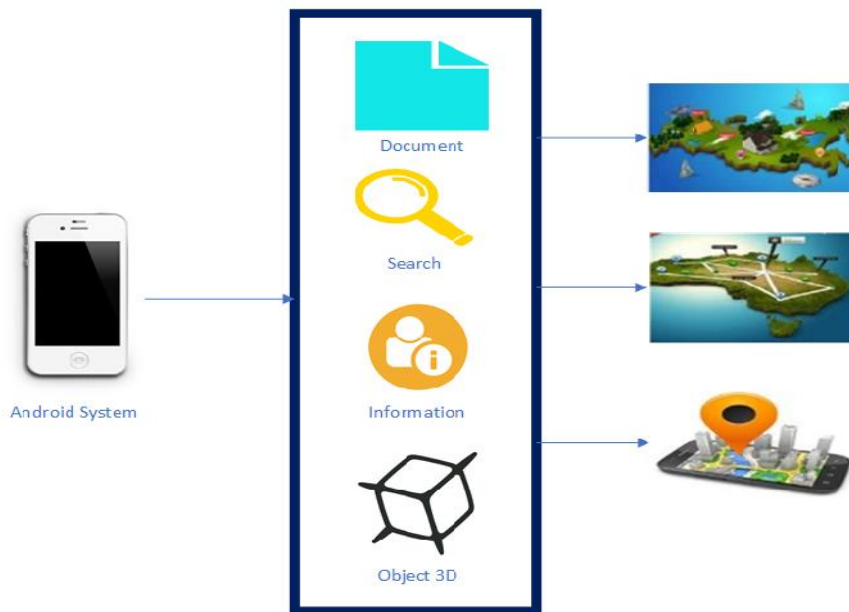


Figure 2. System architecture

3.2. Software Specification Requirement

The software specification of the system is divided into functional requirements and non-functional requirements. Table 1 illustrate the non-functional requirements of the system being built.

Table 1. Non-functional specifications.

Requirement Code	Description of needs
SKPL-F-01	The system provides a feature to find routes to existing government agencies
SKPL-F-02	The system can provide information about what services the agency provides
SKPL-F-03	The system displays the shape of the building in 3D
SKPL-F-04	The system has a rotation feature of 360 degrees to make it easier for users.

Table 2 gives an explanation of Non-functional requirement specification of the system to be built

Table 2. Functional Specification.

Requirement Code	Description of needs
SKPL-NF-01	The system uses hardware in the form of a mobile device
SKPL-NF-02	Has a minimum operating system android version 4
SKPL-NF-03	Users must be used to reading maps

3.3. Use case diagram.

Use case diagrams are used to model the functionality of the system based on the functional requirements described in Table 1 - functional requirements [9-10]. The use case diagram of the system that was built is explained in Figure 3-Use Case Diagram

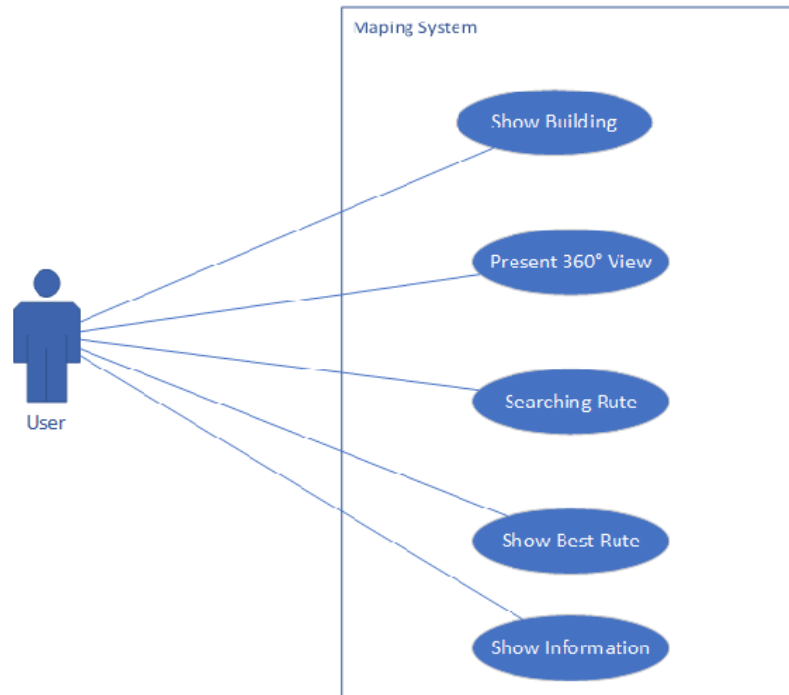


Figure 3. Use Case Diagram

3.4. System Implementation

Implementation System is the stage to translate the design based on the results of an analysis in previous stage into a real system. This stage, the hardware implementation, software implementation, class implementation, and interface implementation are explained.

3.4.1. Hardware Implementation

The hardware specifications that used in the implementation of to be built systems are explained in Table 3:

Table 3. Hardware Implementation

No	Hardware	Specifications
1	Processor	Qualcomm MSM8916 Snapdragon 410 Quad-core 1.2 GHz Cortex-A53
2	Memory	RAM: 1 GB
3	Screen	TFT capacitive touchscreen, 16M colors
4	Resolution	720 x 1280

3.4.2. Software Implementation

The Software specification is needed, Device users use the Android version 4.4.2 KitKat operating system.

3.4.3. Class Implementations

The class is a description of a group of objects from properties (attributes), properties (operations), relationships between objects and general semantics. The class implementation is explained in Table 4 - class implementation.

Table 4. Class Implementations

No	Class name	Filename	executable file	Explanation
1	control	main.unity	control.cs	This class Sets all classes or all functions
2	gedungs	main.unity	gedungs.cs	This class Sets the location of the building and displays the route to the intended building
3	Menu	main.unity	menu.cs	This class Sets the search menu
4	petunjuk	main.unity	petunjuk.cs	This class is instructions for use
5	spashscreen	splashscreen.unity	spashscreen.cs	This class Adjusts the sliding screen, pinchzoom

3.4.4. Interface Implementation

Implementation of the interface is done by implementing the interface design into the form of program files. Interface design is described in table 5 - Interface implementation.

Table 5. Interface Implementation

No	Interface Code	Interface Name	File Name	Explanation
1	T01	Splash Screen	splashscreen.unity	The page to display the main display
2	T02	Main page	main.unity	The page for viewing 3-dimensional maps of the Bandung regency government complex
3	T03	Location Search	search.unity	Search page to display maps and routes to the destination location
4	M01	Office Information	info.unity	Displays messages from agency offices
5	M02	Distance Estimation	Rute.unity	Display message distance estimation information

3.5. Testing System

Testing is done to find out whether the objectives of the research carried out have been achieved according to what was planned. Testing is done by interviewing the user after the user uses the application that was built [2-6].

3.5.1. Interview Scenario

This test is conducted to determine the response of the user to the application that was built. Interviews are carried out to the community that is currently and will visit the Bandung district government service complex. Testing is done by making several questions based on the goals you want to achieve

3.5.2. Interview Result

Based on the results of interviews conducted to 20 respondents, it was found that the application made it easier for visitors/residents to know the way and information in the Bandung district government complex. The route search feature using a Dijkstra Algorithm in the application makes it easier for residents to find routes to the destination [11-13]. The application also gives information on the location

of the agency office to be addressed and provides information about what facilities and services are in the agency's office. Based on the results of the interview, it can be concluded that a system made better than the previous research system. In the study, 3D maps were built based on desktops. The camera mode used is the first-person shooter mode so that the map view is not visible [14-15]. While the application that is built uses a mobile device that can guide residents directly. The application that is built also uses a 360-degree view so that the landscape map is more visible. This result is supported by previous research that the use of 3D maps with 360-degree view gives more clear information to users [15].

In the research conducted by Halim making 3d-based interactive maps provide fairly clear information, but in this study there was no route search [14]. Other studies compare the effectiveness of the Dijkstra algorithm and greedy algorithm in route search [16]. The result is that the Dijkstra algorithm produces a shorter route. While the research that is built is to make a map by combining it with the route search feature using the Dijkstra algorithm as a tool to find the shortest route.

4. Conclusions.

Based on the results of testing that has been carried out 3-dimensional map applications in the complex of the regency administration of Bandung regency can help residents to find out the road and information about the layout of buildings that exist in the Bandung regency government complex. This application also makes it easy to find agency offices and what services are available in each instance.

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