BUILDING APPLICATION OF ROCK CLIMBING SPORTS RECOMMENDATION IN BANDUNG

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ABSTRAK

Rock climbing which is one of the outdoor sports and is part of a mountain climbing technique that is done with special methods and equipment. In this research, an application for rock climbing recommendations has been made, which has the name Climba application, with the aim to facilitate sports activists to find the location of rock climbing and supporting information about the location of rock climbing in Bandung. In recommending the location of rock climbing this time utilizing the TOPSIS method in determining the selection of locations to be recommended to users. By utilizing API (Application Programming Interface) technologies such as GoogleMaps API, Openweather API and GPS (Global Position Service) available on android devices. The application can be used to search for rock climbing locations and access information desired by users. So that users will get ease in finding a route to the location, find out the latest weather forecasts at the location and rating of a rock climbing location. Based on the results of testing using the black box testing method and beta testing with a questionnaire method it can be concluded that this application has been sufficient to help users in the process of finding rock climbing locations.

Keywords: Rock Climbing, TOPSIS, Application Programming Interface (API), Google Maps API, Openweather API, Global Position Service (GPS), Android

1. INTRODUCTION

In 1979, Harry Suliztiarto et al. Pioneering rock climbing activities in a wider circle and now rock climbing is a sport that is starting to be in demand by the community and not only that, rock climbing has now become one of the branches of sports in national to international level competence.

Rock climbing itself is generally divided into 2 types, namely rock climbing and wall climbing [10]. Bandung has a lot of natural potential to become a center for rock climbing in Indonesia, until now Bandung has a natural location that is often used as a rock climbing training facility such as the Citatah karst area, Lembang Faults and maybe there is still a lot of potential in other locations that can be developed into rock climbing training locations in Bandung.

According to one of the administrators at one of the rock climbing locations in Bandung that there is an increase in the number of visitors each year, this is one of the potentials that can be developed so that rock climbing becomes a sport widely known and sought after by the wider community.

Based on the results of interviews with 10 beginner rock climbers, 8 out of 10 stated that they find it difficult to find a training ground because of the lack of reference information they can get, they tend to visit the same place every time. It can be said this will be an obstacle in the development of rock climbing.

From the results of a questionnaire that was distributed online there were 56 respondents. Acquired by 87.5% found it difficult to start rock climbing due to confusion in finding a place to practice. In another question, most of them are smartphone users with the Android operating system which is 87.5%.

Based on the background that has been described above, many people have difficulty in finding training locations and find supporting information regarding the location of rock climbing in Bandung, so by utilizing the technology contained in mobile devices in order to realize a container to overcome the above problems. Thus a study will be made with the title "Building Application Of Rock Climbing Sports Recommendation In Bandung". With the hope of facilitating and developing rock climbing in Bandung.

The purpose of this research is to build a recommendation for rock climbing in Bandung based on Android.

While the objectives to be achieved in the development of this application are:
1. Make it easy for users to find rock climbing sports locations.
2. Make it easy for users to get supporting information about the location of rock climbing sports.

2. RESEARCH CONTENTS

2.1 Literature Review

Literature review explains several theories and explanations related to the application or media to be built. Literature review used in the preparation of the application of rock climbing sports

recommendations in Bandung, including the understanding of rock climbing, android, TOPSIS, GPS, LBS, API, JSON, etc.

2.1.1 Rock Climbing

In general, rock climbing is done in areas with slopes reaching more than 45º and has a certain difficulty level [1]. Rock climbing which requires physical ability to be able to climb higher, technical ability to place feet and hands on the surface of the wall, the ability to set strategies and determine the path and the ability to think to take quick decisions, in order to reach higher places.

2.1.2 Recommendation

Recommendation is a suggestion that is giving advice, informing a truth or providing decision support on a matter or someone else. Recommendations can be very important because they work to convince others that something or someone is appropriate and appropriate. Recommendations can also be said as a form of communication that contains indirect promotions, usually carried out by consumers or people who have already purchased a product or service, then share the results of their experiences relating to the product or service to others.

For example when someone will plan to visit a tourist spot. Usually they will look for travel stories or testimonials from people who have visited the place before, find out what are the interesting objects there, how to get there, is there a travel service provider or a description of the costs if needed to get there. If a lot of positive testimonials and in accordance with the wishes sought will increase the confidence of people to go visit the place.

2.1.3 Android

Android is an operating system for Linux-based mobile devices that includes an operating system, middleware and applications [3]. Android is an open platform provider that can be used by developers to create their own applications. The development of the android operating system has become very popular in Indonesia and even the world, one of the factors is because application developers are easier to make good and renewable applications.

2.1.4 TOPSIS Method

Technique For Others Reference by Similarity to Ideal Solution or TOPSIS is one of many multi-criteria decision support systems. The TOPSIS method has an advantage that is one of the methods of decision support that is simple, has a rational concept that is easy to understand and is able to measure performance relatively in forming simple mathematical forms. The TOPSIS method has the following steps [7]:

1. Make a normalized decision matrix

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x^2_{ij}}} \qquad (1)$$

2. Make a weighted normalized decision

$$y_{ij} = W_i r_{ij} \qquad (2)$$

3. Determine a positive ideal solution matrix and a negative ideal solution matrix.

$$A^+ = (y1^+, y2^+, ..., yn^+); \qquad (3.a)$$
$$A- = (y1^-, y2^-, ..., yn^-); \qquad (3.b)$$

$$y_j^+ = \begin{cases} max_i y_{ij} \\ max_i y_{ij} \end{cases} y_j^- = \begin{cases} min_i y_{ij} \\ min_i y_{ij} \end{cases} \qquad (3.c)$$

4. Determine the distance between each alternative using a positive and negative ideal solution matrix.

- The distance between the alternative Ai with a positive ideal solution using a formula as follows:

$$D_{i+} = \sqrt{\sum_{j=1}^{n} (y_i^+ - y_{ij})_2}; \qquad (4.a)$$

- The distance between the alternative Ai with the negative ideal solution using a formula as follows:

$$D_{i-} = \sqrt{\sum_{j=1}^{n} (y_{ij} - y_i^-)_2}; \qquad (4.b)$$

5. Determine the preference value for each alternative.

$$V_i = \frac{D_{i-}}{D_{i-} + D_{i+}} \qquad (5)$$

2.1.5 GPS

GPS is a system for determining the position and direction of a track on a satellite-based map. GPS stands for Global Positioning System which consists of 24 satellite networks launched into space orbit by the United States Department of Defense. GPS was first introduced in 1978. In ancient times GPS was only used for military purposes, but at this time GPS has expanded its use and can be used by the public. GPS satellites are orbited about 12,000 miles above the earth's surface and move around the earth for 12 hours in one rotation at a speed of about 7,000 miles per hour. These satellites send microwave signals to the earth. GPS satellites get energy by utilizing the energy of sunlight, to keep them moving, this satellite also has a spare battery that can be used when solar energy is experiencing obstacles or during a solar eclipse [3].

The signal sent by the satellite is received by the receiver on the surface, where the GPS receiver will collect information from the GPS satellites, as follows [3]:

1. Time. The GPS receiver will receive information about the time of the atomic clock which has high accuracy.
2. Location. GPS satellites will provide information in three dimensions, namely:
- Latitude
- Longitude
- Elevation or altitude
3. Speed. When users move or move, GPS can provide information about the location and speed of the movement.
4. Direction of travel. GPS satellites can show the direction of destination of a trip.

5. Save location. Places that you have or want to visit can be stored by the GPS receiver.
6. Data commulation. GPS receiver can store track information, such as total trips that have been taken, average speed, highest speed, lowest speed, time / hour to destination and so on.

2.1.6 LBS

Location Based Service (LBS) is an information service that can be accessed using a mobile device equipped with the ability to find out the location of the user, also has the ability to provide information about the services available. Location Based Service can be interpreted as a service that integrates the location of a mobile device with other information, so that it can provide more benefits for users [4]. The two main elements of LBS are :

1. Location Manager (Maps API): Provides resources for LBS. Maps API is a facility provider that functions to display or manipulate maps. This package is at "https://google.android.maps.com".
2. Location Providers (API Location): Provides location search technology that can be used by the device. Location API is associated with GPS data and location data in real-time. Location API is in the android package which is "android.location". Location, movement, and proximity to a certain location can be determined through Location Manager [5].

2.1.7 API

Application Programming Interface (API) is an interface used to access applications or services from a program. API is a way for application developers to use the functions that already exist from another application, so there is no need to re-create the entire design from scratch. In web context, API is a function call through Hyper Text Transfer Protocol (HTTP) and get a response in the form of Extensible Markup Language (XML) or JavaScript Object Notation (JSON). Calling functions to a particular site will produce different responses to users in building enterprise applications in their websites [6].

2.1.8 JSON

JavaScript Object Notation (JSON) is a simple data exchange format, for programmers this format is easy to read and write. As for machines, this format is easy for parsing and generating processes [8]. JSON, which is part of the JavaScript programming language, with the ECMA-262 3rd Edition Standard - December 1999. JSON is a text format programming language that stands alone, but uses standard conventions commonly used by programmers in programming languages such as C, C ++, C #, Java , JavaScript, Perl, Python, and many others.

2.2 Research Methods

The design stage used in the construction of this system is to use the waterfall method. The Waterfall method is the most commonly used software development model. The waterfall method is a linear development starting from the initial stage of system development, namely the planning stage to the final stage of system development, namely the maintenance stage.

The next stage will not be carried out before the previous stage has been completed and can not return or repeat to the previous stage [2].

Generic system is a system whose needs can be determined from the beginning with general specifications.

2.3 Analysis of system

Analysis and design of the system requires systematic steps to get a good application and in accordance with the purpose and purpose. The initial stages of system analysis and design are system analysis starting from defining system requirements such as user needs, non-functional needs, functional requirements, to the system design stages, namely the design of the work system of applications and the design of application interfaces.

2.3.1 Analysis of recommendation

The design recommendations that will be given to users to get the location of rock climbing will be described as the following steps:

1. Firstly find the location of rock climbing with the closest distance to the location of the search, where the distance value is obtained from the distance value on google maps.
2. After getting the distance of each rock climbing location, then determine the three closest rock climbing locations.
3. Provide recommendations from rock climbing locations that have been found by using the TOPSIS method to determine the best rock climbing location for users.

It is known as in Table 1 that there are rock climbing locations with latitude and longitude coordinates obtained through google maps on each rock climbing location as follows:

Table 1. Rock climbing locations

Location Name	Latitude	Longitude
Citatah 125 Cliffs	-6.83561111111	107.453947222
Gn. Batu Cliffs	-6.83025555555	107.635197222
Eiger adventure	-6.91620555555	107.613386111
ITENAS Bandung	-6.89790555555	107.636183333

Location Name	Latitude	Longitude
Pasaga Unpar	-6.87376666666	107.611616666

The latitude and longitude coordinates obtained through google maps for the initial location when searching as in Table 2 are as follows:

Table 2. the starting location of the search

Name Of Start Location	Latitude	Longitude
Unikom Campus	-6.88679166666	107.6152888888

If you already know the latitude and longitude of the initial location of the search, the next step is to get the value of the distance of each rock climbing location to the initial location by using google maps. The following as in Table 3 which contains the results of the distance obtained from the starting point of the search to each rock climbing location:

Table 3. The results of the distance from the initial location to the location of rock climbing

Location Name	Distance
Citatah 125 Cliff	24 Km
Gn. Batu Cliff	8 Km
Eiger adventure	4.1 Km
Itenas Bandung	3.7 Km
Pasaga Unpar	2.1 km

The criteria used in location recommendations are location quality, comfort, safety, and facilities obtained from the questionnaire results. In Table 4 the values for each criterion are as follows:

Tabel 4. Location criteria value

Location Name (i)	Kriteria (j)			
	Quality	Comfort	Safety	Facilities
Pasaga Unpar	5	4	3	4
Itenas Bandung	4	3	4	4
Eiger adventure	4	4	4	4

After calculating the decision support using the TOPSIS method, the following results are obtained:

$V1 = 2,473 / (2,473 + 2,802) = 0,468$

$V2 = 1,875 / (1,875 + 1,812) = 0,508$

$V3 = 2,125 / (2,125 + 1,788) = 0,543$

Based on the value of preference that has been obtained, the value of V3 has the largest value where V3 is the preference value of alternative 3, Eiger adventure. So that Eiger adventure becomes a recommendation for the location of rock climbing sports from the case.

2.3.2 Analysis Of The Technology Used

1. Google Maps API

API (Application Programming Interface) which is prepared by Google will be used in the system that was built. The purpose of this API is to get a digital map service that will be used in the application. In this API, services that can be used in addition to displaying digital maps in the application are the use of markers, polygons, and overlays to the base map, as well as changing the display of certain map areas to users. All of these objects provide additional information about the location of the map, and allow user interaction with the map. These features are used to support application needs. The Google maps API technology will be useful in building functional systems related to the location of an object on a digital map.

The following is a plot to get the distance from the user to the location of rock climbing with the use of the Google Maps API which can be seen in Figure 1.

Figure 1. Flow chart to get distance

The following in Figure 2 is the architecture of the use of Google maps API on applications that will be built:
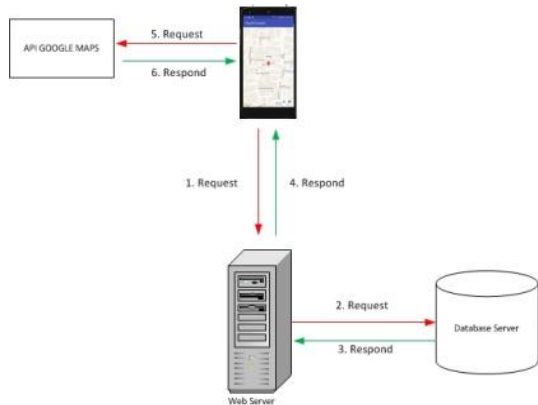

Figure 2. Architecture for google maps API

2. Openweather API

Openweather API is used to get weather forecast data for a place. Openweather provides online services for the latest weather forecast data and historical data. By utilizing this API, the application can get weather forecast data as supporting information on the location of rock climbing.

The following in Figure 3. is the utilization of the Openweather API in the application to be built:

Gambar 3. Architecture for Openweather API

2.3.3 Analysis Of Functional Requirements

The analytical method used in the construction of mobile systems is the OOAD (Object Oriented Analysis And Design) method. Through this OOAD method functional requirements are described using UML diagrams. There are several diagrams on UML tools that are commonly used to describe the functional system, including use case diagrams, activity diagrams, sequence diagrams and class diagrams [9].
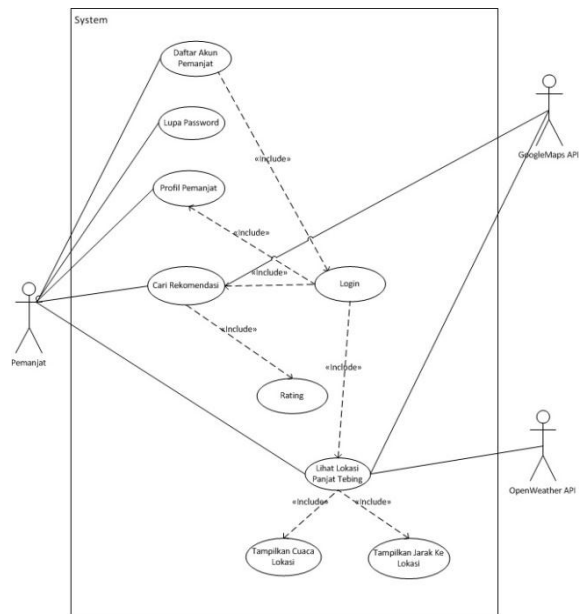

Figure 4. Use case of application

2.4 Interface Implementation

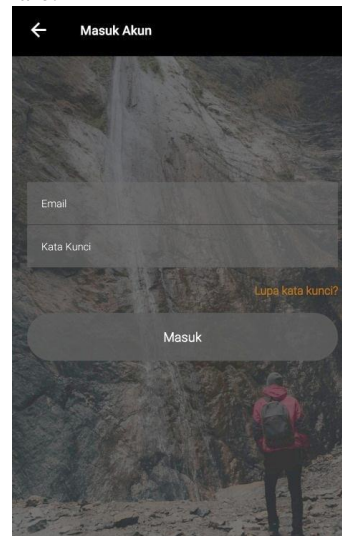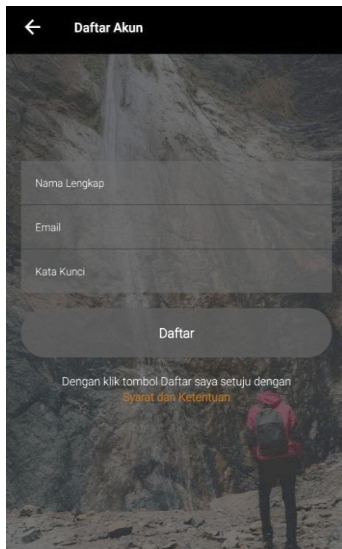The interfaces that have been implemented on the system are:

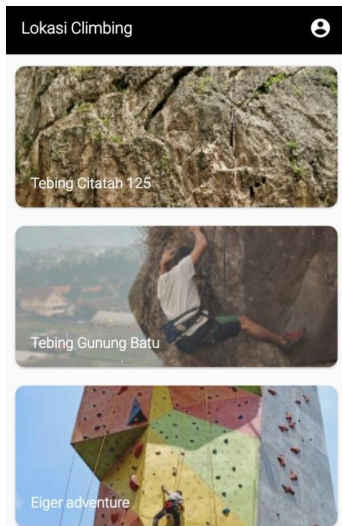**Figure 5.** Login interface

Gambar 6. Sign up interface

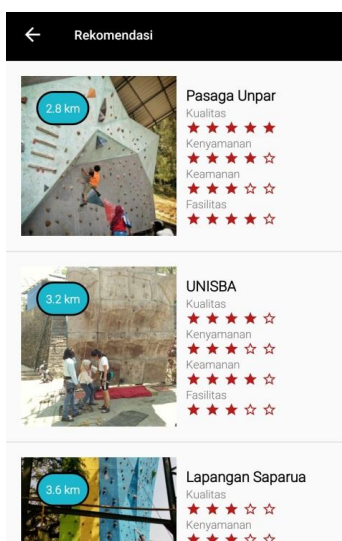**Figure 7.** Search location interface

Figure 8. Location recommendation interface

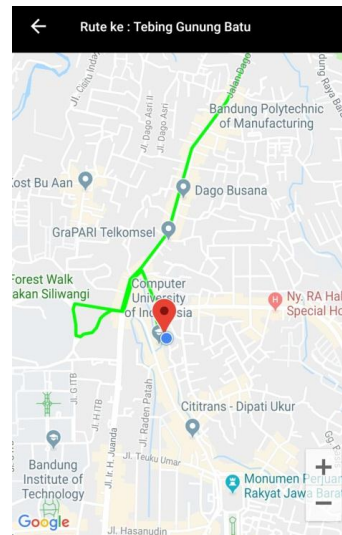**Figure 9.** Weather forecast of location interface

Figure 10. Route to location interface

2.5 Black Box Testing

Table 5. Black box testing

No	Testing Point	Conclusion
1	User Login	[√] Accepted [ ] Rejected
2	New account sign up	[√] Accepted [ ] Rejected
3	Forgot password	[√] Accepted [ ] Rejected
4	Showing a list of rock climbing locations in Bandung	[√] Accepted [ ] Rejected
5	See details of the selected rock climbing	[√] Accepted [ ] Rejected

	location	
6	Showing results of rock climbing location recommendations	[√] Accepted [ ] Rejected
7	Showing rating of a rock climbing location	[√] Accepted [ ] Rejected
8	Showing weather forecast of a rock climbing location	[√] Accepted [ ] Rejected
9	Showing distance of a rock climbing location	[√] Accepted [ ] Rejected
10	Showing rating data of climbing location	[√] Accepted [ ] Rejected
11	Showing user data profile	[√] Accepted [ ] Rejected

2.6 Beta Testing

Based on the results of tests that have been carried out, it can be concluded that:

1. As many as 74% of respondents agree, that the application can help users to find information about rock climbing in Bandung.
2. As many as 80% of respondents agree, that the application can make it easier for users to determine the location of rock climbing they want.
3. As many as 76% of respondents agree, that the application can make it easier for users to find the location of rock climbing list of rock climbing locations that they expect.
4. 82% of respondents agree that the information provided about the information on a rock climbing location is accurate enough.
5. As many as 92% of respondents agree, that the application is easy to use.

3. CLOSING

This chapter will explain the conclusions that contain the results obtained after the analysis, design, and implementation of the design of software that has been built.

And contains suggestions that will provide important notes and improvements and developments that might be possible for further software development.

3.1 Conclusion

Based on the results of the implementation and testing that has been done, the conclusions of the final project entitled the building of the application of rock climbing sports recommendations in Bandung are as follows:

1. Users are easy to find the location of rock climbing in Bandung.
2. Users are facilitated to get supporting information about the location of rock climbing in Bandung.

3.2 Suggestion

In the building of the application of rock climbing sports recommendations in Bandung still has many shortcomings. The suggestions for the development of this application for the future are as follows:

1. Improve the weather forecast feature from before so that it can be made dynamic, so that application users will be able to know and choose based on the time they want.
2. Developing functional rock climbing locations to be developed to monitor which locations are most frequently visited on a daily, monthly or annual basis.
3. Optimizing the recommendation method so that it is more complex and objective so that the accuracy in providing recommendations becomes better.

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