International Journal of Engineering and Science Applications
Vol 8 No. 1 May 2021
ISSN 2406-9833

IJEScA

The Nearest Surfing Spot Search Application in Bali Uses the Web-based

X Y Alexander*, L P I U Dewi, Indriyani
System Information ITB STIKOM Bali, 80361, Indonesia
*Corresponding author: xaviernoyanura@gmail.com

ABSTRACT

Indonesia is an archipelago that has various kinds of beaches and uniqueness. Surfing has become a very popular activity on some beaches with supportive waves. Bali is one of the tourist destinations that in addition to highlighting customs and culture, also has abundant natural wealth as well as coastal tourism destinations that can be used as surfing spots. This study aims to provide information about the location of the surfing spots and the nearest search support. The application uses the web-based Haversine formula to find the nearest surfing spot in Bali which can be used as a solution to display information and the location of surfing spots. Researchers developed this application using the waterfall method. Based on the results of questionnaire testing with 20 respondents, 35% agree and 65% highly agree, that this application can help and make it easier for tourists to find the nearest surfing spot.

Keywords: Application; Surfing; Website.

1. INTRODUCTION

Sports tourism emerged in the last decade of the twentieth century as a set of practices belonging to both the fields of sport and tourism. "The intersections between these two social phenomena have been gradually increasing, and in this regard, spots tourism has become a field of interest recognized by both academia and commerce" [1]. Spot's tourism gained marked attention through a growing body of knowledge that was published especially from the mid-1990s, by the publication of regular papers or special issues in scientific journals and books [2].

Bali is one of the popular tourist destinations in the world. For many reasons, Bali has always been chosen as the 10th best island tourist destination in the world by the Travel and Leisure International Magazine. In 2015 Bali was in the 7th best and 2016 was in the 2nd best position. The more prestigious level that has been given to Bali is the 'Hall of Fame', it is in the place of the 10th best for 10 years continued [3]. Bali is one of the most popular surfing destinations that visited by a lot of surfers. It has so many surfing spots that usually held a surf competition.

There is a formula that can count distance. Earth is where humans live. Earth has an extensive surface. The earth is round, so it is not very easy for humans to calculate the distance between the two locations. However, with the times, the distance to the earth can be calculated easily. There is an algorithm that can calculate the distance of two coordinates that are on the surface of the earth. The algorithm is the Haversine algorithm. This algorithm calculates distances using latitude and longitude. The Haversine algorithm aims to find the nearest straight-line distance from two different locations. The Haversine algorithm has a heuristic value that is used as a basis for consideration in which the estimated value/least cost will determine the shortest distance travelled [4].

Dauni (2019) in a study entitled "Implementation of Haversine formula for school location tracking", provides some information and the location of existing schools that was closest to the user. This application can also calculate the distance from the user's location. The earth calculated by the Haversine formula is not a flat plane, but a plane with a certain curvature [5].

Based on the things that it needs to be provided a system that provides information about the locations where surfing (surf spot) and support search nearby. "The Search Application for the Nearest Surfing Spot in Bali using the Web-Based Haversine Formula" can be a solution in displaying information and location of surfing spots to users, especially tourists who want to surf in Bali.

2. MATERIALS SUPPORT

The materials that can support the success of this research are as follows:

A. Geographic Information System (GIS)

The geographic information system is a spatial data processing applications using a computerized system to combine the graphics data with the object attribute data using the digital base map. GIS is currently growing rapidly and widely implemented in all fields such as education, health, geography, weather, population, piping networks and others [6].

B. Google Maps API

The Google Maps Directions API can provide open access to route planning data for multiple independent or mixed modes of transportation, including driving, walking and cycling. API format is easy to use. Determine the latitude/longitude coordinates of the place of origin and destination. The returned results of API can instantly get a detailed file, including custom routes, segmented routes, and the corresponding travel costs (for example, time and distance). In this study, the selected driving mode and using multiple buttons can greatly speed up the process. The API that returns the results of this research is the time and distance between cost lines. The Google Maps API trip cost is a useful, historical average and reliable prediction for research purposes. This return value is most likely accurate in real-time traffic and congestion condition's location information [7].

C. Coordinate System

The "Cartesian Coordinates System" is derived from Descartes, a name which is pronounced 'Cartesian' in Latin. The Cartesian Coordinates System is defined by two straight lines called axes which are usually located at a right angle. The horizontal axis is indicated by X and the vertical axis by Y. The point of intersection of the axes is called the origin of the axes. To indicate a certain point on the axes system, we indicate the values of the X and the values of the Y on the point, thus creating the ordered pair of numbers (X, Y). The expression "Cartesian Coordinates System" serves only in 2 and a 3-dimensional space [6].

D. Haversine Formula

"Formula Haversine" is a formula that are commonly used in system mapping. The use of the formula haversine is in determining the range within the shortest/nearby in between two points on the earth. The Haversine formula is an equation important in navigation, giving great-circle distances between two points on a sphere from their longitudes and latitudes. In this research, the Haversine formula is used to calculate the distance between two points using latitude and longitude data on the Earth's surface [8].

E. Activity Diagrams

Activity diagrams illustrate the various activities flow in the system, include parallel processes that might occur in several executions [9].

F. Use Case Diagrams

Use Case Diagram is modelling to illustrate the interaction between actors with the system to be created [9].

G. Class Diagrams

A class diagram is a conceptual model which is often used for designing the logic model of information systems. The crucial advantage of the designing system by utilizing UML lies in its ability to describe, and reflect the real world of information systems better [10].

H. Website

A website is a collection of web pages that are used to display text, images, animation, sound information and a combination of all that is generally part of a domain. A website application can serve multi-users in parallel, with less hassle if compared to desktop applications [11].

I. PHP

PHP is currently one of the most popular programming languages. PHP is an open-source programming language that is used widely, especially for web development and can be stored in HTML. The main advantage of using PHP is that the PHP script is not simple for beginners, but it provides many additional features for professional programmers [12].

J. CSS

CSS is a standard language used by front end web developers to adjust the appearance of documents created in the markup language. CSS works as a complement to HTML elements whose simplicity can be controlled using a CSS scripting language. The use of CSS to expand HTML's capabilities in formatting web documents or to beautify the appearance of the web. CSS is composed of a sequence of style rules, where each rule has a selector that selects the elements needed to style in the HTML or XML document [13].

K. Surfing

The sport of surfing has been reported to involve intermittent exercise bouts of activity that vary in intensity and duration. These intensities and durations differ as a result of the conditions and environmental variables (ex. wave formation, type of wave break, wave size, weather, currents, rips, frequency of waves, tides) encountered at surfing locations. As a result, the physiological responses of surfers to specific activities (ex. paddling, wave riding, sprint paddling) will vary [14].

L. Web Application

Web applications refer to applications accessed via a web browser over a network and developed using browser-supported languages (ex. HTML, JavaScript). For execution, Web applications depend on web browsers and include many familiar applications such as online retail sales, online auctions, and webmail. Web applications are needed in the area of business-to-business interaction over networks. The adoption of a web applications infrastructure can provide vital processes such as transfer of funds and updates of pricing information [15].

M. HTML

HTML is the Standard Markup Language. It is used for developing Web Pages. HTML is Hyper Text Markup Language and is used for describing the structure of web pages. Various Tags are used in HTML like "heading", "paragraph", "table", and so on. This paper discusses various HTML tags that are a for developing web pages [16].

3. METHODOLOGY

A. Method of collecting data

In this study, the data collection methods used were questionnaires, observation and literature studies. This method is needed to collect and process data obtained from the object. The stages of the data collection method are as follows:

1) Questionnaire

The questionnaire is a data collection method by giving respondents many online questions or written statements to answer. At this stage, the researcher gave 4 questionnaire questions to 20 respondents. Questionnaires carried out to get some information in the form of data required by researchers. Here is a list of questions that were given to respondents:

a) Do view the website Search Nearby Surfing Spot in Bali using Formula Haversine this interesting?

b) Does the application search the nearby surf spots in Bali using the formula haversine have been able to facilitate the user to know information about the location of surf spots in Bali?

No	Question	Highly Agree	Agree	Disagree
1	1	70%	30%	0%
2	2	80%	20%	0%
3	3	50%	50%	0%
4	4	60%	40%	0%

c) Does the application search the nearby surf spots in Bali using the formula haversine is easy to use by the user?

d) Do you agree application search nearby surf spots in Bali using formula haversine is already feasible for use?

From the answers of the whole respondents above, the percentage is shown in Table 1.

Table 1. Results answer questionnaires respondents

Based on the percentage of answers to Questionnaires are 65% highly agree, 35% agree, and 0% disagree on the feasibility of the system searches the nearby surf spots in Bali using formula haversine. So, it can be concluded that this system is feasible to use.

2) Observation

Observation is an important research method. Where researchers will observe the data to be obtained. By looking at the problems often faced by domestic and foreign tourists, as well as those who have difficulty finding information about surf spot locations, we make observations in this study.

3) Study of Literature

In the literature study, the authors collected information in the form of data obtained in books, scientific journals and other sources with the topic of information systems for fast search surfing spots in Bali using web-based haversine formulas and those related to the object of research.

B. System Development Method

In the method, the system is that referring to the waterfall method. This system development method consists of data collection, requirements analysis, system design, system implementation and system testing to report as shown in Figure 1. Waterfall method generally has the following stages:

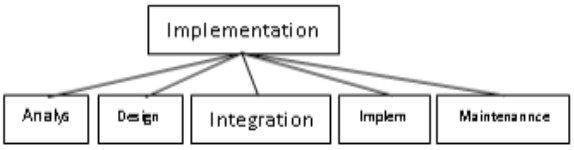

Fig 1. Waterfall method stages

1) Requirement analysis is involved with the customer objectives and their needs. This is the background for the function of system in standard system attribute, which is determined requirements, environment and plan [17].

2) System Design helps in specifying hardware, system requirements and defining overall system architecture [18].

3) Implementation and unit testing. At this stage, the design of the software is realized as a series of programs or program units. Testing involves verifying that each unit meets its specifications, all device components used in both hardware and software [19].

4) Integration and system testing. Individual units of the program or program are combined and tested as a complete system to ascertain whether the software requirements match or not. After the test, the software can be sent to the customer, in this process is a continuation of the previous work, all the work of the device is activated [19].

5) Operation and maintenance. This supporting or maintenance stage is the final stage in the waterfall method. When this stage is done, the that the system can be used. Maintenance of the system needs to be done on an ongoing basis, to protect the system from things that are not desirable. Make conclusions and suggestions need to be made to know a clear picture of the existing system and the development [20].

Table 2. Location surfing spot

No.	Surfing Spot in Bali	Location
1.	Kuta beach	Jalan Pantai Kuta, Kuta, Badung Regency, Bali
2.	Uluwatu Beach	Uluwatu Beach, Pecatu, Kec. Kuta Sel., Badung Regency, Bali 80361
3.	Dreamland Beach/New Kuta Beach	Jalan New Kuta Beach, Pecatu Indah Resort Area, Pecatu Village, South Kuta District, Badung Regency, Bali
4.	Canggu Beach	Canggu, Kec. North Kuta, Badung Regency, Bali
5.	Keramas Beach	Jalan Keramas Beach, Keramas, Gianyar Regency, Bali
6.	Padang Padang Beach	Padang Padang Beach, Pecatu, Kec. Kuta Sel., Badung Regency, Bali
7.	Padang Galak Beach	Jl. Padanggalak Sanur No.88, Kesiman Petilan, Kec. Denpasar Team., Denpasar City, Bali
8.	Legian Beach	Legian Beach Bali, Jalan Melasti, Legian, Badung Regency, Bali
9.	Medewi Beach	Jl. Medewi Beach, Medewi, Kec. Pekutatan, Jembrana Regency, Bali
10.	Balian Beach	Balian Beach Road, Lalanglinggah, Tabanan Regency, Bali
11.	Seminyak Beach	Seminyak Beach Street, Seminyak , Badung Regency , Bali
12.	Nusa Lembo-ngan Beach	Nusa Lembongan Island, Jungutbatu, Klungkung Regency, Bali
13.	Serangan Beach	Serangan, Kec. Denpasar Sel., Denpasar City, Bali
14.	Balangan Beach	Balangan Beach Street, Jimbaran, Badung Regency, Bali
15.	Green Bowl Beach	Green Bowl Beach Ungasan, Jl. Bali Cliff, Ungasan, Kec. Kuta Sel., Badung Regency, Bali 80361

4. RESULT AND DISCUSSION

A. Design and data

This nearest surfing spot search application uses the haversine formula and is built based on a website that aims to make it easier for all users or users to use every means in the system.

At the stage of determining the user's location point, the system will take advantage of the features of Google Maps, namely GeoLocation. After getting the point from the user, the search is done by finding the distance between the user's coordinate point and the surf spot that has been inputted into the system using the haversine formula. Then each surfing spot is found, a comparison is made to determine the distance or the lowest difference in value. From this value, the system will visualize in the form of a map.

Visualization of the appropriate digital map as well as the route of the direction of travel from the user's point to the surfing point using the API from Google Maps. As an example, the system will

look for the coordinates of the user, example the GWK Monument (Garuda Wisnu Kencana) is used as the default point. After that, the system will perform calculations using the Haversine formula. The following is an example of a calculation using the haversine formula:

Coordinate initial point (Surfing Spot: Balangan Beach)

Latitude 1 = -0.4802276 x $\frac{\pi}{180}$

= -0.0083815475 Radian

Longitude 1 = 117.1617663 x $\frac{\pi}{180}$

= 2.0448585794 Radian

The second coordinate point (User: Garuda Wisnu Kencana Monument)

Latitude 2 = -0.4700844 x $\frac{\pi}{180}$

= -0.0082045205 Radian

Longitude 2 = 117.1530481 x $\frac{\pi}{180}$

= 2. 0447064181 Radian

Δlatitude = latitude2-latitude1

= -0.000177027

Δlongitude = longitude2-longitude1

= -0.000152161

= -0.000152161

A = sin2 ($\frac{\Delta latitude}{2}$) + cos(latitude1). cos(lat2). sin2 ($\frac{\Delta longitude}{2}$)

= sin2(0.000177027 : 2) + cos (-0.0083815475) x cos (-0.0082045205) x sin2 (-0.000152161 : 2)

= 0.0000000136225

c = 2 x a sin (√α)

= 2 x a sin (√0.0000000136225)

= 0.000238406661617

d = R .c

= 6371(km) x 0.000238406661627

= 1.51888884122 km

Based on the example above, it is found that a distance of 1.5 km has been calculated referring to the coordinates of the Balangan Beach surf spot to the user's initial coordinates, namely the GWK Monument. Once results are found, the process of sorting will be done, then smallest distance is obtained that is used as the object surf spots of the closest.

B. Process Design

Figure 2 explains the activity diagram, which begins with displaying the home or homepage page. Then the user can press the search button to search surf spots. If there is a surf spot in the nearest area, the web will move to the surf spot search results page. Then the user presses the button to find the closest surf spot and the distance calculation process will be carried out using the Haversine formula. The search results will be displayed in the map form.

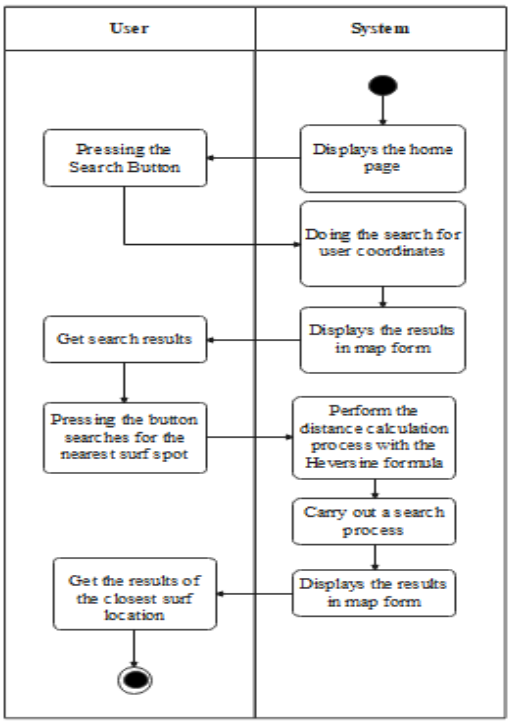

Fig 2. Activity Diagram

C. System Design

1) Use Case Diagram

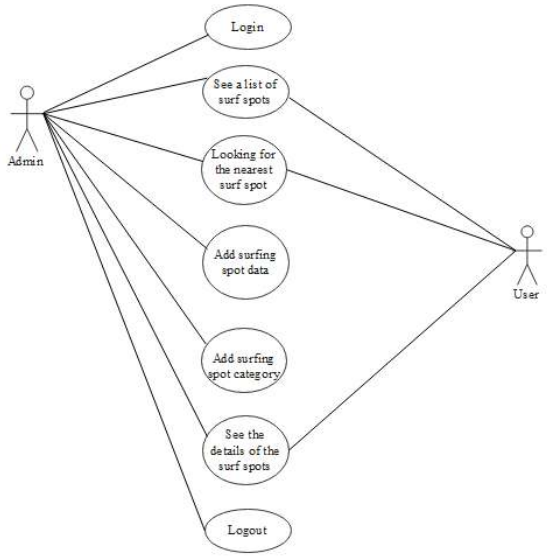

Fig 3. Use Case Diagram

The Use Case Diagram shows that there are two actors in the use of the system based on their functions, namely USER and ADMIN. User who acts as an actor, that can access the system such as viewing a list of surf spots, looking for the nearest surf spot, and seeing the details of the surf spot. While the admin actor can access the system, such as logging into the admin page, viewing a list of surf spots, looking for the nearest surf spot, adding surf spot data, adding surf spot categories, viewing surfing spot details, deleting and updating data that has been added.

2) ERD

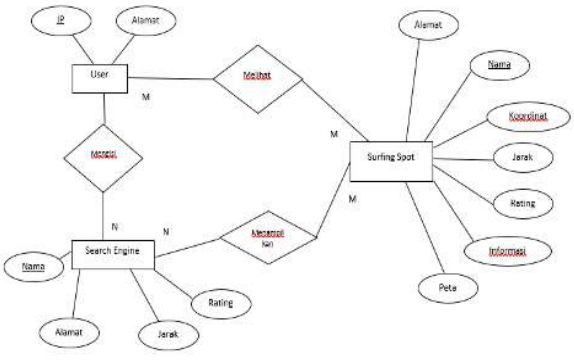

Fig 4. ERD

From Figure 4, it can be explained that the user entity can see the surfing spot entity, the user entity can search or fill in the search engine and the search engine can display the surf spot.

3) Class Diagram

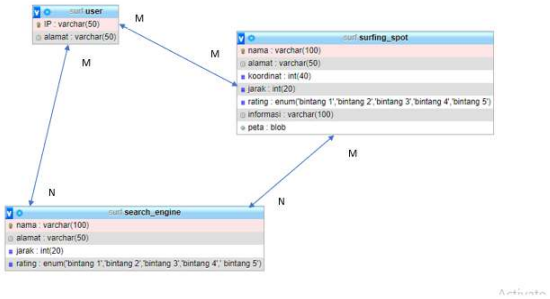

Fig 5. Class Diagram

Figure 5 describes the table relationships in the database. It is explained that the user table contains the IP and address when using the application.

D. System implementation

1) Surf Spot Search Menu

Figure 6 present the initial view, namely the Surfing Spot search menu. There are 3 menus above and 1 menu below. The 3 menus above are the Surfing Spot Search to find the nearest Surfing Spot, Surfing Spot List to see the Surfing Spot data, and Map to see the user's location.

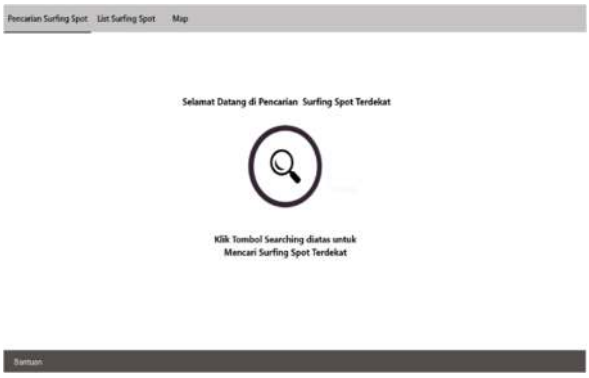

Fig 6. Surfing Spot Search Menu

2) Surf Spot Search Results

Figure 7 exhibit a display of the search results after Surfing Spot search menu. There are 2 search results and their location. Also, there is a button to see details of the surf spot and its location.

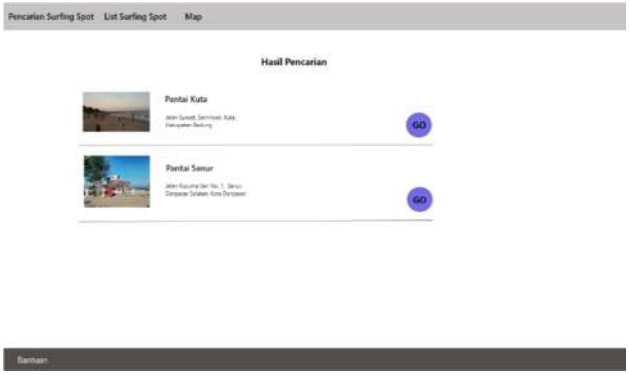

Fig 7. Surfing Spot Search Results

3) Surfing Spot Details

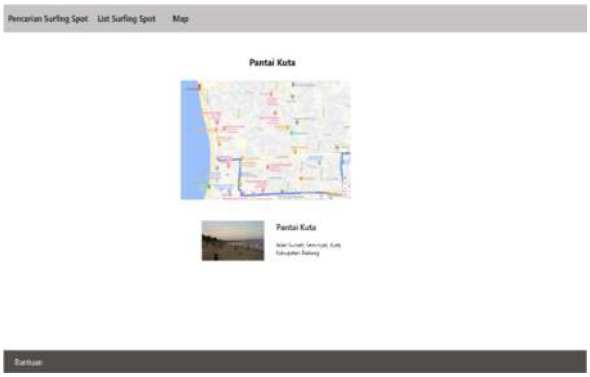

Fig 8. Surfing Spot Details

Figure 8 show a detailed view of the Surf Spot. In this tab, the details of the Surfing Spot are shown to the user in the form of the user's location and the route to catch the Surfing Spot.

4) List Surfing Spot

Figure 9 exhibit the Surfing Spot list view.

Fig 9. List Surfing Spot

5) Map

Figure 10 present a view of the Map, namely the tab that contains the user's location.

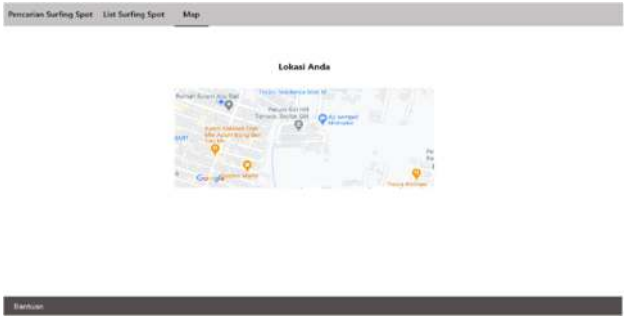

Fig 10. Map

6) Help

Figure 8 show a Help view in the tab. The user will be assisted how to use the website Search Surfing Spot Nearby.

Fig 11. Help

E. System Testing

Tests were carried out using the Blackbox method to find out how the results of the execution of the implementation of the system functioned and had followed user needs. System testing result is presented in Table 3.

Table 3. Front end testing

No	Activities	Expected Things	Actual Results	Infor-mation
1	Weather Main Menu Pen Quest Surfing Spot			
	Users sign in to the website	Users sign in to the page main with several menus	The main page appears with several menus	Fulfilled
2	Surf Spot Search Results page			
	The user selects the surf spot search menu	Displays some of the closest surf spots and can	Several surf spots nearby appear and a function	Fulfilled

		select the "Go" button	button appears	
3	Surfing Spot Details page			
	The user selects a surf spot and displays a surf spot detail page	Displays details of the surf spot in the form of user routes and coordinate	Details of the surf spot appear in the form of user routes and coordinates with map visualizatio n	Fulfilled
4	Surfing Spot List page			
	The user presses the "List Surfing Spot" then the system displays a surf spot list	The system displays a page containing a list of surfing sports	A page appears containing a list showing surfing sports	Fulfilled
5	Map page			
	The user presses the "Map" button and the system displays the map page	The system displays the "Map" page.	A page appears containing a map of the user's location	Fulfilled
6	Help page			
	The user presses the button " Help " and displays the page help	The system displays the page " Help "	A help pag e appears c ontaining an FAQ (*Frequentl y Asked Questions*) related to the system	Fulfilled

F. Discussion

The system has been running according to the application criteria to find the nearest surf spot in Bali. The output presented is in the form of complete information about the location of the surf spot and the details of its location, making it easier for tourists to find the location of the nearest surf spot. This information system is created using the haversine formula in determining the shortest/closest distance between two surfing points in Bali. On this page, the user can see all accommodations in Nusa Dua based on the criteria.

5. Conclusion

From the results, it can be concluded that this application can help tourists to find surfing spots and view information about these locations through the website. In addition, this application also provides information about the distance and recommendations for the nearest beach.

ACKNOWLEDGMENT

We are grateful to the publishers, reviewers, and higher education institutions who have provided a forum for sharing research that can be used as a reference and provide benefits of the knowledge development for productive generations.

REFERENCES

[1] Mhanna, R. 2018. Sports tourism: new challenges in a globalised world, *J. Sport Tour.*22,(4).doi:10.1080/14775085.2018.1532948.

[2] Melo, R., and Gomes, R, 2017. Nature sports participation: Understanding demand, practice profile, motivations and constraints, *Eur. J. Tour. Res.*, 16.

[3] Sutama, I. K., Mudana, G., and Astawa, K., 2017. Balinese Culture and Repeat Visitors To Bali, *IJASTE-International J. Appl. Sci. Tour. Events*, 1 (1) :59.

[4] Artmeier, A., Haselmayr, J., Leucker, M and Sachenbacher M., 2010. The shortest path problem revisited: Optimal routing for electric vehicles, in *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics).* 6359

LNAI, doi: 10.1007/978-3-642-16111-7_35.

[5] Dauni, P., Firdaus, M. D., Asfariani, R., Saputra, M. I. N., Hidayat, A. A. and Zulfikar, W. B. 2019. Implementation of Haversine formula for school location tracking. *J. Phys. Conf. Ser.*, 1402(7). doi: 10.1088/1742-6596/1402/7/077028.

[6] Taryadi, T., Binabar, S. W., and Siregar, D. J. 2019. Geographic Information System for Mapping the Potency of Batik Industry Centre. *J. Inf. Syst. Eng. Bus. Intell.*5(1):40doi:10.20473/jisebi.5.1.40-47.

[7] Xia, N., Cheng, L., Chen, S., and Wei, X. 2018. Accessibility based on Gravity-Radiation model and Google Maps API: A case study in Australia." file:///C:/science/journal/09666923, [Online]. Available: https://doi.org/10.1016/j.jtrangeo.2018.09.009.

[8] Chopde, N and Nichat M. 2013. Landmark-Based Shortest Path Detection by Using A* and Haversine Formula. *GH Raisoni Coll. Eng.1(2):* 298–302, 2013, [Online]. Available: http://www.ijircce.com/upload/2013/april/17_V1204030_Landmark_H.pdf.

[9] Ulfah, S., Ramdania, D. R., Fatoni, U., Mukhtar, K., Tajiri, H and Sarbini, A. 2020. Augmented reality using Natural Feature Tracking (NFT) method for learning media of makharijul huruf. *IOP Conference Series: Materials Science and Engineering*. 874(1) doi: 10.1088/1757-899X/874/1/012019.

[10] Vo, M. H. L. and Hoang, Q.2020.Transformation of UML class diagram into OWL Ontology. *J. Inf. Telecommun.*4(1).doi:10.1080/24751839.2019.1686681.

[11] Dissanayake, N. R., Dias, K. A., and Lanka, S. 2018. Web-based Applications : Extending the General Perspective of the Service of Web. *Univ. Colombo Sch. Comput.* : 1–8

[12] Kunda, D and Siame, A. 2017. Evolution of PHP Applications : A Systematic Literature Review, *Int. J. Recent Contrib. from Eng. Sci. IT*. 5(1): 28–39

[13] Ndia, J. G., Muketha, G. M., and Omieno, K. K. 2020. A Survey of Cascading Style Sheets Complexity Metrics. *SSRN Electron. J.* doi: 10.2139/ssrn.3405783.

[14] Farley, O. R. L., Abbiss, C. R. and Sheppard, J. M. 2017. *Performance analysis of surfing: A review*. 31(1).

[15] Clark, D. 2011. Beginning C# Object-Oriented Programming. *Begin. C# Object-Oriented Program.*doi: 10.1007/978-1-4302-3531-6.

[16] Sharma, A. 2018. Introduction to HTML (Hyper Text Markup Language) - A Review Paper, *Int. J. Sci. Res.* 7(5): 2017–2019 doi: 10.21275/ART20182355.

[17] Gunawardhana, L. K. P. D. 2019. Process of Requirement Analysis Link to Software Development, *J. Softw. Eng. Appl.* 12(10) doi: 10.4236/jsea.2019.1210025.

[18] Bulman, M. 2017. SDLC - Waterfall Model," *Indep.*

[19] Farikah *et al.*, 2019. The Integration of Innovation in Education Technology to Improve the Quality of Website Learning in Industrial Revolution Era 4.0 Using Waterfall Method, *J. Phys. Conf. Ser.* 1364(1):0–5 doi:10.1088/1742-6596/1364/1/012045.

[20] Hidayati, N. and Sismadi, S. 2020.

Application of Waterfall Model In Development of Work Training Acceptance System. *INTENSIF J. Ilm. Penelit. dan Penerapan Teknol. Sist. Inf.* 4 (1) doi: 10.29407/intensif.v4i1.13575.