

## **Graphical User Interface For Tourism Decision Support System (TDSS)**

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*Tourism consists of a wide variety of aspects including facilities, activities, services, and industries to deliver a travel experience. This industry depends heavily on information where customers want to acquire enough information about a tourist destination. This paper presents a Web based GIS which designs with user friendly graphic user interfaces (GUI) to help visitors of Langkawi Island choose and plan their activities more effectively to match their personal preferences and constraints. This paper focus on displaying tourism related information in Langkawi Island, which tourist care o restaurants, hotels, and marketplaces and so on, so that customers can easily obtain adequate information and become attracted to visit the island. This paper is part of the Project “Development of Tourism Decision Support System (TDSS)” under Sustainable Tourism Research Cluster (STRC), Universiti Sains Malaysia.*

**Key words:** web based GIS, Graphic User Interfaces (GUI), Langkawi Island

### **Introduction**

Tourism consists of a wide variety of aspects including facilities, activities, services, and industries to deliver a travel experience. This industry depends heavily on information. Customers want to acquire enough information about a tourist destination, such as locations, hotels, restaurants, routes and tourist attraction, before they decide to visit the place. Tourists still even need those kinds of information during their visit to a tourist destination. Tourists have problems to find what they are looking for, especially in reference to the geographic position of the object and its surroundings. In most cases, it is not satisfying to find a nice hotel without a reference to restaurants, tourist attraction or event locations located nearby. The public wants to find geographic information about a place before they go to the place and they want to know where things are located, what amenities are available, and be able to do site specific searches to find information. To travel anywhere, everyone have a number of locations, where they want to travel, therefore travelling plan for this is necessary. Tourist also need to know which hotel is nearby the route but it is also selected by

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cost, availability and other factors, so this need intersection from Geographic Information Systems (GIS).

Advancements in technology have changed the way people travel and plan their trips. Frequently, the travelers will rely on offline tools, such as pencil and paper to record their locations and then using online mapping tools to put together the relevant locations (Pan & Fesenmaier, 2006). The current trip planning practices it seems that, lack the integration of location information of various aspects of the trips. This can be achieved through Web-based GIS or Web-based Tourism Information System. GIS however, have the capability to handle several kinds of information that can be related to a location or area. For example, hotels and tourist destinations all have one thing in common – location. Chen (2007) also notes that GIS can make it easier for visitors to find their way around their destinations. By using this technology, information on the tourist facilities are offer, the rates at each facility, type of rooms, services are offer, the nearest police station, petrol station and hospital can be obtained.

Web-based Tourism Information System becomes the preferred source of information because they want to obtain such information directly without mediation (Timcak, Schleusener & Jablonska, 2009). As the internet and web technology offer global reach and mediation capability, Web Based Tourism Information System gains more and more importance as media of promoting and distributing tourism services (Doolin, 2002). With the tremendous growth of the Web, a broad spectrum of tourism information is already distributed over various Web sites. To fulfill the tourists request for an extensive data collection it is inevitable to accumulate data from different sources accessible. Beside this problem, tourists are also confronted with differences regarding information presented on various Web sites.

The solution of these problems is using maps to present information in an effective way. Maps are a natural means of indexing and presenting tourism related information. Travelers are using maps to navigate during their travels and for preparing their routes. Moreover, maps exploit the two dimensional capabilities of human vision and present the information in a compact and “easy to read” way. Study area of this research is Langkawi Island. Langkawi, "The Island of Legend" is located between Sumatra and Western Thailand that comprising a group of 104 islands. The island of Langkawi is divided into six districts namely Mukim Kuah, Padang Matsirat, Ayer Hangat, Bohor, Ulu Melaka and Kedawang. Figure 1 shows the study area, Langkawi Island, Kedah.

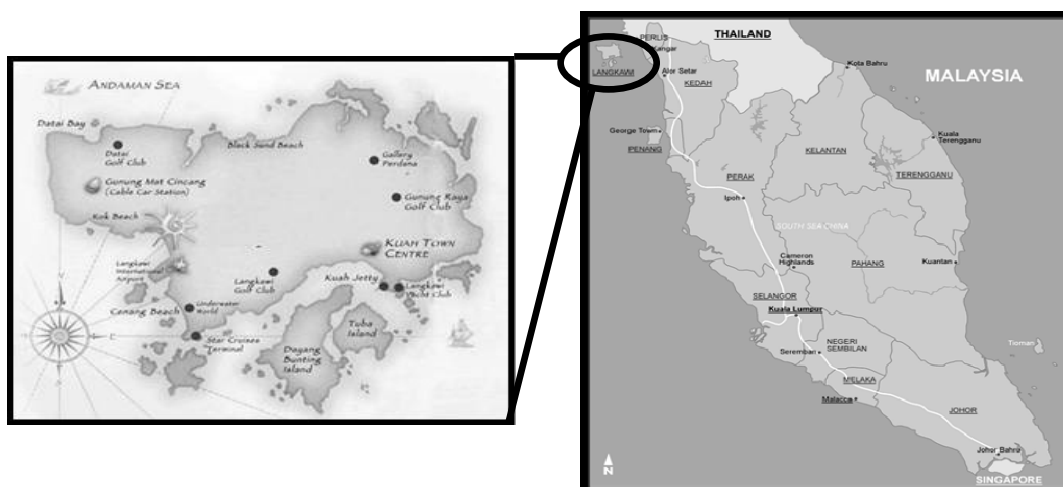


Figure 1 : Study Area, Langkawi Island, Kedah

## **Literature**

Dye and Shaw (2007) presented a GIS-based spatial decision support system (SDSS), TrailFinder application that integrated GIS functions and SDSS designs with easy-to-use graphic user interfaces to help visitors of Great Smoky Mountains National Park (GSMNP) choose and plan their activities more effectively to match their personal preferences and constraints. Based on the preferences and constraints selected, the GIS-based SDSS then retrieves all relevant data from various GIS layers and performs the necessary analyses to identify the trails that meet the user-specified criteria and constraints. Information on the recommended trails is presented in both map and text formats for users to make their decision.

Chu, *et al.* (2011) presented a tour guiding system for a mobile GIS. The system offers contents that change with the location of the moving tourist spatially and temporally. The system is implemented by integrating GPS and GIS techniques using hand-held mobile devices. The system includes four main functions, a graphic function, a GPS function, a Route function, and a Query function. In particular, this system combines mobile GIS and GPS techniques with location-based services (LCBS) to provide tourists a better trip experience and deeper understanding of the importance of this valuable landscape. The tour guiding system is currently being used for guiding services in the Yehliu GeoPark. Information is provided with multimedia methods for navigation, guided route selections and warnings about dangerous areas and route deviation.

Kushwaha *et al.* (2011) investigate how GIS and multimedia tools could be used to enhance the Management and promotion of tourism in Narsingarh. They presents an overview of the research and includes a discussion of the tourism potentials of Narsingarh and the potential benefits GIS could bring to the development and promotion of its tourism. In this study, optimum planning for sightseeing, query of geographical data, obtaining the visual and detailed information about the geographical data and network analysis applications were carried out. GIS design and application for tourism and network analysis help users to supply optimum planning for tourism. Moreover, users seem to save time with the help of GIS Application.

Longmatey *et al.* (2004) discusses the application of GIS and multimedia tools for archiving, analyzing and displaying of tourism information for the efficient management and promotion of the tourism industry in Ghana. A geographic information system with integrated multimedia tools could provide tourism information in an integrated fashion to the Central Region. Among the many benefits that may be realized through the system includes intelligent mapping capabilities, analytical capabilities, modeling and prediction, and revenue generation.

Turk & Gumusay (2004) carried out GIS design and network analysis by taking advantages of GIS possibilities for tourism. In this study, optimum planning for sightseeing, query of geographical data, obtaining the visual and detailed information about the geographical data and network analysis applications were carried out where Geographical Information System (GIS) technologies provide with these possibilities such as determining the shortest routes to the historical places and natural beauties from their accommodation. This because people who want to go sightseeing in different places as tourists may need to have some information about those places. GIS design and application for tourism and network analysis help users to supply optimum planning for tourism. Moreover, users seem to save time via GIS design.

Jovanović & Njeguš (2008) used GIS in three types of applications such as inventory, analysis and evaluation of plan based on tourism development. GIS technology offers

great opportunities for the development of modern tourism applications using maps. This technology integrates common database operations such as query with the unique visualization and geographic analysis benefits offered by maps. GIS use has so far provided successful results which promote importance of information over technology.

### **Web Based Tourism Information System (Tourism Decision Support System - TDSS)**

The basic idea of the integrated Tourism Information System for Langkawi Island is to provide comprehensive tourism related information, so that customers can easily obtain adequate information and become attracted to visit the island. The Tourism Information System is also designed to aid tourists during their visit. Access to the Tourism Information System is provided as a Web GIS-based so that it can be accessed anywhere at any time. The use of Web GIS also gives an easy access to the system via the internet. The main access to the Tourism Decision Support System (TDSS) is via Web GIS, which provides a user-friendly Graphical User Interface (GUI) that allow tourist to communicate with system. The user interface must be design that makes the user's interaction as simple and efficient, in terms of accomplishing user goals. The GUI of the Web GIS of TDSS consists of a large map display with menu bar at the top, navigation control, zoom slider, legend, scale and other as in Figure 2.

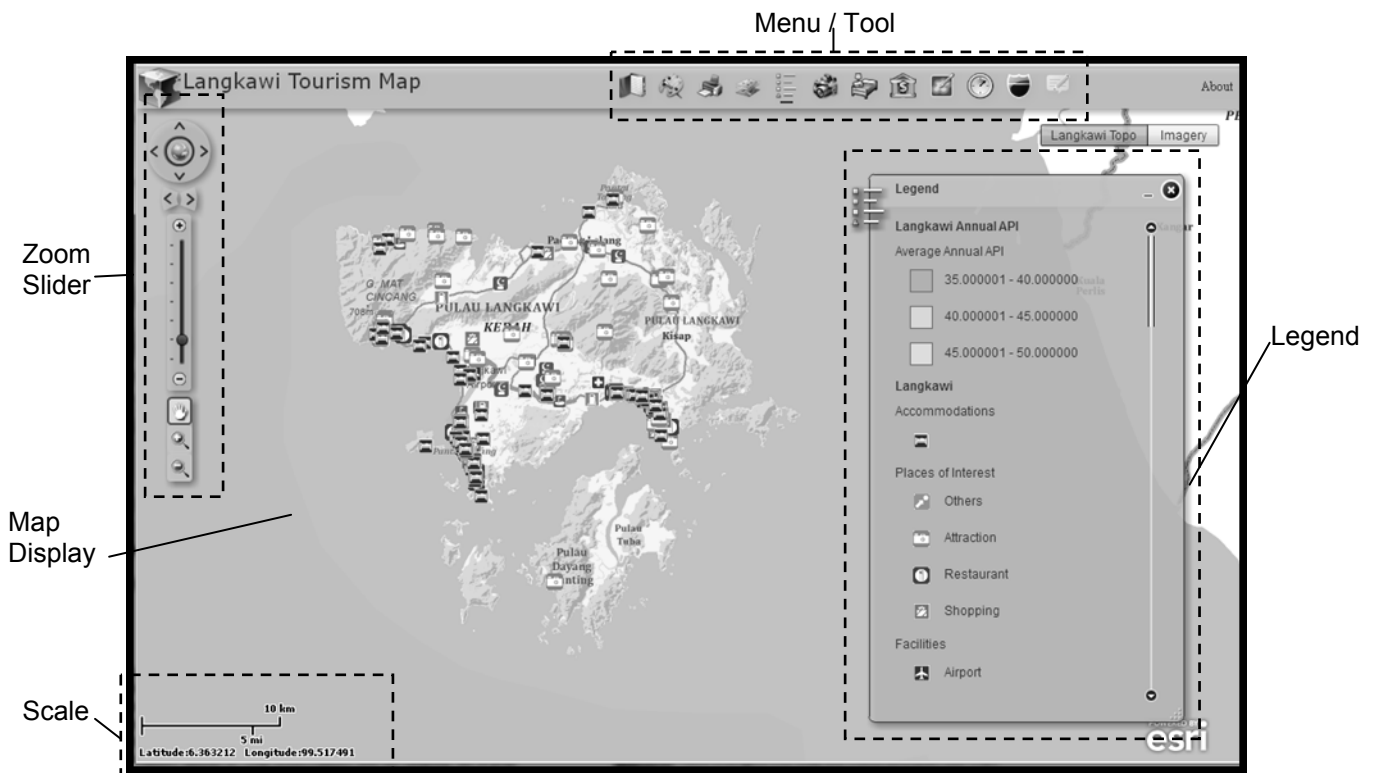


Figure 2: GUI of the TDSS Web

The Web GIS will present as much tourism information as possible via interactive map rather than via hyperlink texts. Map layers which contain important information will be visible by default, so it will be noticeable by user when open the website. User can choose which layers they want to see or hide later. Tourism

information systems provide interactive map that allow users browse through the map by selecting map layers, zooming in/out, panning the map and indentify object in the map by clicking a point to get information about it. Users can also zoom to a predefined scale by moving the slider in the slider bar. These analytical tools, such as zoom in/out, pan and query, were developed to help the end user. The information will be display as a pop up window and may include pictures and videos. Layers of map will be grouped by categories to help users find places they are interested in easily. Users also can choose from displaying street map or satellite imagery as the base map as in Figure 3. A function to choose this base map is available from the top menu.

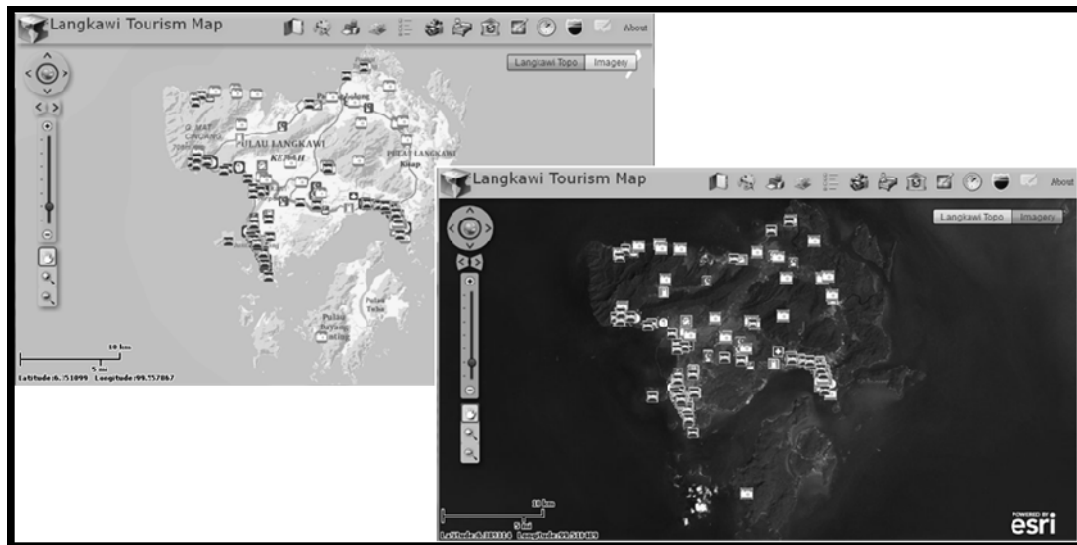


Figure 3: Two Type of Base Map, Street Map or Satellite Imagery

The aim of this tourism information systems are to attract tourists and also aid them navigating the place they are visiting. Beside have navigation map, the Web GIS provides search functionality that allows users to perform query in their database by provide tools for users to find places based on attributes, such as name or type, or based on specified distance from certain location. The places found will be highlighted on the map, and users can click on them to view detail information.

### **Tourism Facility**

This function of system provides information of services and accommodation such as hotel, Point of Interest (POIs) such as restaurant, shopping and other facilities such as Airport, Bank, and Petrol Station etc. For Function “Search POI”, there are two types can be used:

- (i) by POI's name or
- (ii) by Type and location of POIs

#### **(i) By POI's name**

User select layer field and insert POI name, then click the search button to view the POI object and will show where the location of POI as show in Figure 4.

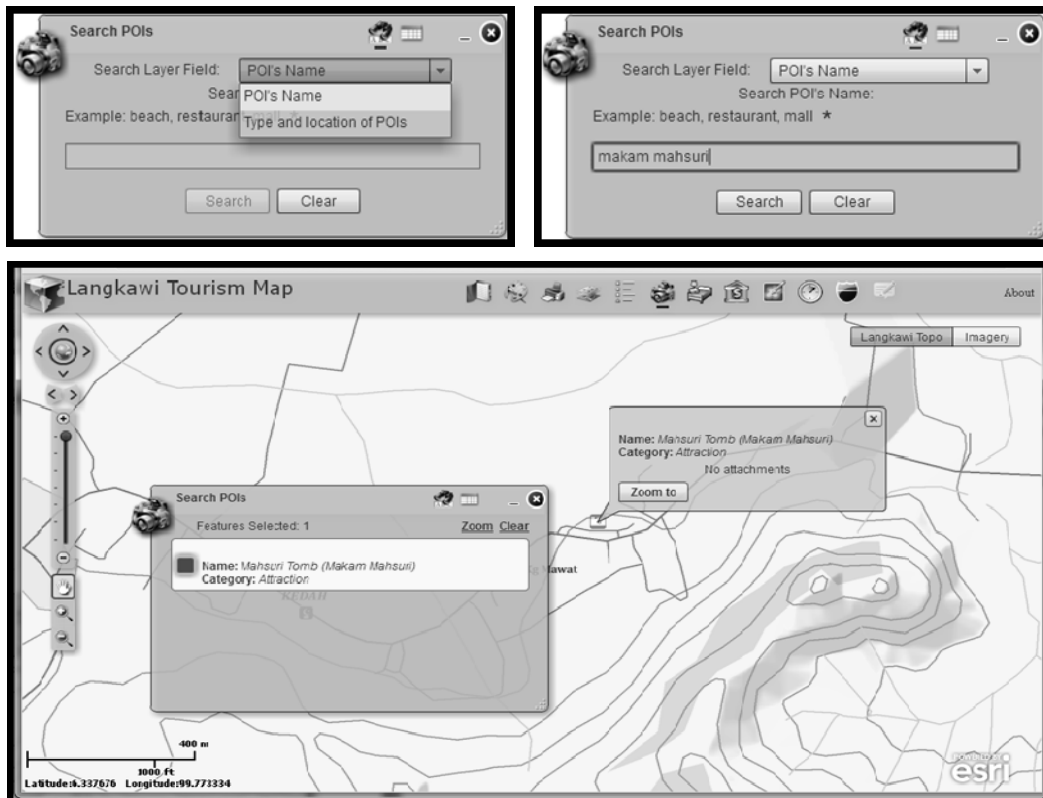


Figure 4: POI search Form & Result

(ii) Type and location of POIs:

User select category and location provided from drop down menu.

For Function “Search Facilities”

User can select category and location provided from drop down menu as shown in Figure 5. Facilities can be search from this function such as Bank, Mosque, Petrol Station and etc.

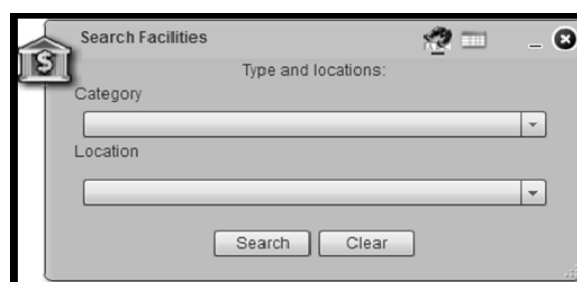


Figure 5: Search Facilities

For search Hotel, there are two categories the tourist will be chosen:

- (i) By name or
- (ii) By Type and location of accommodations

(i) By name

For search Hotel, it includes Chalet, Resort, Hotel, Budget Hotel, Homestay and Motel/Inn. User select layer field and insert accommodation name, then click the

search button to view the accommodation object and will show where the location of accommodation as show in Figure 6.

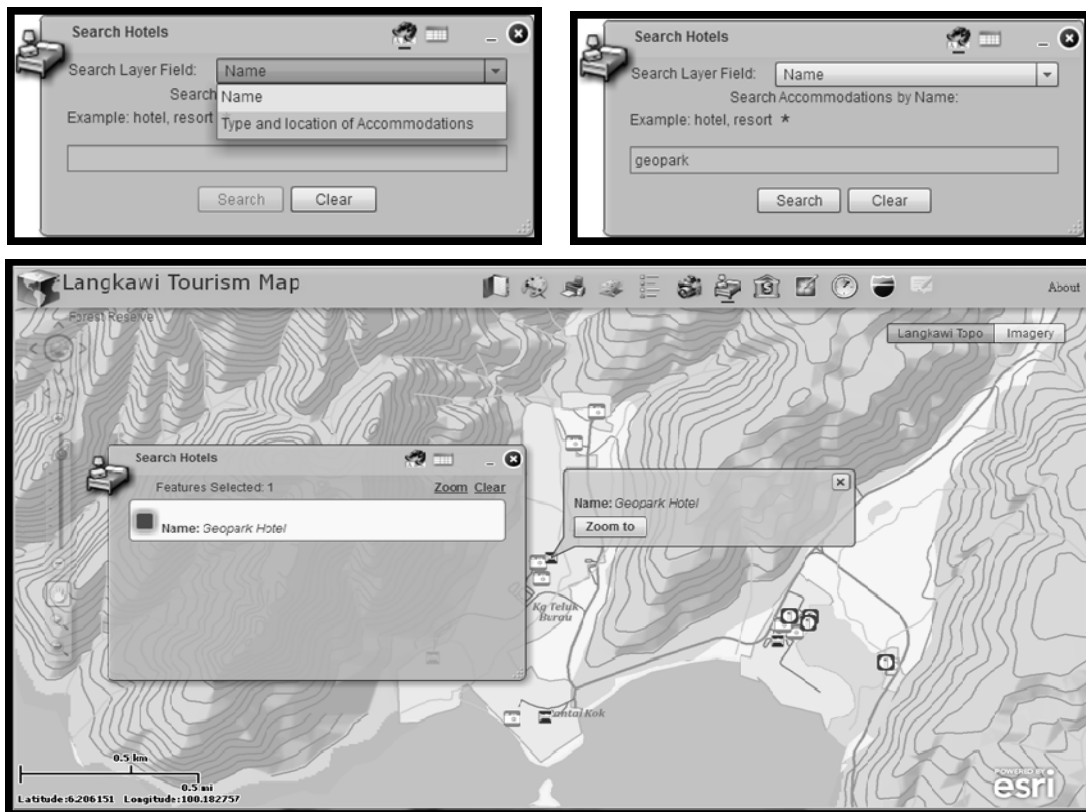


Figure 6: Hotel search Form & Result

If users want to know the route from one place to another place, user can use Route Tool/Function from menu provided, where user need to enter or selects origin and destination points to find route connecting the two points. The result will show the route on map and the description how to arrive to the destination as shown in Figure 7 and can print the map.

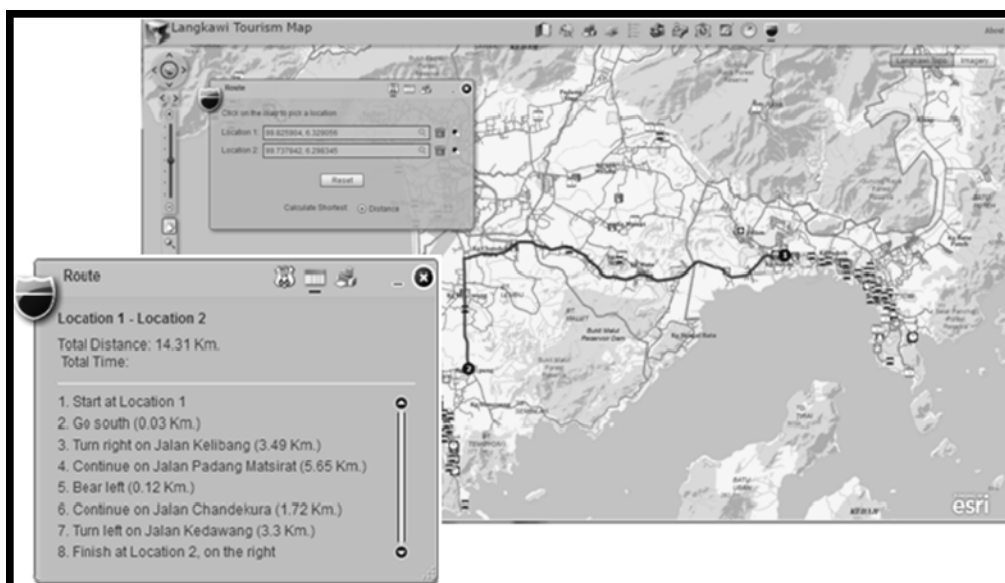


Figure 7: Route Function

Another popular functionality is finding tourism objects nearby or within specified distance. This function is to find whether Facilities, Accommodations or Tourist Attractions within specified distance that can be insert by user. A user chooses a location, specify search radius, and then perform the search. This function calls "Search Nearby". Figure 8 shows for search facilities within 2 Kilometers and the result will list what facilities have within 2 Kilometers from selected point chosen.

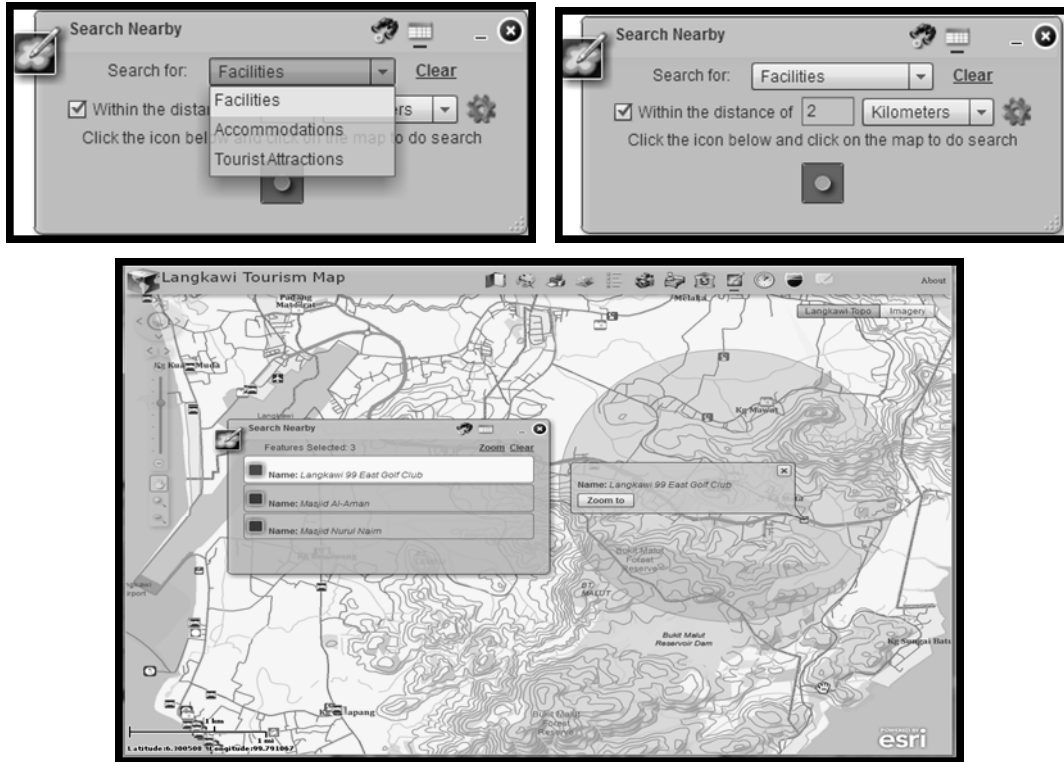


Figure 8: Function Search Nearby

Users also can find what object have in a particular area such as hotel, restaurant, shopping complex and other facilities by click on the location were interest as Figure 9. There are six Favorite place which are Pantai Cenang, Pantai Tengah, Pantai Kok, Teluk Datal, Tanjung Rhu, and Kuah Town.

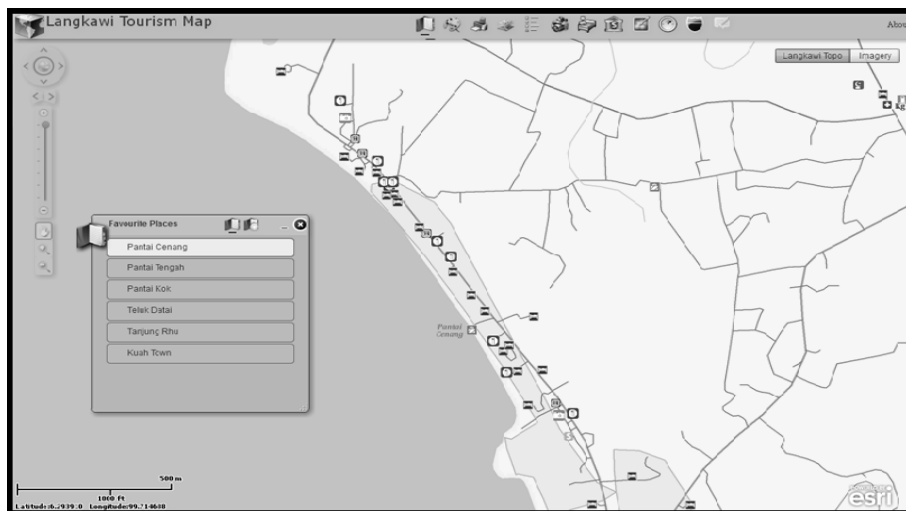


Figure 9: Favorite Place



More functions available in the Menu are shown in Table 1. Users can also choose which layer they want to turn ON or OFF from the Layer List. Some layers are only available at certain scale to maintain the readability of the map.

Table 1: List of Menu in the WebGIS.  
The menu printed in bold is the name of menu group.

No	Name	Description
1	<b>Map</b>	
1.1	Street Map	Display street map as the base map
1.2	Satellite Imagery	Display satellite imagery as the base map
2	<b>Tools</b>	
2.1	Find Places of Interest	Find a place of interest or facility by its name or other attributes.
2.2	Find Accommodations	Find an accommodation by its name or other attributes.
2.3	Find nearby	Find a place of interest or facility locating within a certain distance from a selected point.
2.4	Shortest Path	Find the shortest path in the streets from one location to another
2.5	Tour Planning	Arrange an efficient tour to visit several places of interest selected by user.
3	<b>Maintenance</b>	
3.1	Login	Login menu for registered user.
3.2	Add Places (Point)	Add a place of interest in form of a point. Only available for 'Contributor' and 'Manager' user level.
3.3	Add Places (Polygon)	Add a place of interest in form of a polygon. Only available for 'Contributor' and 'Manager' user level.
3.4	Edit Attribute	Edit attribute data of places. Only available for 'Contributor' and 'Manager' user level.
3.5	User management	This menu links to other page to manage users. This menu is available for Administrator only. On the user management page, Administrator can approve, reject, or delete users.
3.6	Place management	This menu links to other page to manage places of interest This menu is available for Manager only.
4	<b>Advanced Analysis (Manager Only)</b>	
4.1	Site Selection	Find a suitable location for tourism related development
4.2	Spatial Index	Calculation of several spatial index of tourism: Carrying Capacity, Development Pressure, Location, Tourist Concentration.

Users of TDSS are categorized into Guest, Contributor, Manager and Administrator. Anybody who uses the system without logging in is considered as Guest. As it is shown in Table 1, Guest can access all basic functions which are necessary for a tourist. 'Add Places' is only available for user with Contributor or Manager level. This is to ensure that only reliable person add new place to the map.

'Advanced Analysis' is only available to Manager, because this level of user is given to a decision maker and the type of analysis in the 'Advanced Analysis' menu is for strategic level. Inclusion of the 'Advanced Analysis' into the WebGIS menu is delayed until the basic system is completed. This is because those analyses usually use a lot of resources, so their feasibility for online application still requires further test.

## **Discussion**

GIS are equally useful in tourism, which consists of a wide variety of aspects including facilities, activities, services, and industries to deliver a travel experience. This Integrated Tourism Information System of Langkawi Island is to provide comprehensive tourism related information, so that customers can easily obtain adequate information and become attracted to visit the island. The Tourism Information System is provided as a Web GIS-based system that it can be accessed anywhere at any time. This web development consists of many functions such as tools for finding places. The result of this research is a web-based GIS tourism information system, which provides tourism information with an interactive online tourism map. Tourism information systems provide an interactive map that allows users to browse through the map by selecting map layers, zooming in/out, panning the map and identifying objects in the map by clicking a point to get information about it. Web GIS also provides search functionality that allows users to perform queries in their database by providing tools for users to find places based on attributes, such as name or type, or based on specified distance from certain location. The places found will be highlighted on the map, and users can click on them to view detail information.

## **Conclusion**

This study develops TDSS, offers various tools that allow users to find their route, ask information about POI, accommodations and other places of interest which is near to them to improve convenience, safety and efficiency of travel. In this study, Web-Based Tourist Decision Support System intended to provide tourism information for tourists visiting Langkawi Island. The developed WTDSS will provide the tourists to answer the fundamental questions such as near-by facilities, finding route, searching places of interest etc. in Langkawi Island. This helps the tourist to find the most relevant accommodation or to locate the position of a specific tourist place. Web-based GIS information system for tourism was designed and implemented with the real data in Langkawi Island. The tourism map is generally dynamically with an interactive interface, and an online map that offers various functions such as zooming, panning and querying. Tourism maps in an information system offer powerful, clear and user-friendly access to tourism data with a great benefit for tourists. In this study, Web-based tourism information systems seem to have been built upon the same basic concept, which is to provide detailed information about the tourist destinations that includes description about the places, sights, events, and tourism-related facilities. All of those tourism information systems provide an interactive map that allows users to select layers, zoom in/out, and click on points on the map to find tourism-related information. In addition to navigation using a map, it also provides search functionality that allows users to perform queries in their database. Tourists can browse relevant information that was published and that will strengthen the impression of those sights and help to attract more visitors.

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