Online Navigation System For Tourists In The South Western Zone Of Nigeria

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Abstract-In this work, we presents a web-based GIS that provides spatial and non-spatial data on tourism information of south-west zone of Nigeria comprises of six states with landmass of approximately 78771sg-km. ArcGis 9.3 application software was used for the preparation of integrated maps to indicate the location of tourist centers on a gridded platform, also integrating this with information technology system for ubiquitous access by individuals planning to visit the tourist center in South Western Zone of Nigeria via the use of Hypertext preprocessor scripting language with Hypertext Markup language embedded in the Macromedia Dreamweaver platform for website development. A web-based GIS was developed which provides detailed tourist attraction, information, events, and digitized map showing the road or route navigation to various destinations of tourist centers in south western zone of Nigeria which gives tourists to have access via the internet.

Keywords—Tourism, Digitized Map, Database, Sharp File, Internet, Geographical Information System (GIS

I. Introduction.

Tourist centres, a key factor in nations development, had suffered some drawbacks due to inadequate access to information of tourism facilities, destinations, services and also problem encountered by tourist to find where and which tourist center to visit. This led to the underutilization of these resources in country. An efficient promotion of tourism will not only allow significant gain of foreign currency and nations reputation but also it has an effect in building the real image of the country as they serve as the meeting of the past, present and future of any country.

Tourism is travel for recreation, leisure, religious, family or business purposes, usually for a limited duration. Today, tourism is a major source of income for many countries, and affects the economy of both the source and host countries, in some cases being of vital importance. According to [9], it is one of the major sources of income in the world today and an important export industry and chief of foreign exchange in many countries like United States of America (U.S.A.),

United Kingdom (UK), Germany, China, and Austria while African countries like Kenya and Zimbabwe have

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approximately 80% tourists coming into their countries primarily for wildlife. Tourist center is the geographical location where the attraction is found and the World Tourism Organization [12] defines tourist as someone who travels far away from home least eighty kilometers (fifty miles)) for the purpose of recreation, relaxation, adventure etc.

Geographical Information System (GIS) is a computer based tool which has the facility to extract the different sets of information from a map such as roads, settlements,vegetation, land use data and so forth, and use them as required. GIS can show many different kinds of data on one map, such as structures, designs and vegetations. This enables people to easily see, analyze, and understand patterns and relationships. Thus, GIS provides flexibility, understandability, while allowing a paper map or imagery from the satellite to be quickly produced which exactly meets the needs of the user. Geographical Information System (GIS) can be regarded as the high technology equivalent of map in the field of geography [7].

GIS can use any information that includes location. The location can be expressed in many different ways, such as latitude and longitude, address, or ZIP code. The system can include data about people, such as population, income, or education level. It can include information about the land, such as the location of natural resources e.g stream, soil, vegetation. It can also industrial, educational and socioaccommodate economical information about the region. GIS technology allows these different types of information, no matter their source or original format, to be overlaid on top of one another on a single map. When the desired data have been entered into a GIS system, GIS must manipulate the data because different maps have different projections. No projection can copy the reality of Earth's curved surface perfectly. Different types of projections accomplish this task in different ways, but all result in some distortion. In this research, application of GIS is in production of updated map with required detail of the information needed for the tourist. Thus, a given user is viewing its own context of the map as it applies to his request per time. GIS takes data from maps that were made using different projections and combines them, so all the information can be displayed using one common projection [13].

Internet is a worldwide, decentralized public information space where documents are shared and used for

conducting business. It is a global system of interconnected computer network. The World Wide Web is commonly known as web, it is a system of interlinked hypertext document accessed via the internet without limit where the server and client system reside.

However, unavailability of tourist centres updated information can be a source of concerns for tourist or group of tourists with limited means in term of finance, time and material needs. This research is intends to solve this unavailability of information about tourist centres in South western zone of Nigeria using the application of the above listed technologies and systems.

In this paper a web-based GIS application is developed for locating the route of tourist centers in south-west zone of Nigeria.

II. The Study area

Case study area for this research work is south western Nigeria, a geopolitical zone in Nigeria with latitudinal extent of 5^0 51' 26.038''N to 9^0 11' 17.4''N and longitudinal extent of 6^0 1' 47.629''E to 2^0 42' 31.433''E. This study area comprises of six states which are Ondo, Ogun, Osun, Oyo, Lagos and Ekiti state. Figure 1a and 1b shows the map of Nigeria and South Western zone of Nigeria indicating their Local Government Area.



Fig.1a. Map of Nigeria



Fig.1b. Map of South Western Zone of Nigeria indicating the six states

The Yoruba people, who occupy the southwest of Nigeria, are a highly researched ethnic group in Africa. The people can boast of a rich cultural heritage,

manifested in their history, sociology, and philosophy [13]. South-West zone of Nigeria is a land blessed with many natural and human resources. Nature has endowed south-west with a good design that is so attractive that Nigeria makes one of the most naturally picturesque nations in the world. Tourist attractions abound in South-West zone of Nigeria, ranging from natural attractions like hills, waterfalls, springs, lakes, mountains, rocks, beaches, etc; Olumo Rock in Abeokuta, Man-made attractions like resorts, parks, game reserves, ranches, etc., and Cultura attractions such as Festivals, carnivals, etc. The figures 2-5 show some tourist attraction in South Western states.



Fig.2. National Theater



Fig.3. Olumo rock Ogun state



Fig.3. Agbokim waterfall

Fig.



Fig. 5. Idanre Hill, Ondo state

III. Analysis of the Existing System in the Study Area

Tourism in Nigeria is being managed by the Nigeria Tourism Development Commission (NTDC). The NTDC has subdivisions in each states in Nigeria. The NTDC subdivisions were to regenerate and upgrade the standard of the state's tourism with the aim to properly maintain the growth of the tourism industry in the states. In view of the south-west tourism in Nigeria, the states found in this region establish their own tourism board, such as Tourism in Oyo state is being managed by the Oyo state culture and tourism board situated at Ibadan, the state capital, the Ondo state tourism board etc. In their aim to achieve the board's objective, managers were kept at each tourist centers, protections were kept at each tourist centers around the state, tourist services like food were kept in place, tickets are available for income from tourism to the state and other tourist facilities like accommodation, transport and others were kept in place. Thus, if a group of tourist were to visit the state, they get in contact with the state tourism board. The board then fixes a tour date while all managers at intended tourist sites are notified of the tour. In other cases where individuals are to reach tourist centers around them. they need not get through the board if they know their route, the managers at the tourist centers will take them through the place.

The tourist centers in all south-west state can be located on a paper maps, this maps show all the location of tourist site but not all tourist have access to it. In situation where a tourist needs to make a research on a particular tourist center and does not know where it is located and how to get the route destination, if in case the tourist is a foreign, he or she make enquiry from the NTDC, then the NTDC will direct the tourist to the state the tourist site is found. The tourist will have to drive to state and meet with the state tourism board for more information about tourist center before getting down to his or her destination for the research. This process is tasking, also before a tourist could have access to the paper map that show the route to the tourist destination there is also a lot places to go to before it is received. This paper maps are owned by the government.

IV. The Proposed Solution- Geographic Information System (GIS)

A geographic information system (GIS) is a computer system for capturing, storing, checking, and displaying data related to positions on Earth's surface. GIS can show many different kinds of data on one map, such as streets, buildings, and vegetation. This enables people to easily see, analyze, and understand patterns and relationships [13].

Components Geographical Information System (GIS)

- Data:Data (information) is the foundation of GIS applications. This include spatial and non-spatial data needed in the development of the application.
- Software: The computer programs needed to run GIS. There are many GIS programs available, from low-cost and low-performance packages to expensive and very powerful ones. This also includes support programs, such as statistical, word processing, graphing, and others.
- Hardware: These include the devices such as computers, printers, plotters, digitizers, GPS and other equipment on which GIS operates.
- People- The most important part of a GIS infrastructure. Although GIS is a powerful tool, it will not work without some well-adapted methods and trained people [10].

World Wide Web and Geographical Information System (GIS)

The proposed system is said to unravel and make the system effortlessness with the help of World Wide Web incorporated with Geographical Information System (GIS). Web-based GIS applications have unique capabilities to integrate and allow access to disparate data sets in bringing together into meaningful shape. The integration of Geographical information system (GIS) with World Wide Web is referred to as Web-based Geographical information system. The Geographical Information System (GIS) will help to edit the paper map to become digital on the computer and the web will bring together the tourist information, tourist events, the route maps to the tourist destination via internet which users can access with their computers or mobile phone anywhere.

How a Web-based GIS Work

Web-based Geographical Information System is a set of computer-based tools; that provides tourist with information about tourism attraction, events and tourism destination giving them the access to view the important route to their destination based on the integrated maps stored in the database or through Google Earth via the internet, using their computer or mobile phones. There are many different products that can be used to implement Web-based GIS as described in this section. They include Map Guide, Map Objects, ProServer, GeoMedia Web Map, Spatial WebBroker, APPIAN Carta, Spatial Net and CARIS Internet Server Google earth, ArcGIS, Apache, and Macromedia Dreamweaver. The entire process of communication between server and client to show route map to the tourist center is illustrated below. Once a user is on the Web site, the following steps are required to search for tourist centers, view roads linking to the tourist location either by vector imagery or the satellite imagery:

- User can search for tourist center location of their choice in the search engine
- User may also click on pictures of the tourist attraction for viewing the information about tourist, in order to view the map click on the vector imagery (which shows images in lines, polygon and point), or satellite imagery.
- Google Earth application must be running on the system in order to view the satellite imagery
- provides easy access etc [11]; [1]; [2]; [7]
- The vector maps are stored in GIS Database. The vector maps show the accessible roads, towns, settlement to a particular tourist center
- Web browser retrieves the request of the user and displays on the screen
- Downloading of maps requires registration of user before downloading can be done.
- User can also subscribe for newsletter [6]

V. Related Works

This research sought to extend the capability of GIS integrated with the Internet to tourism in the South Western Zone of Nigeria.

VI. The Proposed System Architeture

The system architecture is based on the concept of client server architecture. In client server architecture, some application program act as information providers (server), while other application programs act as information receivers (clients).

Document on networks are called hypertext if the media is text only or hypermedia if the media include graphics as well as text. Every hypertext or hypermedia has a [3] proposed a web-based information System for Tourism where GIS was applied to support planning activities for tourism in the Manavgat region located in southern coast of Turkey, and focused on the analysis, decision making and management using GIS technique. [7] worked on Web-Based Geographical Information system(GIS) where GIS was used to provide the facility to extract different sets of information (e.g. tourist attractions, hotels and their distances from one another. roads, settlements, vegetation, land use data, changes in tourism resources) from a map and use them as required for promotion of Tourism Industry in Oyo State, Nigeria. [6] applied Geographical Information System (GIS) Technology to Tourism Management in Ile-Ife, Osun State, Nigeria to make an inventory of existing Tourist infrastructures in Ile-Ife and also create awareness of the existence of these tourist attraction centers to prospective visitors. Also, [1] developed a multimedia GIS database for Planning Management and Promotion of Sustainable Tourism Industry in Nigeria which constitutes a great resource for producing various tourist maps of Nigeria and for educational institutions offering courses in tourism in Nigeria. In a related development, a Web-Based Tourism Information System using Geographical Information System was proposed by [16] to promote tourism and providing an innovative way to the users to access spatial orientation of the Chandigarh city in the northern part of India.

The advantages of GIS in tourism integrated with the internet as shown in the reviewed literatures includes among others; GIS always keeps the information up to date, reduces cost and saves time, provides information for decision support and policy making, increases efficiency in tourism activities, increases management control,

unique address called Uniform Resource Locator (URL). Hypertext document usually contains references to other URLs that appear in bold, underlined, or color text. The user types the URL of the site on the web browser and connects to the site clicking on it. The use of URL within a website is known as Hyperlink. Then the HyperText Transfer Protocol (HTTP) will connect the web browser to the web server. HTTP defines how message are formatted and transmitted on the WWW. When user click on hyperlinks on a web page, the browser move to the next server to download and display the document targeted by the link. Using this method the user browser can easily and rapidly take user back and forth between different website pages. Below diagram shows the system client server architecture.



Fig. 6. Conceptual System Architecture

VII. Methods of Data acquisition Data Acquisition

The data used for this research was acquired both by primary and secondary source. The primary data were acquired through field survey using GPS devices to acquire point data in terms of coordinates of points where the main attraction of the tourist centers which are either Museums, Art Gallery, Beaches, Hills, Water fall are located in the whole of South-west. The secondary data used for this project was an existing map of Nigeria that shows the states in Nigeria but concentrated on the study area i.e. South-west ArcGis software with coordinates obtained from the gridded map. The projection of the datasets was projected zone of Nigeria which was converted to digital form and Geo referenced using coordinates of known points. The reference system used is "UTM" Universal Traverse Mercator and a Projection of Zone 32N. The shape files of roads, settlements, towns, and street were also collected.

Data processing and Georeferencing

Georeferencing of the satellite image was required so as to bring them to the same ground coordinates. The Georeferencing of the satellite image was done using the ArcGis software with coordinates obtained from the gridded map. The projection of the datasets was projected to WGS 1984, Universal Transverse Mercator, Datum 100 Minna –Nigeria, Zone 32^oN. The Georeferencing began with the selection of four X and Y coordinates tie points that are spatially distributed and points were added, and map was then updated. The Geographical co-ordinate system used for map production is shown below



Fig. 7. Co-ordinate system used

Database Design Creation and On-screen Digitizing After Georeferencing, a geodatabase was created in ArcCatalog. This was followed by creation of a feature dataset and feature classes namely; state boundary, railway, Major Settlements, Major roads in the geodatabase. A model is adopted for the database creation. The digitizing process was done in the Arc Map environment, after the creation of features in the database in ArcCatalog. Digitizing is the process of converting geographical features from an analogue or raster map into vector format. Layers Digitized in this paper are as follows:

- Settlements: as polygon feature
- Street: as line feature
- Road: as line feature
- Railway: as line features
- Town: point features

Creation of Geo Spatial Database Design Method

The geospatial database design involves creating and arranging various geospatial data such as point, poly line and polygon objects with their attribute table. The color, weight, size and symbols of these objects have to be analyzed and implemented. Geo database organizes spatial data into a hierarchy of data objects. These data objects are stored in feature classes, object classes, feature datasets and raster datasets. An object class is a table in geodatabase that stores non-spatial data. All the geographical data features must contain spatial reference. The spatial reference describes the coordinate system, the spatial domain and data precision of the feature. The point coordinates of Tourism destinations and a feature class each and their corresponding attribute fields is created in the ArcGIS 9.3 Geo database using the Arc Catalog, to store the point data and their corresponding attributes. Inputting, the point data into ArcGis 9.3 software application Geo database, the edit mode is turned on and the feature class attribute table is opened. Each point is selected using the select tool and its corresponding attribute is added into the Database. Figure 6 shows the sources and the steps in creating the geospatial data base for this research



Fig. 8. Data Flow to the GIS Data Base

Creation of Non-Spatial Database Design

The non- spatial database are the information that are received from user or tourist. These users information are gotten from newsletter subscription or a user registering has a member of tourist trek in order to have access to the maps, the information are gathered and stored in the non-spatial database.

VIII. Web Design Model

After all the above process has been carried out, the need to design a visual standard model of the web Fig. 9. Web design template

application, which will serve has a guide in the development of the web application. The website comprises of different links such as Home (also known as index), Login, Register, About us, a tourist center image, names of the tourist centers, search button etc. some of the links has a target such as _blank (it opens the linked document in a new browser window,

leaving the current window untouched) _parent (it opens the linked document in the parent frameset of the frame the link appears in, replacing the entire frameset.), _self (it opens the link in the current frame, replacing the content in that frame) and _top (it opens the linked document in the current browser window, replacing all frames.). Service, News Resource, Contact us Download page, etc, which are hyperlink together. Figure 7 provides a guide to the website and it demonstrates the links between different pages in the website.



IX RESULT

The form of implementation of this web-based GIS for tourism is the graphics snapshot of a pre-generated map. The map are generated with the ArcGIS software, then, screen shots of the map are placed in a web document via HTML tags. Snapshots are easy to implement, however they do not support map interaction features. The web is developed using Macromedia packages. The website has a link to Google earth, for tourist to view the satellite imagery of the tourist center they want to visit. The system is divided into modules but the main modules are Home page, Login page, User Registration page, Download page.



Fig. 10. The states road network in south-west zone of Nigeria map including the local government boundary

Fig. 11. The road map to Ikogosi warm spring in Ekiti

Fig. 12. Home Page

Fig. 13. Shows the road of map of Ooni palace when the link of Ooni's palace is click on in the home page, the satellite view will connect to Google earth.

Fig. 14. Registration page

Fig. 15. Login Page

Fig. 16. Downloading page

X. CONCLUSION

The study aimed at identifying tourism destinations which include beach, Museums, tourist attraction sites, as well as complementing it with route leading to the tourism destination centers in the south west zone of Nigeria. It also places Geographical Information System in tourism management and the south west states on the computer and World Wide Web (Internet). The maximization of the system will provide critical data and information required to serve the tourism market and greatly increase the cultural heritage of south western states of Nigeria. The result of this research have revealed that presenting tourism information by incorporating Geographical Information System and the internet would offer a platform for the management and promotion of the tourism industry in whole of south-west of Nigeria. The tourism information would be accessible by tourist, other tourist agencies, and the people at large.

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