GEOGRAPHIC INFORMATION SYSTEM TECHNOLOGY AS A DECISION SUPPORT SYSTEM FOR HOSPITALITY MANAGEMENT IN AMAC-ABUJA

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Abstract:

This paper discusses how geographic information system technology could serve as a decision support system for hospitality management in ABUJA. GIS functionality was used to create digital spatial database for tourist site, hotels, hospital, police station and road network for tourist movement within ABUJA. The study involved the design of spatial database for various entities identified in the study area. Geometric data was acquired from satellite imagery through digitizing and the imagery updated through hand-held GPS receiver while attribute data were acquired through social survey. ARCGIS 9.3 was used for database creation where attribute tables were linked with geometric data. Various spatial operations were performed and these include Buffering, Spatial query and Network Analysis (best routes, alternative route and closest facility) to efficiently map tourist movement in ABUJA. ArcGIS9.3 provides greater support in giving information about tourist sites and solving direction finding problems. The study was concluded by recommending various ways to promptly identify hospitality sites, managing tourist movement and solving direction finding problems for tourism management.

Keywords: Gis, Hospitality, Tourist Site, Decision Support System

Introduction

Friendly and generous behavior towards visitors and guests, intended to make them feel welcome: food, drink, room and entertainment given to customers by a company or organization is defined as hospitality Rundell (2007). Another scholar Cooper et al (1996) in educating the Educators in Tourism stated that hospitality is a combination of physiological and psychological elements with security and level of service. Hospitality is concerned with the provision of physiological and psychological comfort within defined standard of services.

The primary interesting elements is that of the social relationship fostered by the warm, friendly, welcoming, courteous, open, generous behaviors, of host creating the hospitable social environment. This promotes the positive feeling of security and comfort created by physical structure, design, décor and location of facility. Finally, the provisions of accommodation facilities to sleep, eat, relax and wash, together with the supply of beverage, service and entertainment.

The Hotel Proprietors Act of 1956 defines a hotel as "an establishment offering food, drink and sleeping accommodation if so required to any traveler who appears able and willing to pay for services and facilities provided. This implies in common law, a hotel must offer:

- Food
- Accommodation to its guest
- Liability for the property of guest
- Conform to public health and safety regulations
- Provide high standard of cleanliness and socialization.

The term hospitality emerges as the way hotelier and caterers would like their industry to be perceived. It conveys an image that reflects the traditions of service that goes back over many centuries. In 1987, the hotel catering and institution management association, the industry professional association changed the name of its Journal to Hospitality, likewise in 1991, the British Hoteliers, Restaurateurs and Caterers Association, the United Kingdom Industry's main trade association changed its name to the British Hospitality, this has also been adopted by educators so that most, if not all universities and colleges now offer courses on hospitality management (Jones, 2002).

Hospitality has been defined as the cordial and generous reception of guests (Angelo and Vladimir 1994). It has also been defined as those commercial activities which offer consumers (guest) accommodation, meals and drinks when they are away from home while promoting a warm friendly experience that benefits travelers (George, 2001). The term

hospitality is derived from the Latin word hospe, which means host or guest, and also hospitium, which means guest chamber, inn or quarter (Chon and Sparrowe, 2000)

Table:1 Two Faces Of Hospitality Industry

FOOD SERVICES INDUSTRY COMPONENT	LODGING INDUSTRY COMPONENT
Catering and Banquets	Clubs
Food and Beverage with other business	Institution
Restaurant without other business	Hotel and Motels
Beverage establishment	Resorts
Clubs	Convention centers or Hotels

Source: Adapted from Chon and Sparrowe (2000).

From the above it is easy to understand what hospitality industry is all about. Lillicrap and Cousins, (1990) gave an apparent view of the hospitality industry saying; the main purpose for the industry is to provide accommodation food and drink to guest.

Hospitality business involves guest home place, a destination place, and guest moving from one of these places to the other. In other to develop and manage successful small and medium hospitality business, profound understanding or knowledge of spatial distribution of tourist sites, tourism facilities, tourist flow, becomes imperative and also the spatial patterns of tourist movements between destinations, within destination, tourist motivation, tourist needs and facilities required. This will enable hospitality managers, planners, policy makers, and the hospitality industry in general to achieve the development of small and medium enterprise and provide better facilities and services to cater for the needs of the guest and the environment.

Geographic information system is an information system which has the capability to handle spatially distributed data, relate them to other numerical or descriptive data, and present the data visually on a map, reports, chart etc. the ultimate goal of Geographic information system is to create relationship among spatial features or entities and convert data into meaningful information needed to support decision taken in solving location problems and making optimum use of the location by small/medium enterprises for maximum profit. Geographic information system provide the opportunity to better understand

geographical influences on hospitality business and therefore allows hospitality planning, development and management to be tailored to suite the individual needs of each destination.

Table:2 Hospitality Issues And Gis Applications

Function capabilities of a GIS	**GIS Basic**	**Questions**	**hospitality Application**
Data entry, storage and manipulation	Location	What is at	**Hospitality**
Map production	Condition	Where is it	Identify most suitable location for development
Database integration management	Trend	What has changed	Measure hospitality impacts
Data queries and searches	Routing	Which is the best route	Visitor management / flows
Spatial analysis	Pattern	What is the pattern	Analyse relationships associated with resources use
Spatial modeling Decision support	Modeling	What if……	Assess potential impacts of hopitality development

Source: modified after Bahaire and Elliot –White 1999, p.259

The overall fact is that GIS technology is an essential and effective decision support system for hospitality management.

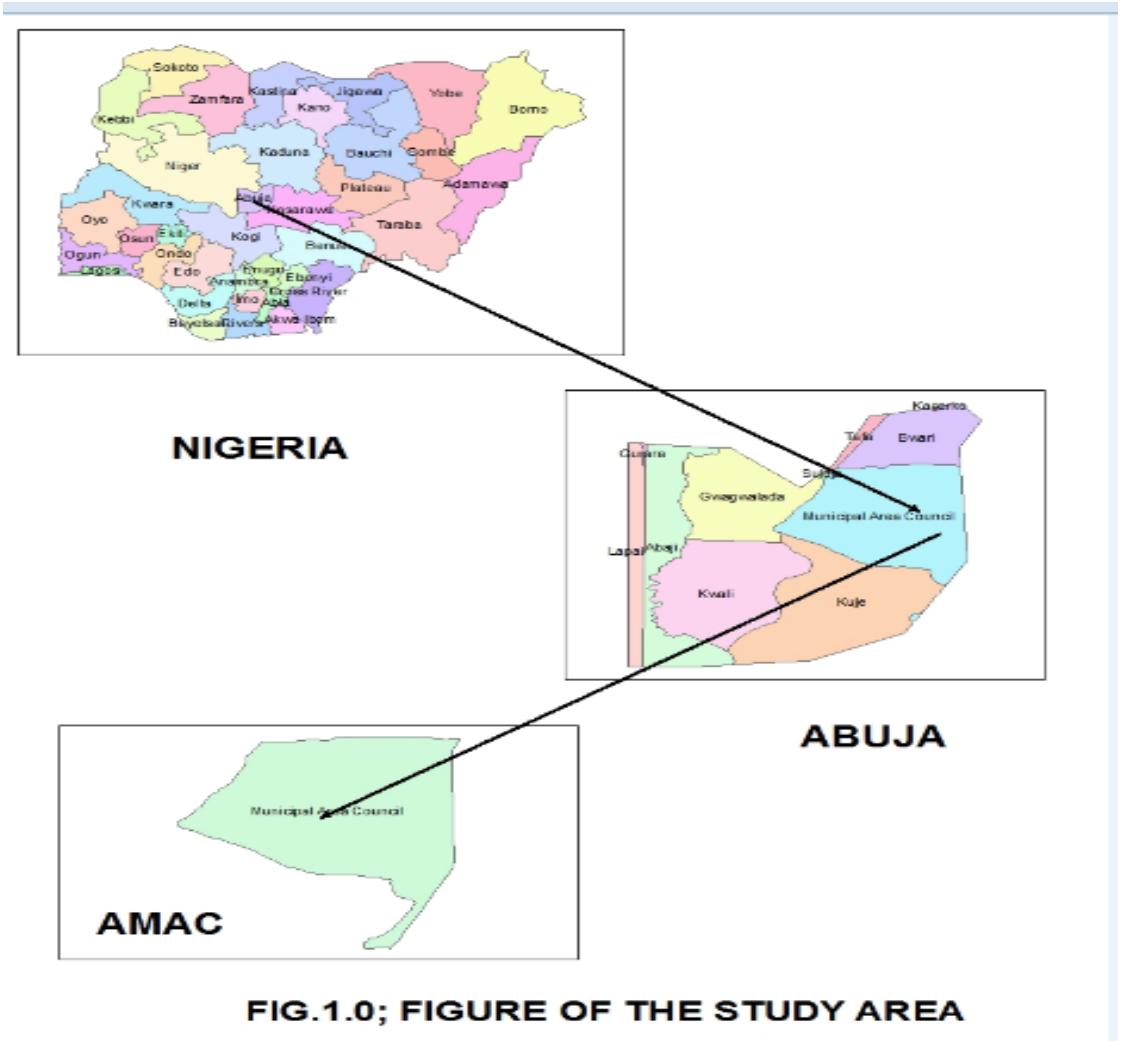


FIG.1.0; FIGURE OF THE STUDY AREA

GIS is an integrated assembly of computer hardware, software, geographic data and personnel designed to efficiently acquire, store, manipulate, retrieve, analyze, display and report all forms of geographically referenced information geared towards a particular set of purposes (Burrough, 1986, Kapetsky, and Travaglia, 1995). Another scholar (Benharden, 1992) Stated in a clear term that one of the newly developed technology, which have important components of any approach to global problem solving is the GIS developed about 30 years back.

ESRI went further to define GIS as a computer-based tool for mapping and analyzing things that exist and events that happen on earth. GIS technology integrates common database operations such as query and statistical analysis with the unique visualization and geographic analysis benefits offered by maps. A processes spatial information and designed for data management, mapping and spatial and non spatial analysis (Berry, 1987). Santanu Dutta (2006) gave a comprehensive definition of the acronym GIS thus:

"A system for input, storage, manipulate and output of geographic information. A practical instance of a GIS combine software with hardware, data, a user, etc. to solve a problem to support decision, and help planning. A Geographic Information System is a computer-based tool for mapping and analyzing geographic entities that are spatially referenced to earth."

Santhkumar and Mathew (1998), further stated the unique ability of GIS to combine system of hardware, software, data, people, organizations and institutional arrangements for collecting, storing, analysis and disseminating information about areas of the earth distinguish GIS from other information systems and make it valuable to a wide range of public and private enterprises for explaining events, predicting outcome and planning. Based on the definitions of the above various scholars, for the purpose of this research, GIS will be seen as

"***An integrated computer system for decision marking, that have the capability to acquire geospatial and attribute data, manipulate, store, retrieve, process, analyze and present information for solving complex spatial problems."***

It is apparent that GIS serves as tool that can simultaneously integrate various dataset and present instantaneous information for decision taking.

The above are necessary for taken accurate decision in hospitality management. As such, the process by which people, moves from one geographic landscape (hotel) to another (tourism sites) an essentially movement in geographic space and an important aspect of coverage of Geographic Information System. GIS technology is applied in transportation – tracking, navigating, routing and scheduling logistics from one geographical location to another (Berry, 1987). Selecting the best route through an area is one of the oldest spatial problems. But lately, this problem has been solved with the use of GIS technology. Geographic information system and tourism share a common characteristic, in that both cut across the boundaries of disciplines and areas of application. Given that all tourism activities are spatial in nature and must take place in space and in a location the potential of GIS technology to resolve or solve tourism spatial problems becomes very significant.

Scores of scholars have affirm, as mention early in the study the effectiveness of GIS technology in managing, analyzing, and displaying large volumes of divers data pertinent to a lot of local and region planning activities. Hospitality industry is highly dependent on the environmental resources. It is also a phenomenon which in the event of lack of proper planning and management is likely to erode its environmental base. Hence, the efficiency of

hospitality management will be greatly enhanced by GIS application. GIS technologies which are pertinent in hospitality management are identify and its application in ABUJA.
GIS technology represents position of real word data in one of the two models

Vector Model And Raster Model

The vector data model provides precise positioning of features which are resented in three formats

1, POINT symbol, (Recorded of simple x,y coordinate)

2, Line symbol, (Recorded series of x,y coordinate)

3, Polygons (Recorded closed loop of x,y coordinate)

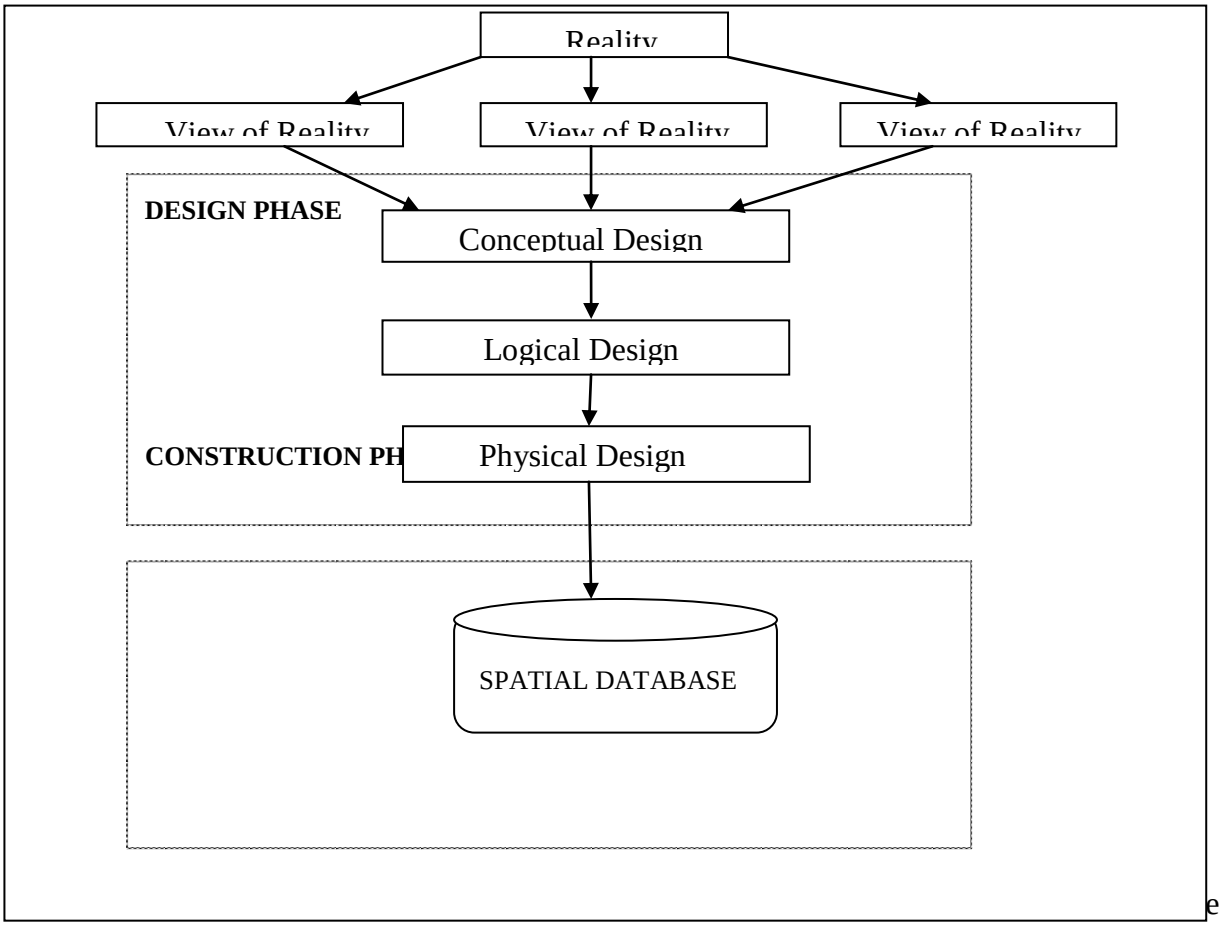
Raster system is limited to 2.5 D reality of geographic space is see as non empty space composed of tiling of area units with each unit having a certain location value.
Tourism destinations can be represented in GIS environment by points, lines, and polygons since tourism destination is characterized by three different landscape features: Point features (tourism attractions) Line features (linear pattern i.e roads,)Polygons features (parks,)

This location attribute are necessary to a Geographic Information System.

There is no doubt that GIS possesses significant potential as decision support system for hospitality management. Tourism site specification information about sources of visitors origin and destination, travel motivation, spatial patterns of recreation and tourism use, visitor expenditure patterns, level of use and impacts and sustainability of tourism site for recreation/ tourism development, numbers of hotels, hotel rooms available in the city and the type of services, all of which are easily implemented in the GIS arena. The fact remain that GIS technology is an essential and effective decision support system for tourism management.

Methodology

Spatial database is the central force of GIS technology, according to Kufoniyi (1998) described GIS data modeling as process by which the real world entities and their interrelationship are analyzed and modeled in such a way that maximum benefit are derived while utilized a minimum numbers of data. Reality refers to phenomena as they actually exist, including all aspects which may or may not be perceived by individuals. The view of reality is the mental abstraction of reality for a particular application (user requirements) or group of applications (Kufoniyi, 1998). In this study reality refers to road network, Police station, Hospitals, Abuja boundaries, Hotels, Tourism site and Recreation places within the study area.



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Users model of reality; a database is an integral part of any decision support system (DSS) (kroenke, 2002). Spatial decision support system used by GIS is a special kind of database with spatial database required in GIS for wide range of reasons including, reducing data duplication, ensuring data standard, and for efficient way of representing geographic data in the user's perspectives.

There are two main phases in obtaining a GIS database; these are the design phase and construction or implementation phase otherwise known as data modeling, this consist of three stages and the construction phase is made up of spatial database proper, the three main phase of database design are:

I. Conceptual design phases
II. Logical design phases
III. Physical design phases

Conceptual Design

Conceptual design is the arrangement of a human conceptualization of reality, how the view of reality will be presented in a simplified manner but still accommodate the information requirement for successful implementation of the project at hand. Abstraction of

reality is the first step to be addressed before designing and creating a database. For this study, the reality stands as the spatial arrangement of tourism site in other to see their spatial relationship with other factors that interact with tourism, such as road, hotels, hospital, banks, recreation, parks, gardens, police post, etc. The vector data model was adopted for the representation of the complex reality in this study. The vector data model represents the real word using points, line and polygons or area. The complex reality in this study will be represented as follows using vector data mode;

POINT: Tourist Sites , Hotels, Catering, Sport houses.

LINE: Roads, rives or any liner feature

Polygons or Area: Boundary

This study considered the following entities: Tourism sites, Hotels, Recreation Park, Hospitals, Police station Arts and Culture Center and Roads.

Logical Design Phase:

Representation of the data model designed to reflect the recording of the data in the computer environment; it may also be referred to as the data in the structure. Data can be structured using the hierarchical, network or relational approaches. For the purpose of this study the relational data model was adopted this choice was based on the available software, the data collected and most importantly the scale of operation both input and output, where all the entities are treated as object. In relational data structure, data are stored in simple records, which contain set of attribute values that are grouped together in a two-dimensional table know as relations. Each contains item of data called field about entities. The entities (objects) are found along rows while the column, contains attribute are fields.

TOURISM SITE (OBJ_ID, TRMSITE_NAME, TRMSITE_ADD, TRMSITE_FACI, TRMSITE_OWNER} BUILDING (OBJ_ID, B_USE, B_NAME, B_ADDRESS, B_FACILITIES, B_OWNER} ROAD (OBJ_ID, R_NAME, R_LENGTH, R_CLASS)

DATABASE CREATION

Abuja imagery from IKONOS was geo-reference and used for this study. It was digitized on-screen using ARCGIS 9.3 version. Following the design phase, the database was created and populated in ARCGIS 9.3 environment. Polygon, Line and Point layers were created respectively for Tourism site, Hospitals, Recreation centre, Hotels, police station and Roads data. These form individual relations which were then populated with their attribute values.

Database implementation involves the following steps:

- ❖ Hardware and software based on data to be stored and the format
- ❖ Physical database creation, to input data into the database
- ❖ Lastly, the graphical display of the spatial data context of the database.

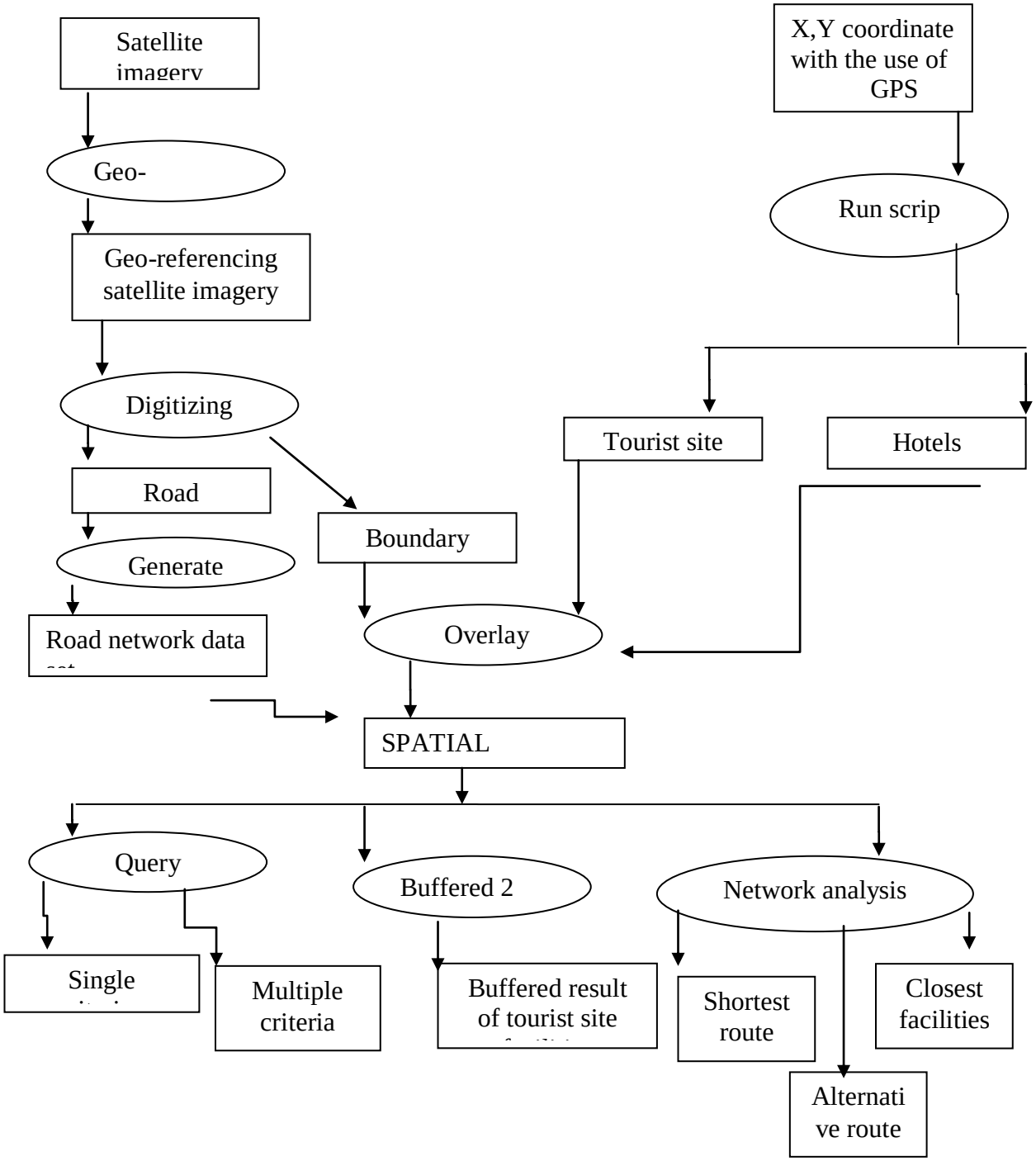

Fig 3: cartographic mode

Spatial Analysis

There are wide ranges of function for data analysis in GIS packages; this is what distinguishes GIS from other information system. GIS project will not be said to have been completed without carrying out spatial analysis. Some of GIS capabilities are measurements techniques, spatial search, attribute queries, proximity analysis, buffering operations and analysis of models of surface and network analysis. The following spatial analysis was carried out in this project: Spatial Search, Network analysis (Finding the best route and closest facility for tourist in Abuja), Buffering to determine tourism facility with a define radius using the recommended criteria.

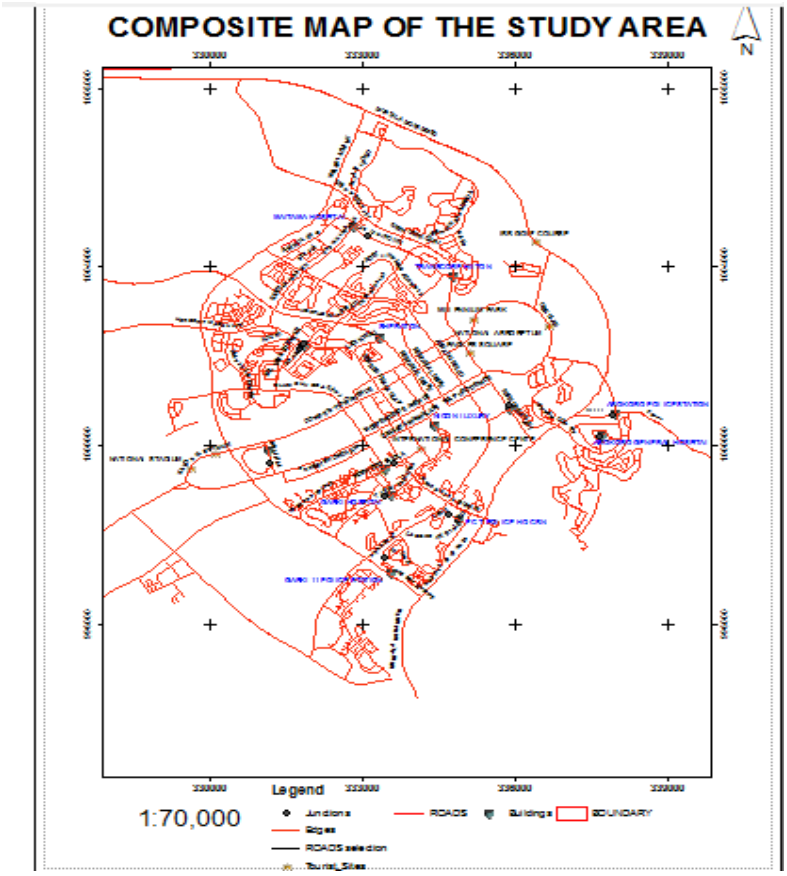

Figure 4: Composite Map Of The Study Area Spatial Search\ Queries

Spatial search was used to test the database created by looking for certain attributes within Abuja, which is logical and systematically defined. The database towards answers generic questions of what is where and where is what.

Queries

Single criterion query is the analysis of the database stating one condition for the search from the database prepared for the study, while the multiple criteria combine more than one field to generate result. The variants of query (selection) involved are, Query by Attribute, Query by Location, and Query by use.

Query Syntax : SELECT* WHERE "TRMSITE_NAME"

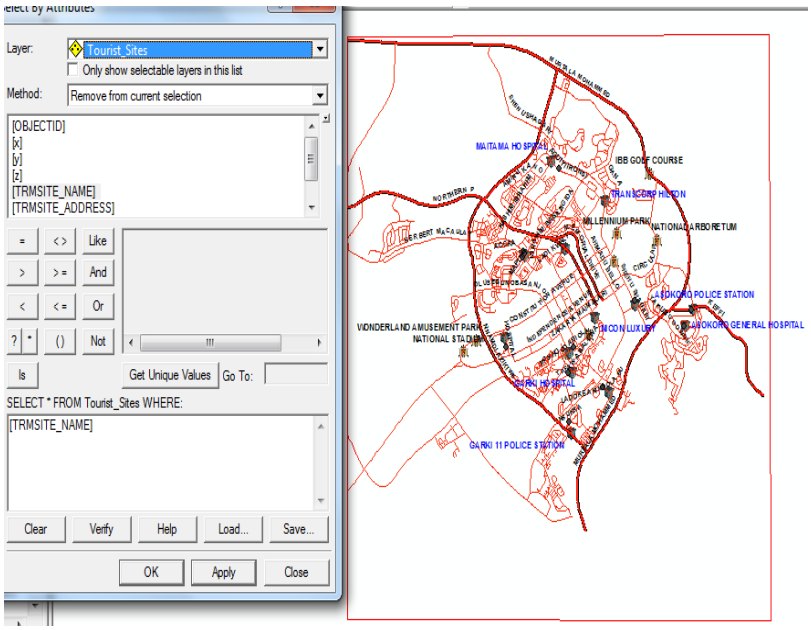

Fig 5. Query Of Tourist Site Location

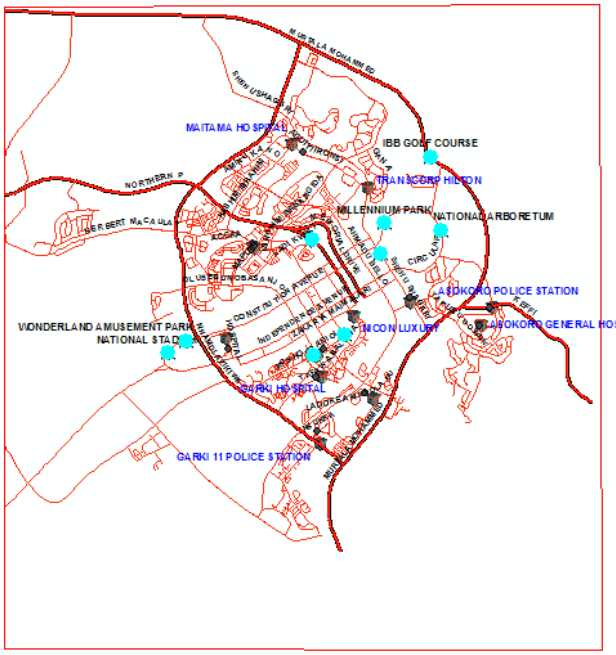

Fig5.1 Result Of Query (Tourist Site)

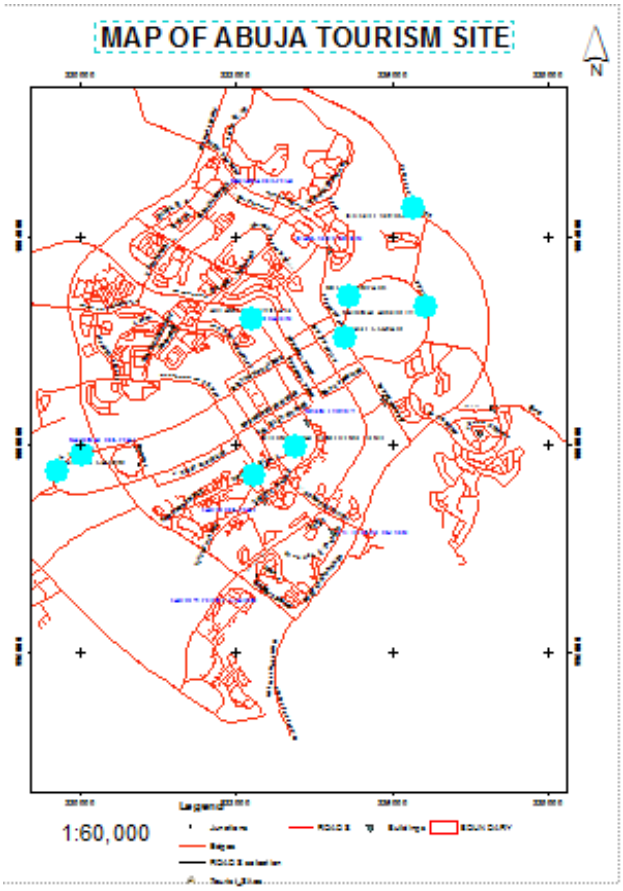

Figure 5.2 Abuja Tourist Site Map

Network Analysis

A network is a set of interconnected lines linking up a set of features through which resources can flow. Network with appropriate attributes can be used directly for finding shortest path and measuring accessibility to closest facility. A network can also asist in solving location problems, and transportation planning for tourist.

Analysis 1: Shortest Route

Shortest route finds the path with the mimimum cumulative impedance between nodes on a network. It can be used for movement of tourist. Below in figure 4.12 show the shortest route between sheraton hotel at point 1 and national stadium at point 2.

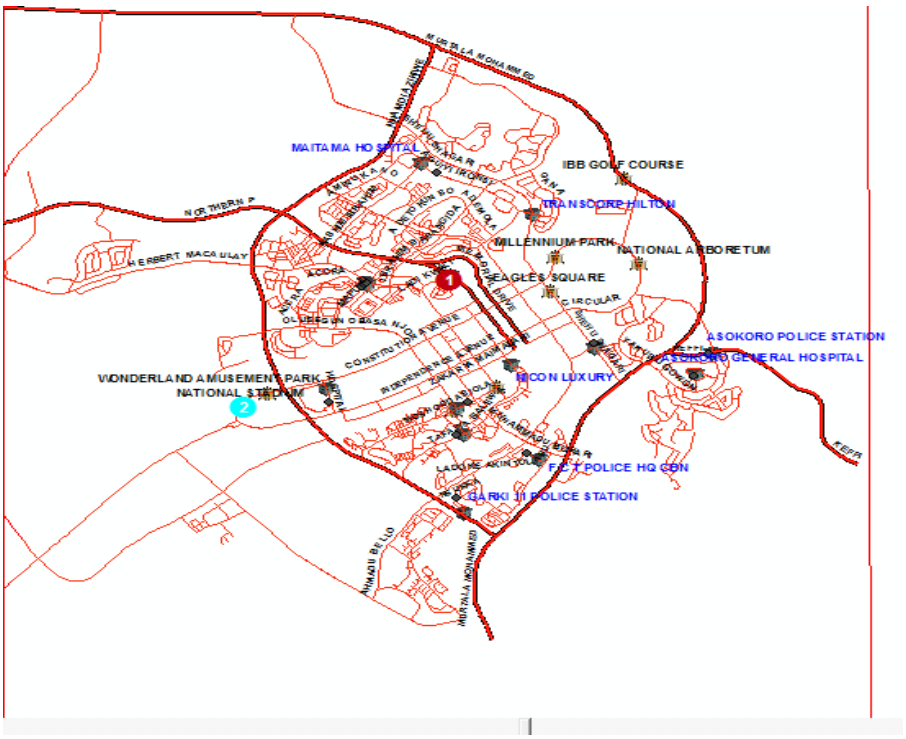

Figure 6.: Point 1 Sheraton Hotel And Point 2 National Stadium

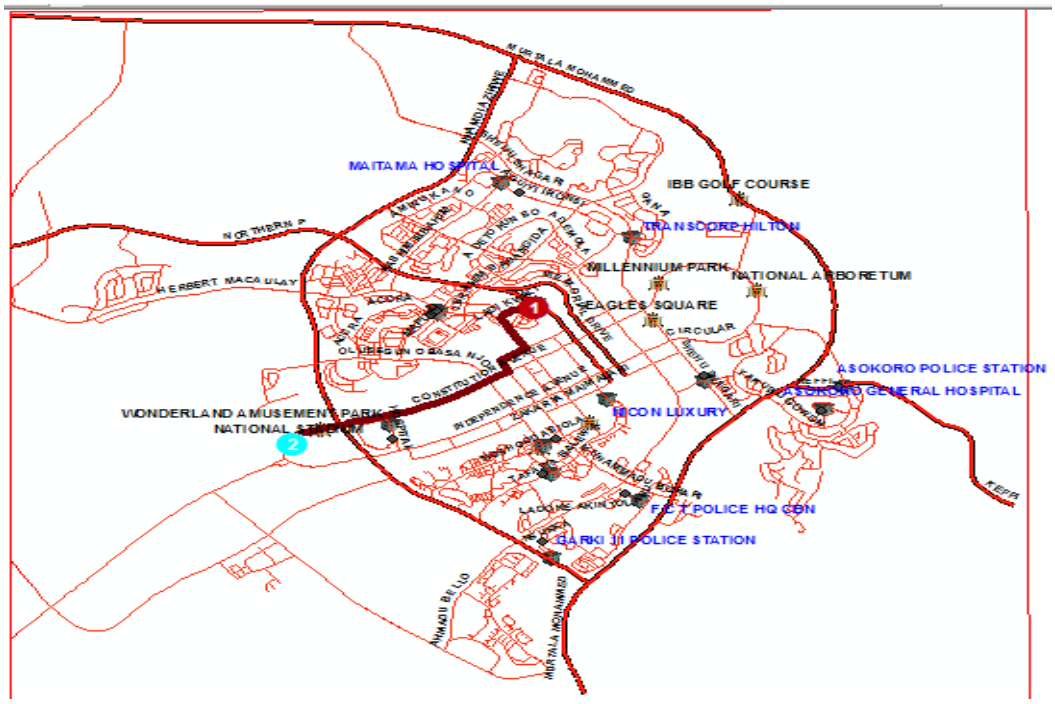

Figure 6.1 Shortest Route From Sheraton Hotel To National Stadium

Route: SHERATON HOTEL - NATIONAL STADIUM		5.8 km
1:	Start at SHERATON HOTEL	
2:	Go northwest toward LADI KWALI	< 0.1 km
3:	Turn left on LADI KWALI	0.5 km
4:	Turn left on HERBERT MACAULAY	0.7 km
5:	Turn right on SAMUEL ADEMULEGUN	0.5 km
6:	Turn left on MUHAMMADU BUHARI	0.3 km
7:	Turn right on CONSTITUTION AVENUE	2.8 km
8:	Continue on NATIONAL STADIUM	0.9 km
9:	Finish at NATIONAL STADIUM, on the left	
	Total distance: 5.8 km	

Figure 6.2 Shortest Route Result From Sheraton Hotel To National Stadium

Analysis 2: Alternative Route

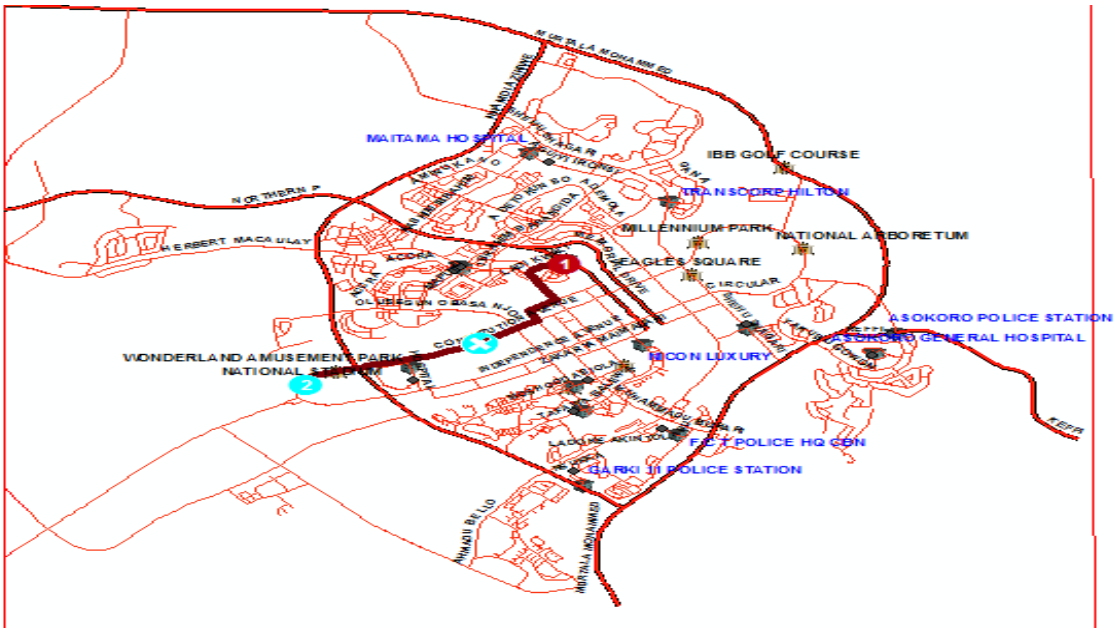

Figure 6.3 Alternative Route From Sharaton Hotel To National Stadium With Barriers At Constitutional Avenue

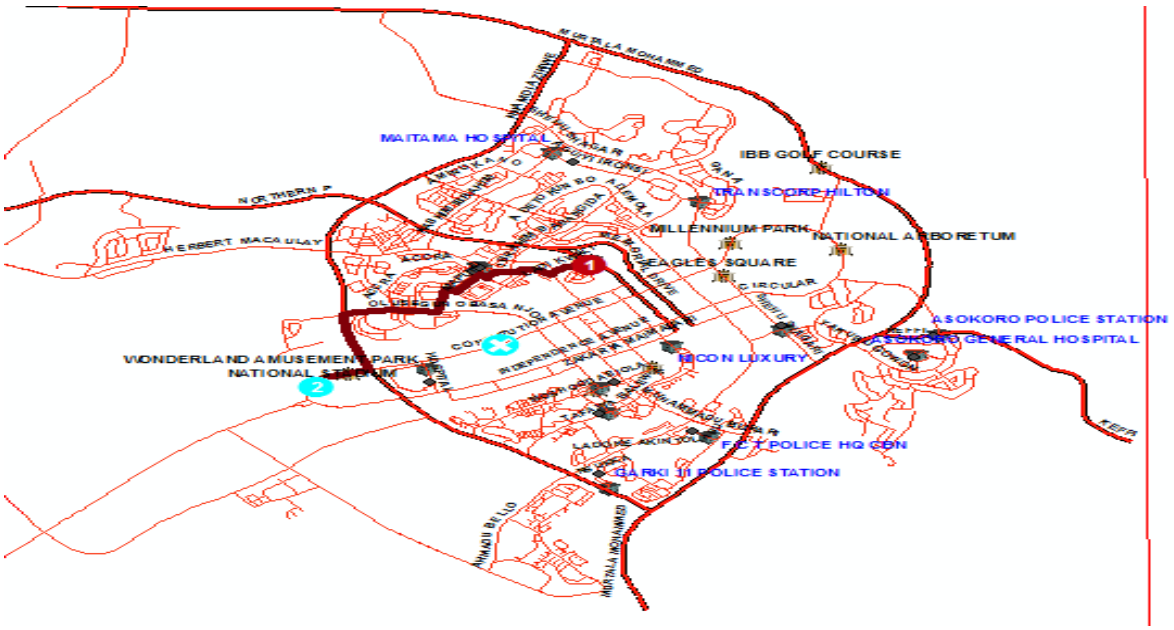

Figure 6.4 Alternative Route Result From Sharaton Hotel To National Stadium With Barriers At Constitutional Avenue

[−]	**Route: SHERATON HOTEL - NATIONAL STADIUM**	6.4 km
1:	Start at SHERATON HOTEL	
2:	Go northwest toward LADI KWALI	< 0.1 km
3:	Turn left on LADI KWALI	0.5 km
4:	Turn right on HERBERT MACAULAY	0.4 km
5:	Turn left	< 0.1 km
6:	Turn right	0.5 km
7:	Turn right	0.1 km
8:	Turn left on MAPUTO	0.5 km
9:	Turn right	0.1 km
10:	Turn left on SUL TAN ABUBAKAR	0.5 km
11:	Turn right on OLUSEGUN OBASANJO	1.3 km
12:	Turn left on NNAMDI AZIKIWE	1.3 km
13:	Turn right on NATIONAL STADIUM	0.9 km
14:	Finish at NATIONAL STADIUM, on the left	
	Total distance: 6.4 km	

Figure 6.5 Alternative Route Result From Sharaton Hotel To National Stadium With Barriers At Constitutional Avenue

Analysis 2: Alternative Route

The shortest route from Sheration hotel at Ladi Kwali to National Stadium at Natonal Stadium road for event tourism for tourist is 5.8 km through constitutional avenue to national stadium road. Why the alternative route from Sheraton hotel at Ladi Kwali to National Stadium at National Stadium road is 6.4 km through Olusengu Obasanjo,Nnamdi Azikiwe if there are barries in counstitution avenue that is the shortest route from Sheraton.

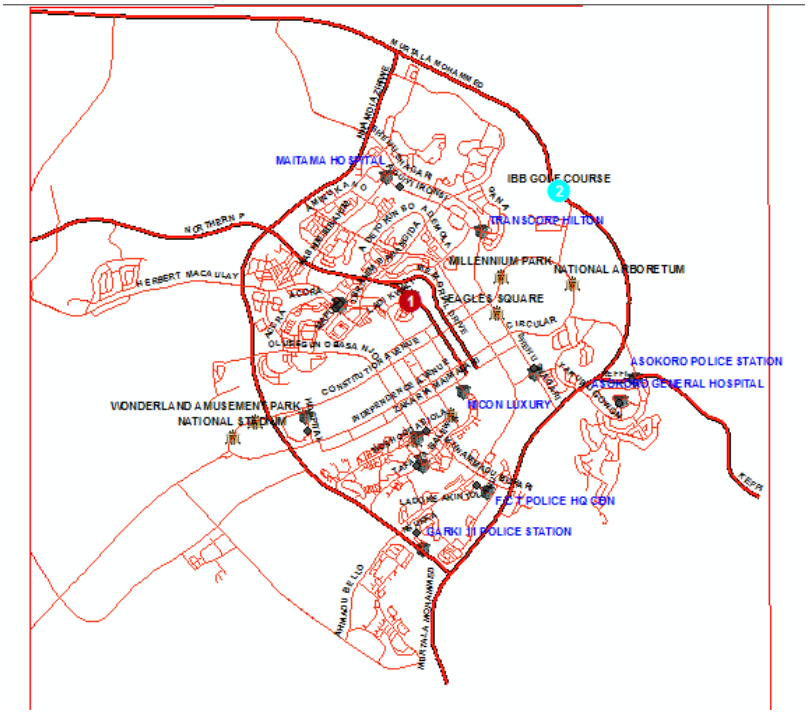

Figure 6.6 Point 1 Sheraton Hotel And Point 2 Ibb Golf Court

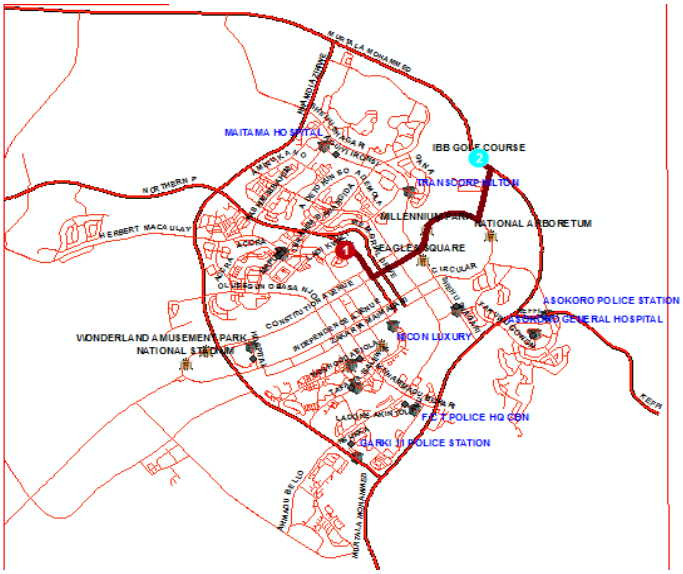

Figure 6.7 Shortest Route From Sheraton Hotel To Ibb Golf Court

Route: SHERATON HOTEL - IBB GOLF COURSE		6.1 km
1:	Start at SHERATON HOTEL	
2:	Go northwest toward LADI KWALI	< 0.1 km
3:	Turn right on LADI KWALI	0.1 km
4:	Turn right on MEMORIAL DRIVE	1 km
5:	Turn left on CONSTITUTION AVENUE	0.7 km
6:	Continue on CONSTITUTION	0.5 km
7:	Bear left on CIRCULAR	2 km
8:	Make sharp left	1.3 km
9:	Turn left on MURTALA MOHAMMED	0.4 km
10:	Finish at IBB GOLF COURSE, on the right	
	Total distance: 6.1 km	

Figure 6.8 Shortest Route Result From Sheraton Hotel To Ibb Golf Court

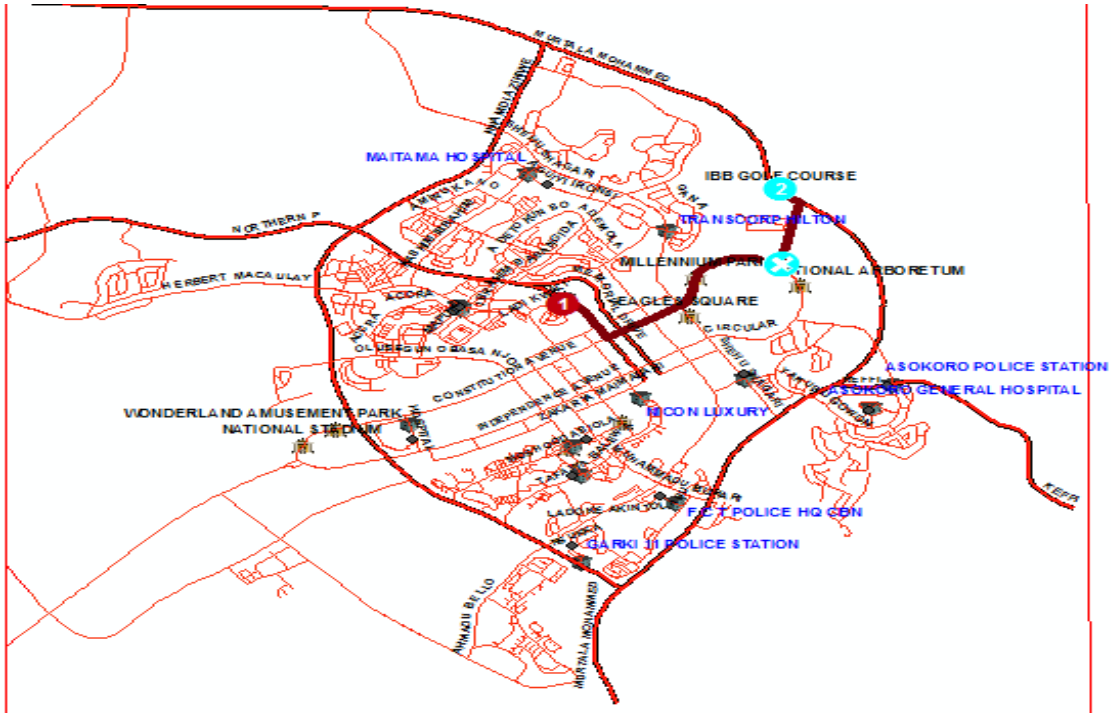

Figure 6.9 Alterative Route From Sharaton Hotel To Ibb With Barriers At Circular Road

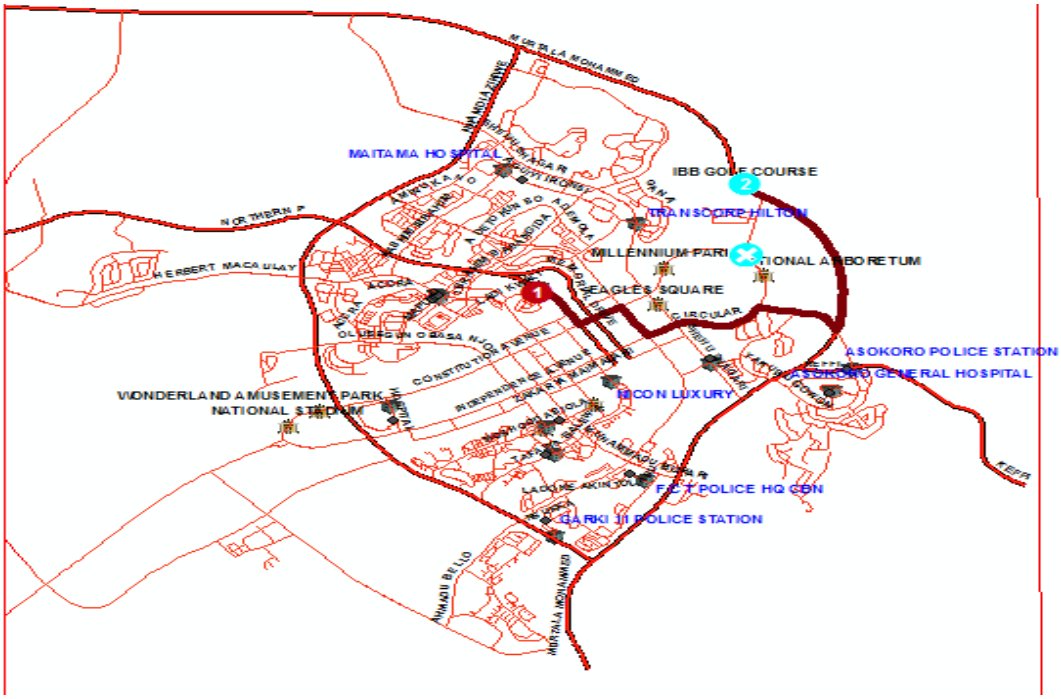

Figure 6.10 Alterative Route From Sharaton Hotel To Ibb With Barriers At Circular Road

Route: SHERATON HOTEL - IBB GOLF COURSE	9.5 km
1: Start at SHERATON HOTEL	
2: Go northwest toward LADI KWALI	< 0.1 km
3: Turn right on LADI KWALI	0.1 km
4: Turn right on MEMORIAL DRIVE	1 km
5: Turn left on CONSTITUTION AVENUE	0.7 km
6: Turn right on AHMADU BELLO	0.7 km
7: Turn left on INDEPENDENCE AVENUE	0.5 km
8: Bear right on CIRCULAR	1.4 km
9: Turn right on YAKUBU GOWON	1.3 km
10: Make sharp left on MURTALA MOHAMMED	3.7 km
11: Finish at IBB GOLF COURSE, on the right	
Total distance: 9.5 km	

Fig **6.11 Alternative Route Result From Sharaton Hotel To Ibb With Barriers At Circular Road**

The shortest route for tourist from Sheraton hotel at Ladi Kwali through Circular to IIB Golf Course at Murtala Mohammed is 6.1 km. While the alternative route for tourist from Sheraton hotel at Ladi Kwali to IIB Golf Course at Murtala Mohammed if there are barries at Circular is 9.5 km through Independence avenue, Yakubu Gowon, Murtala Mohammed.

Table 3: Showing Difference Between Routes

From	To	Shortest	Alternative	Difference	Remarks
Sheraton Hotel	**National stadium**	5.6KM	6.4 KM	***0.8KM***	
Sheraton Hotel	**IBB Golf Course**	6.1KM	9.5KM	***3.4KM***	

Analysis 3: Closest Facility

Closest facility is a network analysis that is used to determine facilities closest to you from a current location or to any location on the network for example from a tourism site to nearnest police station. Below in Figure 4.24 is the analysis showing a tourist site NATIONAL ARBORETUM located at 43 Circular road, the closest police station is the

LOUISE EDET COMMAND HQ located at 20 Shehu Shagari, with a total distance of 2.5 km .

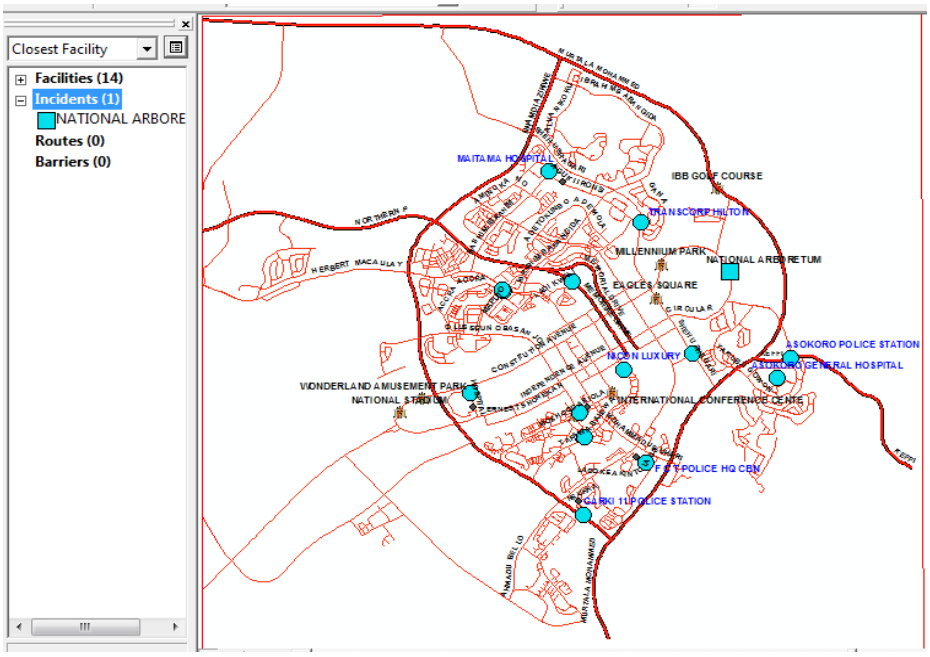

Figure.7. Analysis of the closest police station from a tourist site (National Arboretum).

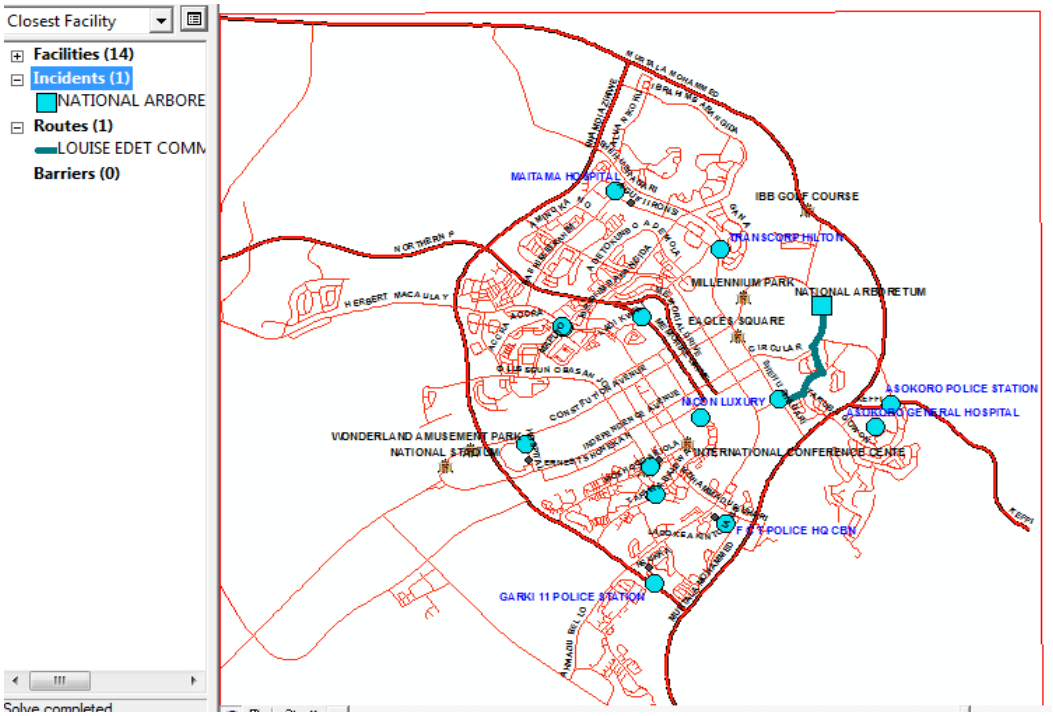

Figure.7.1 Result of the closest police station from a tourist site (National Arboretum).

Route: NATIONAL ARBORETUM - LOUISE EDET COMMAND HQ	2.6 km
1: Start at NATIONAL ARBORETUM	
2: Go south on CIRCULAR toward YAKUBU GOWON	0.9 km
3: Turn left	0.5 km
4: Turn right on YAKUBU GOWON	0.6 km
5: Turn right	0.4 km
6: Turn right on SHEHU SHAGARI	0.1 km
7: Finish at LOUISE EDET COMMAND HQ	
Total distance: 2.6 km	

Figure.7.2 Result of the closest police station from a tourist site (National Arboretum).

Analysis 4: Buffering

In concideration of the distance of facilities such as police station, hospital, etc to tourist site so as to enhance confidence on the tourism destination it is encouraged that tourist should not travel more than 1 hour before having access to hospital or police station. One important spatial operation in GIS is the determination of spatial proximity or nearness to various geographic features. Using the above criterion in the Arc GIS software, 2 KM was buffer from a tourist site ABUJA ARTS AND CULTURE located at 61memoria drive.

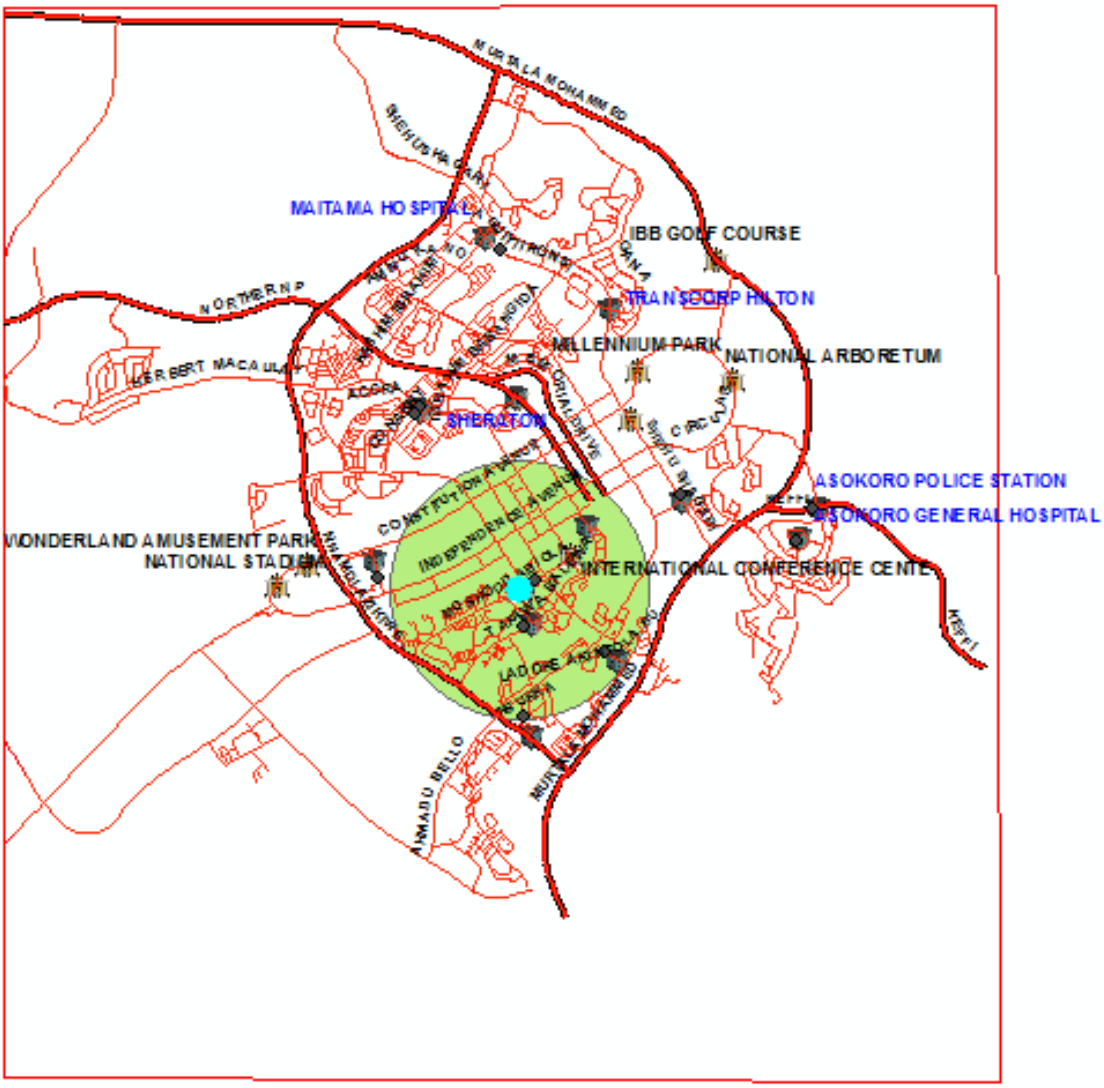

Figure 8. Buffering Result Shownig Tourism Facility That Fall Within 2 Km Of Abuja Art And Cuture

From the above buffering analysis, facilities that fall within the define paramenter is said to be within the buffer zone that have met the above recommendation, the tourist facilitiea that fall within the buffer zone, are police staiton CBN at 19 zaria, area 10 police station at 8 moshood abiola, louise edet police hq at 20 shehu shagari and garki general hospital at 12 tafawa belewa.

Discussion Of Result

This century time is considred as a very valueable resources, time have to be judisously used to achive maximum benefits or gain. The GIS analysis carry out in this project will enable tourist to access information on the closest facility, query the hospitality

database to get information on the type of tourist sites, services that are available for visitors, proximity to tourist facility, distance from the hotel, best route and alternative. This will enhance the value of abuja as tourism destination, increase petronage and make information about abuja hospitality facilities essily avialable, economical and time saving, as tourism information is aceess from the tourism database. Moreso the hospitality database will serve as a spacial decision support system for policy formation and decision making.

Information Presentaion

All the analyzed result generated in this study can be diagrammatically/ graphically view on the computer system, printed in hardcopy or store in a CD/DVD depends on the users' specification.

Conclusion

The study started with the design of spatial database as a decision support system for hospitality management. The entities in the study area were identified and vector data model was employed, satellite imagery of the project site was georeferenced and digitized in ARCGIS 9.3 while the imagery data was updated with hand-held GPS. Attribute data for the site was collected through social survey. Spatial database was created in ARCGIS 9.3 where attribute table was linked with geometric data. Various spatial operations such as spatial query, best or shortest route and closest facilities were performed and results were presented both in softcopy and hardcopy.

Spatial database of digital road network for decision support in hospitality management has been created. It is now possible to manipulate the database to answer basic question using GIS technology. Moreover, maps or plan or report can now be produced at will when required. The database is capable of capturing the tourism site, closest location of tourism facilities, closest Hospital and the best shortest route from tourist hotel to the closest tourist site, police station or hospital. After performing various tasks by using the database generated, it was discovered that the aim of the study research was achieved.

Recommendations

Integrity of the database should be ensured at all times, thus care must be taken while inserting data and updating the database. A hardcopy should always be printed at regular interval and examined for any entry errors. This is very important for efficient tourist

management, there are lots of benefits that are derivable from GIS technology in supporting decision making in hospitality management, I therefore recommend based on the finding of this study that:

- The government should properly document all the tourist sites in Abuja and develop a functional hospitality database using GIS technology to better enhance tourist experience and stay in Abuja as a tourist destination.
- Detailed information about tourism activities should be easily available and accessible from the hospitality database.
- The hospitality database should be made to cover the road network of Abuja and updated from time to time in other to capture new developing areas with the facilities that are present.

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