

Smart Tourism: Harnessing Intelligent Information for Travelers

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ABSTRACT

Access to relevant and accurate information is at the heart of tourism, more so in this era of the Internet information overload has become a prevalent phenomenon and as such a serious issue for those seeking for appropriate information. Furthermore, various researches have been carried out on how to make information on tourism website more effective. Intelligent tourism information system tries to bridge the gap by noting what a tourist perceives as relevant, in terms of content pertaining to tourism products in tourism websites. Hence, the aim of this research entails the implementation of an intelligent platform that will assist tourists in gaining access to information on tourist locations in Nigeria. In view of the forgoing, the system was implemented using Rational Unified Process as the adopted software development process, whereas MySQL, HTML and PHP were the implementation tools used in the development of the system. It was also able to act intelligently by using hybrid recommendation technique to recommend tourist locations based on their preference.

Keywords: Intelligent, Tourism, Database, Information, Smart, System

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1. INTRODUCTION

In the new era of information technology, information overload has become a serious problem to those seeking for information online. Manhua Yang, 2022 relate that a tourist needs enough information about the country he wishes to travel. Some specific data required include hotels, destinations, malls, and tourist places, and they are needed before they land on the tourist country. Recently, intelligent search has been employed in the web that suggest that these problems can be partially overcome by providing search engines with more intelligence and with the user's underlying knowledge. (Anastasia, 2017). Such include google.com and another class of intelligent system that has proven relevant in addressing the issue of information overload is the recommender system (Daramola, 2009). In the aspect of tourism, internet and web technologies has made information on tourist accommodations, transportation, shopping, food, festivals, and attractions to be more readily available.

This helps vacation planning and package tours to be easier (Heum, 2016). According to (Jiang, 2013), “the definition of Intelligent Tourism system as systems that comprises of technologies such as; Internet of things, Cloud Computing, Internet, intelligent mining that are applied to tourism industry, which integrates and activates the tourism physical and informational resources to improve tourism service, improve the tourism experience, innovate tourism management and enhance tourism enterprises competitiveness.” Tourism is the vehicle through which the culture, nature and history of a given society or location is appreciated by people of diverse nations. Tourism is traveling for predominantly recreational or leisure purposes or the provision of services to support this leisure travel.

Furthermore, a tourist is someone who travels at least eighty kilometers (fifty miles) from home for the purpose of recreation. To a lay- man, tourism could just be the act of visiting other places for the purpose of sightseeing and enjoyment but the activities of tourism are more than that. In other words, tourism is said to be the activities of the people traveling to and staying in places outside their usual environment for more than one consecutive year for leisure, business and other purposes related to the exercise of an activity remunerated from within the place visited. It is recognized as a diverse multi-sectoral activity. While driven by visitor’s choice and expenditure much of the visitor’s experience rests on the environmental attributes, amenities and services that a destination provides. Tourism is vital for many countries due to the income generated by the consumption of goods and services by tourists, the taxes levied on businesses in the tourism industry and the opportunity for employment in the service industries associated with tourism. Therefore, the important role which tourism plays in the computation of the national gross domestic product cannot be over emphasized, judging from available data.

Tourism has emerged as one of the major industries in the world economy, by benefiting transportation, accommodation, catering and many other sectors. Thus, each country insists in developing it and making a profit from its variety of impacts. Moreover, everyone is interested in increasing the number of incoming visitors since it serves as a source of economic growth. In 2019, the tourism contributed almost US\$ 9 trillion to the world global economy, or 10.4% of global gross domestic product (GDP). Tourism has emerged as one of the major industries in the world economy, by benefiting transportation, accommodation, catering and many other sectors. Thus, each country insists in developing it and making a profit from its variety of impacts. Moreover, everyone is interested in increasing the number of incoming visitors since it serves as a source of economic growth. However, the goal of this research work is to assist the tourist before and during their travel. The system (web-based smart and intelligent tourism information system using (artificial intelligence) can make a decision for the trip according to the budget and related information (i.e., culture, language, map etc.) with the place the user is going to visit.

1.1 Background of the Study

Based on World Tourism Organization (WTO, 2005) definition of tourism, Tourism comprises the activities of persons traveling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business and other purposes while tourist locations are those enterprise or organization involved in facilitating travel and other activities away from one’s usual environment. Tourism is one of the fastest growing industries in the world. Tourism has grown globally over the past 21st century. (Adebayo, 2014). For developing countries like Nigeria, tourism is one of the biggest income generators.

But the huge infrastructural and resource demands of tourism (e.g. water consumption, waste generation and energy use) can have severe impacts upon local communities and the environment if it is not properly managed. The extent to which the tourist locations contribute to socio-economic and political development in many countries in the world, especially Nigeria, is no longer in doubt (Adora, 2010). Tourism is a vital and popular global human activity whose effect is crucial in the Nigerian economy. Tourism in Nigeria has very good potentials to generate significant foreign exchange earnings, employment and investment towards economic development. In the past years tourist locations growth has been a major contributor to increased economic activity throughout the world. It has created jobs in both large and small communities and is a major industry in many places. It is the dominant economic activity in some communities which made it an industry.

According to recent statistics carried out by many researchers, tourism provides about 10% of the world's income and employs almost one tenth of the world's workforce. All considered, tourism's actual and potential economic impact is amazing. Many people emphasize the positive aspects of tourism as a source of foreign exchange, a way to balance foreign trade and also a way to eradicate poverty in the country. One significant trend in tourism is personalization, which involves tourists managing their own itineraries. The problem of designing tourist trips involves the creation of personalized itineraries. Smart systems in the tourism industry refer to personalization and recommender systems. Said by Ana-Maria Ionescu and Flavius Aurelian Sârbu, 2024.

2. REVIEW OF AN INTELLIGENT SYSTEM

Intelligence is a coordination of the intellect reaching out for performance in reaching its objectives or goals. (Chinagolum, 2019). This means having experiences where the system learnt which actions best let it reach its goals. A non-gained experience makes a person to be unintelligent in all areas of knowledge. This means they are only intelligent in those areas where they had experiences. A system is part of the universe, with a limited extension in space and time. What is outside the frontier of the system, we call its environment. Strong relationship exists between one part of the system and another, then between this part of the system and parts in the environment. (Ituma, 2012). Haykin, 2009, defines Artificial Intelligence as science and technology to develop computers that can think and function in ways normally associated with human intelligence, including reasoning, inference, learning and problem solving.

The Intelligent System has a temporary objective which it derived from its main objective. It senses its environment and stores these sense impressions as elementary concepts. Concepts are material way of storing information. Working on concepts creates new ones and stores relationships to other total, part, abstract and concrete concepts. (Walter, 2006). Concepts are something that exists only in the brain of an intelligent system. (Opara, 2013). There is a check for incoming message in an intelligent system. An intelligent system builds the current situation with information which is expressed as concept after that, the system prunes. Pruning is the process of a system to search in the memory and getting the best response rule on a particular action. The intelligent system continually records the present situation and the action that followed as a response rule. The very first response rules are due to chance actions and to teaching. When the system is externally inactive, that is it sleeps, it reviews the response rules stored in its memory and performs some generalizations. After some while, its memory is full and it forgets the least used concepts and response rules.

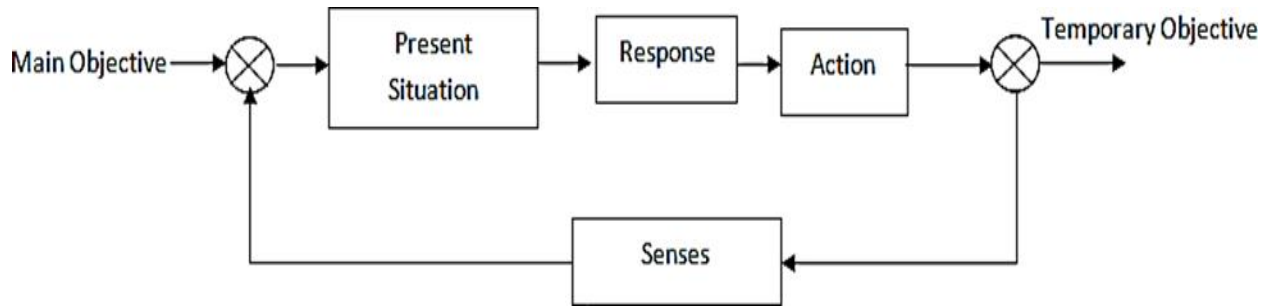


Fig 1: A Block Diagram of an Intelligent System

Figure 1 shows the interaction of an intelligent system based on some response rule; its main aim is to ensure that the temporary objective matches its main objective, to achieve these, the main objective is taken to be the input, and the temporary objective (which is what it finally achieved at a point) is taken to be the output. It senses its environment and the system then stores these sense impressions as elementary concepts. A good example of an intelligent system is a robot; at the start of the robot's life the memory is empty of concepts and response rules (Ituma 2012). In every aspect of software development, intelligence can be applied ranging from web application to machine software.

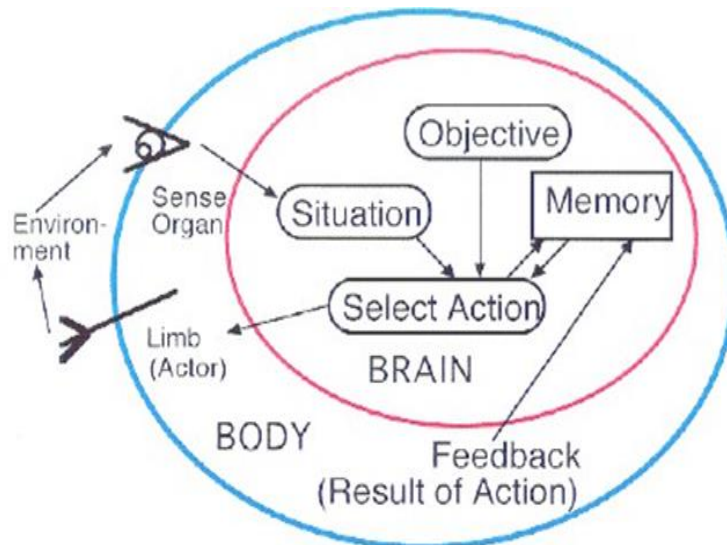


Figure 2: Overview of An Intelligent System (Source: intelligent-systems.com.ar)

Figure 2 shows that an intelligent system comprises of two main components, the brain and the body. The diagram shows how these components interact with the environment. The brain carries out all the decision processes while the body houses the brain and the other parts of the intelligent system. Sensing the environment starts from the body, after which the sensed data is sent to the brain for onward processing. Two things differentiate an intelligent system from a non-intelligent system; firstly is the ability to sense the environment and secondly is the ability to learn from actions to maximize success in achieving particular objectives. (Ulrike, 2011)

2.1 Recommender System In Tourism

Recommender systems are a subclass of information filtering system that seek to predict ‘rating’ or ‘preference’ that a user would give to an item (such as music, books or movies) or social element (e.g.people or group) they had not yet considered, using a model built from the characteristics of an item or the user’s social environment (Lalita, 2013). They are well-established artificial intelligence applications in modern computer science, and are used typically in software components in e-Commerce, m-Commerce and Tourism systems. In simple term, they are techniques that act as information filter which tries to provide the user with information.

In most cases, people tend to associate recommender systems with ecommerce sites, where recommender systems are extensively used to suggest products to customers and to provide them with information to help them decide which products to purchase. Recommender systems provide consumers/ tourist with information to facilitate decision making process. It helps to map user needs and constraints, through appropriate recommendation algorithms, and converts them into product selection using knowledge compiled into the intelligent recommender. Knowledge is extracted from either domain experts (content- or knowledge-based approaches) or extensive logs of previous purchases (collaborative-based approaches).

Tourism Recommender Systems (TRS) are class of intelligent systems that render tourism related information services in form of guides and suggestions to users. The inclusion of tourism recommender systems functionalities in Tourism Information Systems would ensure that users receive intelligent guides when making decisions on important tourism and travel concerns such as accommodation, GPS location, destinations, and travel plan packages. Tourism recommender systems can be broadly classified as web-based tourism recommender systems and mobile recommender systems. (Daramola, 2009)

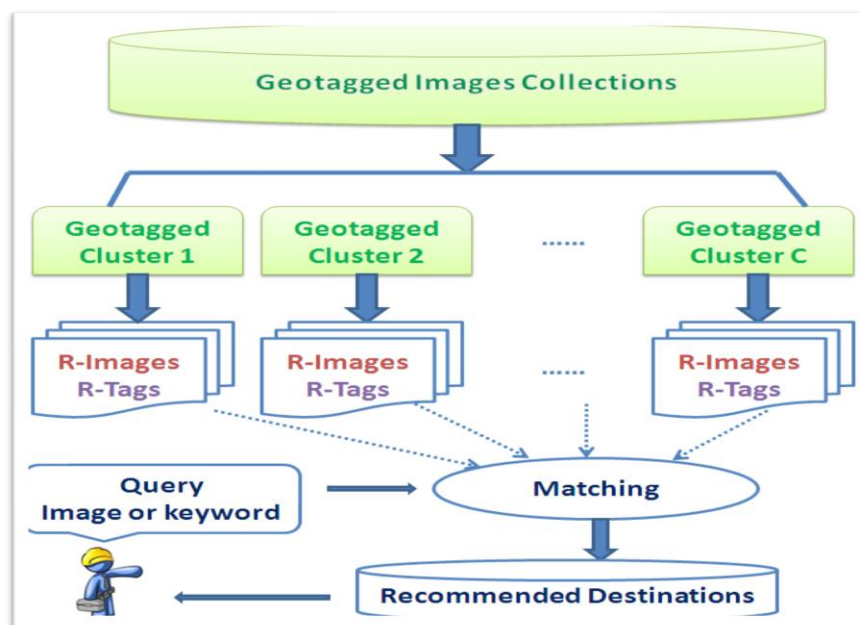


Figure 3: Diagram of Geotagged tourism recommender system (Source: ifp.illinois.edu)

Figure 3 shows a geotag tourism recommender system. geotagging simply is the marking of a video, photo or other media with a location. This can not only help people find images and information based on a location, but it can also be used to create location-based news and media feeds by combining an application like [Google Maps](#) with geotagged blogs, news articles and [Flickr](#) photos. A user can provide either a photo of the desired place of interest or a keyword describing the place of interest, and the system will look into its database for places that share the visual characteristics.

2.1.1 Examples of Recommender Systems

Konga: Konga is an electronic commerce company founded in 2012 with headquarters Yaba, Lagos. It offers a third-party online marketplace, as well as first-party direct retail spanning various categories including consumer electronics, fashion, home appliances, books, children's items, and personal care products. It has a feature that shows the most searched goods on the website within a particular time frame which makes it a good example of a recommender system. Just like Amazon shop, may not have refund policy on damaged goods and they is no 100% security on shoppers credit card (Onuiri, 2015).
Amazon: This is a powerful e-commerce American based online shop. It fully became operational on web in July 1995. Amazon.com, one of the most widely known, used and cited commerce sites on the Web, offers more than 4.7 million book, music CD, video, DVD, computer game and other titles. (Amazon.Com, 1998). It has some common features which helps them to enhance the customers shopping experience and increase sales. Some of the features include;

- i. **Search Engine:** One of the primary features of Amazon.com Web sites is its interactive, searchable catalogs of more than 4.7 million books, music CD, video, DVD, computer game and other titles (Amazon.Com, 1998). The website provides a selection of search tools to find books, music, video and other products based on keyword, title, subject, author, artist, musical instrument, label, actor, director, publication date or ISBN.
- ii. **Reviews and Content:** The Amazon.com stores offer numerous forms of content to enhance the customer's shopping experience and encourage purchases. Various types of content are available for particular titles, including cover art, synopses, annotations, reviews by editorial staff and other customers, and interviews by authors and artists. (Amazon.Com, 1998)

2.3 Related Work

So many researches have been carried out relating to intelligent tourism management system and tourism management system in general with significant impact in the tourism industries around the globe. Most of these systems have some strengths as well as weaknesses in adapting to changes in meeting users need. Noting their strengths as well as their weaknesses will go a long way in helping us improve on the existing systems. In order to realize the function of distributing tourism service resources and provide better services for tourists, on the basis of fully understanding the definition of cloud computing and the main key technologies, the tourists' needs are firstly analyzed, and the overall design scheme of intelligent tourism system is clarified.

Cloud computing information technology, Unity 3D software, and augmented reality and mobile phone VR technology are used to model. A set of intelligent tourism system with tourism service, mobile guide and consultation as the main modules is developed and designed based on Android platform (Lei, 2018). The system was designed for tourist taking Nigeria tourism into consideration. This was to provide tourist with intelligent interaction based on virtual community concept of tourist and locals that has common interest theme. The system aims at bridging the gap; which is the lack of interaction that exists between tourists and locals at a particular destination.

The system was design using Java Applet (Netbeans IDE 6.1), Hypertext Mark-up Language (HTML), Personal Home Page (PHP), Java script and MySQL as the back-end integration database (Abdul Hamid, 2010). The research was centered on tourist sites in china applying internet of things technology with the development of the smart tourism industries and smart tourism cities. The attempt was to combine IoT (internet of things) and smart tourism in order to eliminate asymmetry of Information Island. Resource consumption could be substituted by exploiting information resources. The process of applying IoT to tourism has to undergo several stages such as tourism infrastructure construction, tourism information data construction, and tourism service platform construction. Ultimately, the unified information platform, which will support tourism operation monitoring and automated management, is created. The aim of the research is to build an IoT information technology public platform that covers service management up to marketing management with this, the research will be able to determines the current status and development potential of smart tourism in China, and offers recommendations for their applications in China. (Yang GUO, 2010).

3. METHOD

During this process, researches are done on previous systems through interviews, on-site observation (that is going through the system manual to know how it works), and questionnaires (getting opinions from users on the current systems, knowing how it works and noting how to make improvement on the new system). It is an in-depth study of end user information needs that produces functional requirements that are used as the basis for the design of a new information system. Apparently, we perform system analysis in order to subsequently perform a system design. Nikolay. (2019). It automates and maintains a centralized database of all related information. The system allows one to easily access the relevant information, make recommendation for places, and provide some other features which are not present in most existing systems. Users can decide about places they want to visit and make bookings online for travel and accommodation. Intelligent Tourism Information System (ITIS) will be designed to minimize the amount of time required for data management and operation of the system.

Implementation Tools Used

This part extensively talks about the implementation tools used for the development of the system (ITIS). These tools were used in the creation and development of different modules in the system. Such tools include;

- i. **Adobe Photoshop:** Adobe Photoshop is a popular image editing software used for the graphical design of the system such as the creation of logos and banners. This also improves the attractiveness of the website.
- ii. **HTML (Hypertext Markup Language):** HTML is used for creating documents on the World Wide Web. It consists of various tags and attributes that helps give a definite structure of webpages. In simple term, the documents and links that redirect users to other websites are all produced with HTML.
- iii. **Cascading Style Sheet:** Cascading Style Sheets (CSS) is a simple tool for adding styles to webpages and user interfaces. It supports document separation from presentation which in turn provides accessibility and flexibility. It can be embedded in html file or outside the html file to give more room for accessibility by multiple webpages
- iv. **Sublime Text Editor:** Sublime text editor is a cross platform source code editor with python application programming interface. It supports many programming languages as well as markup languages. This where the application codes were written.

- v. **PHP (Hypertext Preprocessor):** PHP was used to implement the system which was embedded in the HTML codes to add dynamism to the website
- vi. **MySQL Database 5.5.8:** This was used as the Database Management System (DBMS). It is a robust DBMS that can manage the large amount of data that is being generated by system. It is also easier to create to, delete from and to retrieve information from the database. It was used because of its full data insert capability and support for web functions.
- vii. **WAMP Server:** WAMP server represents Windows, Apache, MySQL and PHP; it is an open-source application used in web server environments. It provides us with the four key element of a webserver: operating system, database, webserver and web scripting software.

JavaScript: JavaScript was use to add client-side behavior to html pages. They are embedded in html pages for the purpose of interaction with the document Object Model. JavaScript was used majorly to load new page content or summiting data to the server, for validating input values of web form and for interactive content such playing of videos and audios on the web. Kanellopoulos, D. N. (2016).**3.2**

4. DESIGN DATABASE

Due to the requirement and functions of ITIS, the use of database is inevitable. Every system has some information needs. A system needs to save information data for proper management. A database is a shared collection of logically related data and a description of this data, designed to meet the information needs of an organization (Thomas Connolly, 2005). A Database management system (DBMS) is employed in order to manage database. A database management system is a program that stores, retrieves, and modifies data in databases on request. (Ojeh, 2008). The main purpose of DBMS is to provide a reliable and persistent data storage facility and mechanism for easy access and retrieval of information. ITIS database will be designed using MySQL. MySQL is a relational database (RDMS) good for high- traffic web sites because of its high-performance query engine; tremendously fast data insert capability, and strong support for specialized web functions such as fast full text searches. In the database, they are different tables which are used to store different kinds of information.

3.3.1 USER TABLE

This table is used to store information of users who have registered with the system. The information stored in this table is mainly the information inputted by the user during registration.

Table 1: User Table

FIELD	TYPE (SIZE)	PRIMARY KEY
User_id	Int (10)	Yes
full_name	Varchar (30)	No
Email_address	Varchar(50)	No
Phone_number	Int (11)	No
Address	Varchar(20)	No
Password	Varchar(12)	No
Gender	Varchar(6)	No
Date_of_reg	Datetime	No
Updation_date	Datetime	No

3.2.2 BOOKING TABLE

This table consists of the all-tourism attractions which are located in the different geographical zones in Nigeria.

Table 2: Booking Table

FIELD	TYPE(SIZE)	PRIMARY KEY
Bookingid	Int (11)	Yes
Packageld	Int(11)	No
UserEmail	Varchar (100)	No
FromDate	Varchar (100)	No
ToDate	Varchar (100)	No
Comment	mediumtext	No
RegDate	Timestamp	No
Status	Int(1)	No
CancelledBy	Varchar(5)	No
UpdationDate	Timestamp	No

By developing a dynamic application with a centralized database to manage all the necessary information and also combining the two-recommendation technique (collaborative and content-based filtering technique) the system will be able to meet tourist needs with a quick response time. The system will be designed using Rational Unified Process with PHP (Personal Homepage), HTML (Hypertext Makeup Language) and MySQL as the back-end database.

4.1 DSCUSSION AND RESULT

System implementation is the process of converting the system specification into an executable system and delivering that system into production to be used by the organization. It involves the process of software design and programming but sometimes involves the improvement of software specification. The interface of a website shows the interactivity of that website. It is simple, intuitive and responsive and allows user to get things done with less effort and time. A user interface is a point of interaction between the system and the user through the use of input /output devices and some supporting software; interaction in this case ranges from graphics, sound, position, movement etc

4.1.1 SYSTEM HOMEPAGE

Figure 4 shows the homepage of Intelligent Management Information System. After the user has logged in, the homepage is displayed which provides the general information from which all the features of the system is explored.

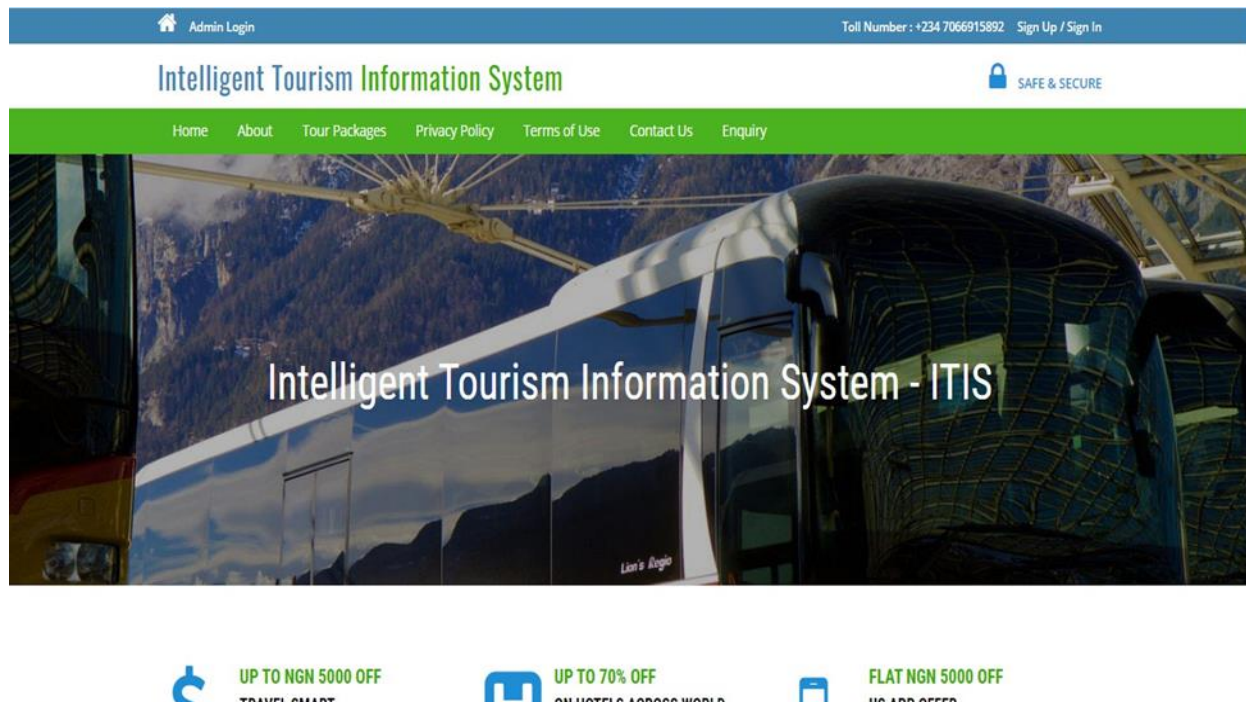


Figure 4.: System Homepage

4.1.2 USER SIGN UP

Figure 5 shows the interface that displays the user registration. The registration page displays a form requesting the user to fill in his/her credentials which in turn allows the system to match the credentials filled by the user during registration to the one he/she is to use while login into the system. Access is denied when the system finds no match on the information in the database.

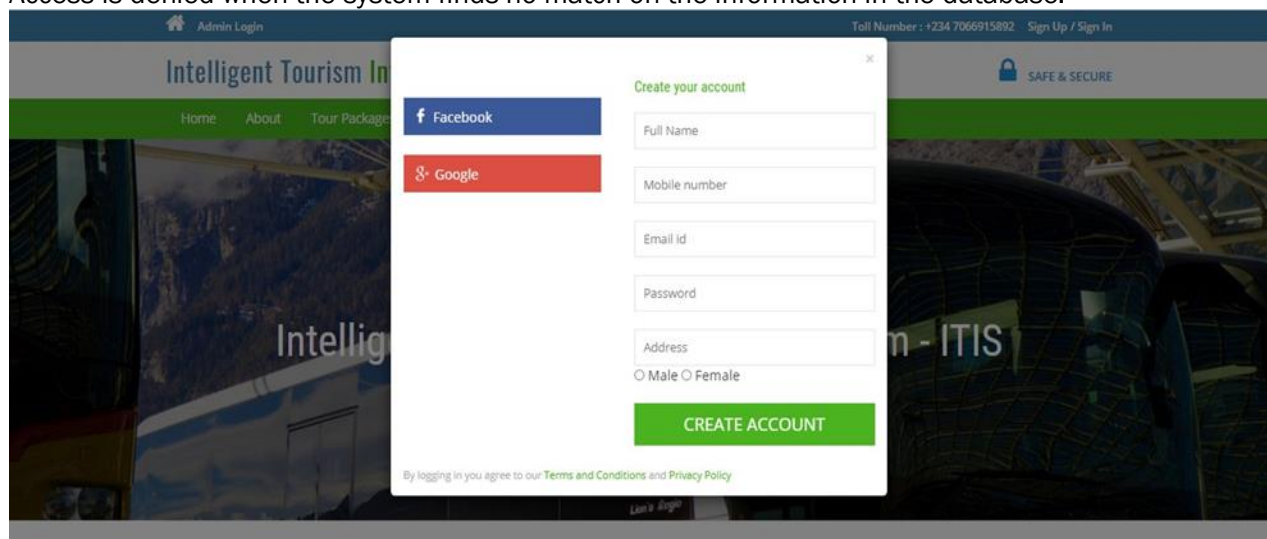


Figure 5: User Sign Up

4.1.3 USER SIGN IN

Figure 6 shows the interface that displays the user sign in. The sign in page displays a form requesting the user to fill in his/her credentials which in turn allows the system to match the credentials filled by the user during registration to the one he/she is to use while login into the system. Access is denied when the system finds no match on the information in the database.

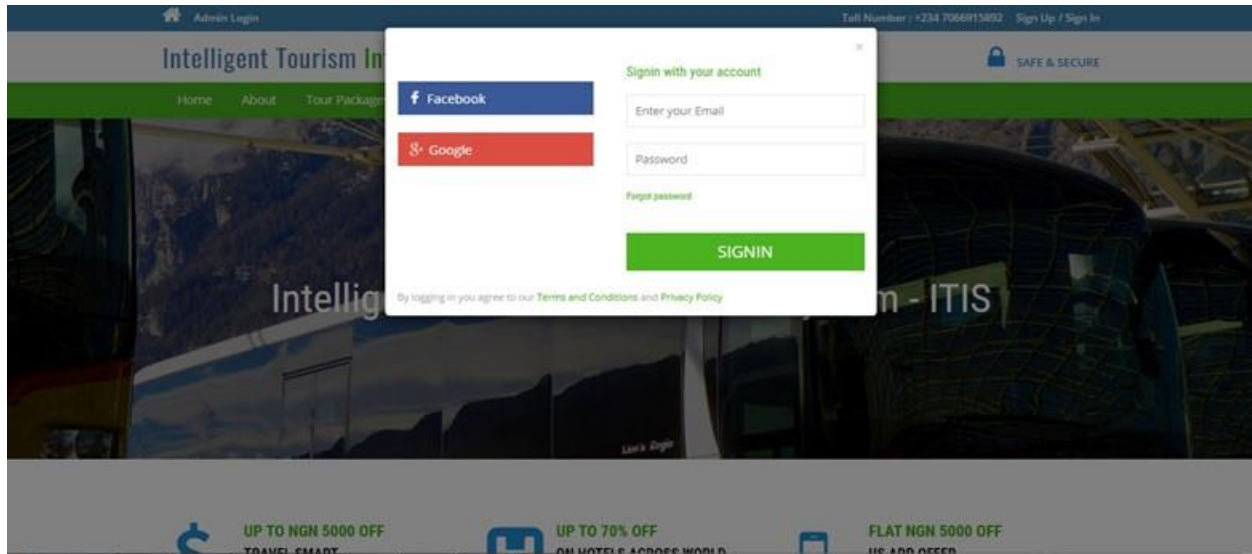


Figure 6: User Sign in Page

4.1.4 Tourism Package List

Figure 7 shows the interface that displays the tourism packages available on the system. The package list display all tourism packages, the package types and individual features peculiar to the package of the tourism.

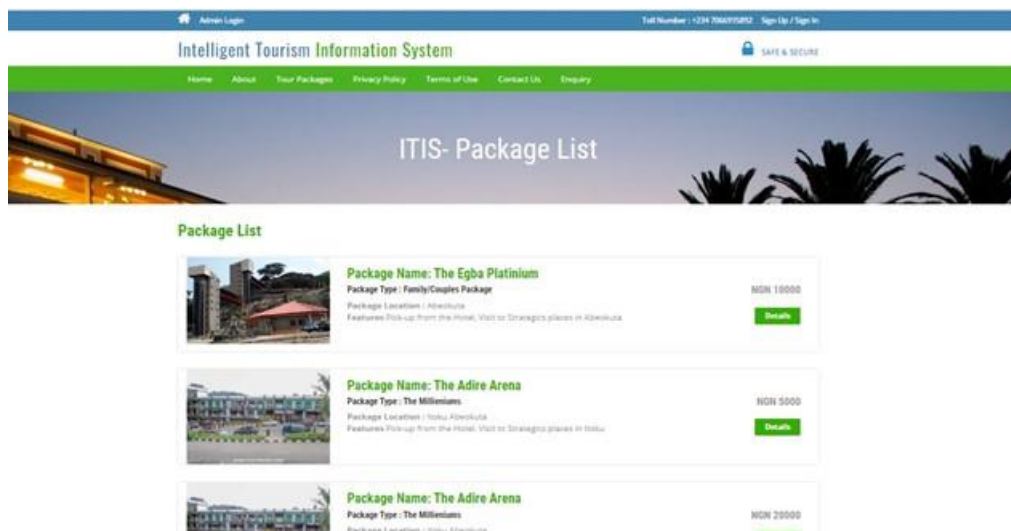


Figure 7: Tourism Package List

4.1.5 SYSTEM ADMIN SIGN IN PAGE

The interface in figure 8 shows displays the admin sign in. The admin sign in page displays a form requesting the admin to fill in his/her credentials which in turn allows the system to match the credentials filled by the user with what is available in the database. Access is denied when the system finds no match on the information in the database.

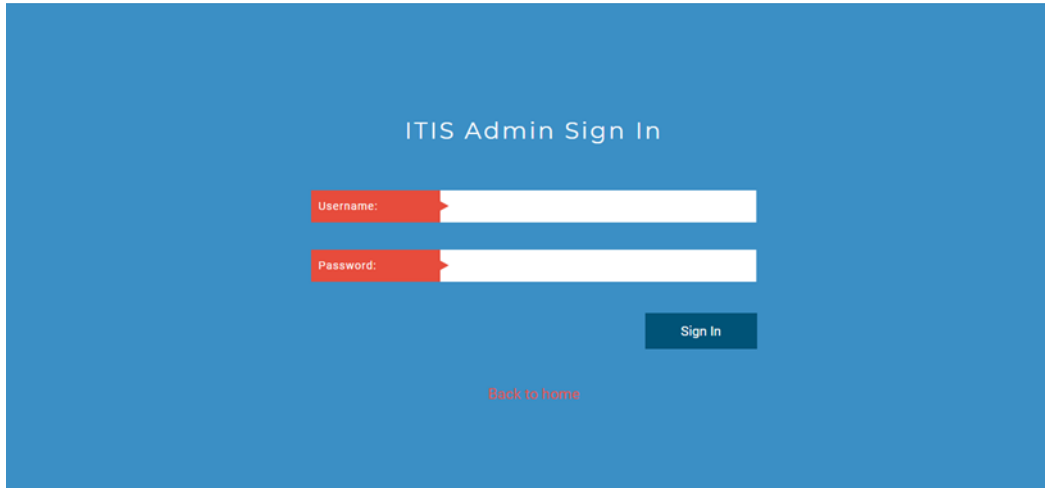


Figure 8: Admin Sign in Page

4.1.6 MANAGE USER

The interface displays in figure 15 below enables the admin to manage users of the system. The admin has the privilege to their contact details and other information.

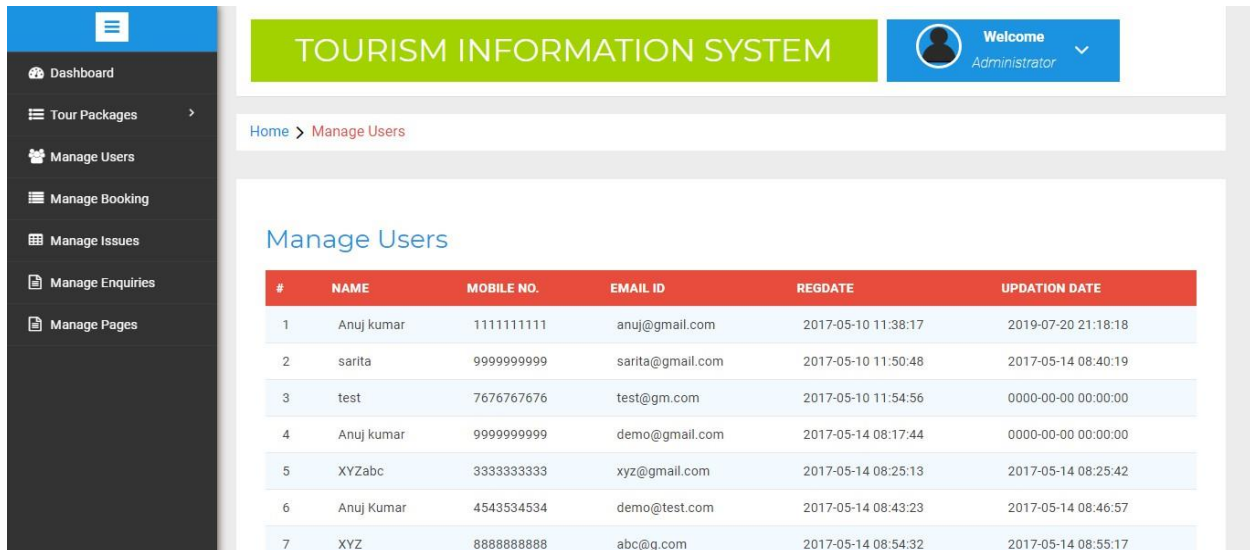


Figure 9: Manage User

Intelligent Tourism Information System provides an opportunity for tourists to seek the best tourism industry to visit in Nigeria. Knowing that the tourism industry in Nigeria is poorly managed, the system seeks a means of creating a platform that keeps track of every tourism site in Nigeria; creating room for both foreigners and indigenes to know more about places to visit. ITIS is able to achieve in providing information to tourists by fetching information from the web patterning to the subject of interest by the tourist to get to his/her destination. The study was able to conduct a review on the traditional way of accessing tourism information and create another way to access this information. Every user needs an interactive website which is easy and simple to use. This is one of the features provided and objectives met by the system by creating and developing a web-based graphical user interface that is simple, intuitive, colorful, and responsive that enables tourist have full access to tourism information and services. This platform also has a robust database to store data for easy storage, retrieval, and accessibility to tourism industries.

4.2 Conclusion and Recommendation

In conclusion, this smart tourism intelligence will solve many problems in Nigeria relating to management of product and information pertaining to tourism. Tourist will get acquainted with all the tourist places in Nigeria and information pertaining to those tourist sites without been physically extracting information from people or having to travel long distances to see what the tourism location has to offer. With the availability of the Internet, users have access to ITIS application; hence they are empowered with current and relevant information pertaining to Tourism in Nigeria. The application will go a long way in assisting tourists in decision making process, and also as a source of revenue to the country. ITIS will make tourism round the country fun and easy because of easy access to information.

It is worth mentioning that this work is open for further review and enhancement in the future with the expectation that it becomes more robust and better enhanced; covering every single tourist site in Nigeria. In addition, certain constraints, such as inadequate information sources for each of the tourist locations in Nigeria, some features were not included which would have made ITIS more robust and Information Management System.

Some of these features include the following;

- i. Provision of advertisement platform so that tourists will be able to get latest information on all the tourist locations in Nigeria
- ii. A fully functional reservation platform so that booking could be made via credit cards. Provision of content scheduler to eliminate outdated information

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