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A Web-Based Tourist Decision Support System for Agra City

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Abstract—In the last decade the use of Information and Communication Technologies (ICT) have boomed in many sectors, such as business, education, commerce and have profound implications for the tourism industry. They are being used extensively in a great variety of functions and count innumerable applications. Among these, Decision Support System (DSS) plays a fundamental role for their capacity to give tourist managing their tours and to base all the decisions concerning to queries on the climate, road conditions, cultural aspects, lodging, health facilities, banking, etc. of the location to be visited on sound and rational bases. In the present paper, a Web-Based Tourist Decision Support System (WTDSS) for Agra City has been developed that allows the traveling community to find their route in city and ask for information about sights, accommodations and other places of interest which are near by to him to improve the convenience, safety and efficiency of travel.

Keywords: Web-Based; Decision Support System; Tourism; Agra

I. INTRODUCTION

For many countries, either developed or developing, tourism is a very important source of foreign currency earnings and employment. Tourism is one of the largest and fastest growing business sectors of the world economy. Agra is famous as being home to one of the Seven Wonders of the World - The Taj Mahal. The architectural splendor of the mausoleums, the fort and the palaces is a vivid remainder of the capital in the 16th and early 17th centuries. As history of Agra is amply evident from the numerous historical monuments in and around the city, it is a leading destination for tourists.

In the current study, the development of a Decision Support System for Tourists called WTDSS (Web-Based Tourist Decision Support System) is presented. The system offers various tools to the traveling community or tourist visiting to the Agra City that allows them to find their route in city and ask for information about sights, accommodations and other places of interest which are near by to him to improve the convenience, safety and efficiency of travel. The developed system takes into account the user needs to present the tourism objects in the Web-based environment, support planning for tourism, focusing on the analysis, decision making and management and presenting the result on the Internet. WTDSS is a 3-tier, Web-based application, focused on effective modeling of the tourism data analysis and trip suggestion process.

II. WEB-BASED DECISION SUPPORT SYSTEM

Web technology is considered an emerging area for DSS and an important tool for DSS development. Web-Based Decision Support System (DSS) is defined as a system that communicates decision support information or tools to decision-makers through a web environment. A Web-Based Tourist DSS can provide tourists with tourism information through Internets, Extranets and Intranets and Web-based delivery of DSS capabilities will promote and encourage ongoing improvements in decision making processes. Web-based DSS have reduced technological barriers and made it easier and less costly to make decision-relevant information available to tourists and others in geographically distributed locations.

DSS as a set of computer-based tools; provides decision maker with interactive capabilities to enhance his understanding and information basis about considered decision problem through usage of models and data processing, which in turn allows reaching decisions by combining personal judgment with information provided by these tools. The components of a DSS include a database of data used for query and analysis, a software system with models, datamining and other analytical tools and a user interface.

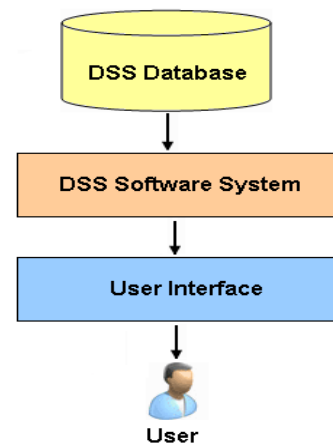


Figure 1. Components of DSS

III. RELATED WORK

With the evolution of Internet technologies web-based tools for tour planning can now be easily made available, implemented and become a valuable resource for the traveling community and tourists. Decision Support System

provides tools for persuasion and a vocabulary and discipline that facilitate negotiations and coordination across the organizational boundaries. Bousset et al [2] developed a Decision Support System (DSS) which combines tools to assist in the analysis of the views, concerns and planned strategies of a wide range of tourism stakeholders in the face of given trends in tourists expectations. Giannopoulos and Aifandopoulou [5] described a decision support tool created as part of a consultancy study to help the Ministry of Merchant Marine in the management and monitoring of the new liberalized system and taking decisions based on European Union Legislation.

Bensina [1] developed a Web-based decision support system using by fuzzy logic to be used in organizations and environments less inclined to use a systematic approach to decision making. Ramachandra et al [10] developed an interactive computer-based Decision Support System (DSS) to compile, analyze and present the data at disaggregated levels for regional energy planning. Knezic and Mladineo [7] described and investigated a new approach to priority setting within mine action, with the introduction of a hierarchic GIS-based decision support system (DSS). The proposed DSS was aimed at determining the objective priorities required to reduce the risks stemming from mine contamination. Dye and Shaw [4] presented a GIS-based spatial decision support system (SDSS) 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.

Hassan and Amayreh [6] presented a comprehensive system for the traffic control Web-based Traffic System (WTS), which provided the user of the roads with the optimal paths for their journey. Mahmassani and Chen [8] investigated the reliability of information on prevailing trip times on the links of a network as a basis for route choice decisions by individual drivers. Ceder and Sarvi [3] presented an analysis framework and formulation for designing and evaluating passenger ferry routes by using a methodology that combined the philosophy of mathematical programming approaches and decision-making techniques. Petropoulos et al [9] presented the design and implementation of an innovative Decision Support System for Tourism Demand Analysis and Forecasting, called SFTIS (Statistical and Forecasting Tourism Information System).

IV. WT DSS- THE PROPOSED SYSTEM

A. Architecture

The developed system follows the design of three-tier architecture. This three-tier architecture absorbs the substantial loads from the network since a lot of requests do not reach the server but the different tiers. The integrated information system with three-tier architecture will have the following features:

1) *Scalability*: The key benefit of three-tier is improved scalability since the application servers can be deployed on many machines. Also, the database no longer requires a

connection from every client; it only requires connections from a smaller number of application servers.

2) *Usability*: The architecture assists users in performing their jobs efficiently and effectively.

3) *Improved Data Integrity*: Since all updates go through the middle tier, the middle tier can ensure that only valid data is allowed to be updated in the database and the risk of a rogue client application corrupting data is removed.

4) *Improved Security*: Security is improved since it can be implemented at multiple levels (not just the database). Security can be granted on a service-by-service basis. Since the client does not have direct access to the database, it is more difficult for a client to obtain unauthorized data.

5) *Reduced Distribution*: Changes to business logic only need to be updated on the application servers and do not have to be distributed to all the clients.

6) *Improved Availability*: Mission-critical applications can make use of redundant application servers and redundant database servers. With redundant servers, it is possible to architect an application so that it can recover from network or server failures.

7) *Hidden Database Structure*: Since the actual structure of the database is hidden from the caller, it is possible that many database changes can be made transparently. Therefore, a service in the middle tier that exchanges information/data with other applications could retain its original interface while the underlying database structure was enhanced during a new application release.

8) *Autonomous*: The contents of any of the tiers/layers can be replaced without making any resultant changes in any of the others. For example: A change from one DBMS to other will only involve a change to the part in the data access layer. A change in the Use Interface (from desktop to the web, will need only some changes in the components of the presentation layer.

B. Architecture Layers/Tiers

The three-tier architecture of the system comprises of:

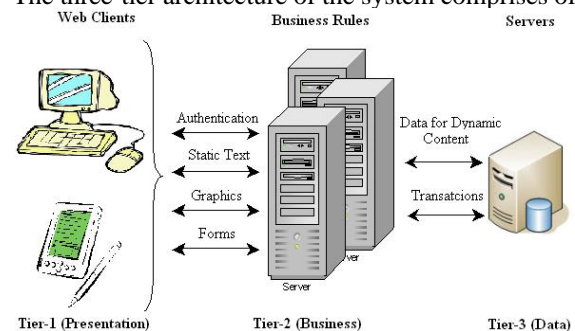


Figure 2. Three-Tier Application Architecture

1) *Presentation Tier*: This tier is responsible for communication with the users. It is the place where the user

can select the query criteria in order to view the tourism data he wants.

2) *Business Tier*: Business tier is responsible for accessing the data tier to retrieve, modify and delete data to and from the data tier and send the results to the presentation tier. This layer is also responsible for processing the data retrieved and sent to the presentation layer. It contains business logic, validations or calculations related with the data.

3) *Data Tier*: Data tier is the database or the source of the data itself. The database management system lies on the database server, a server that is isolated in order to avoid hacker's attacks and also provides satisfactory response times. This layer is responsible for managing data. It will provide the business layer with required data, when needed, and stores data when requested.

C. Database

The tourism data was gathered under various categories, which constitute various tables in the designed database following a relational database model format. The database was developed using PostgreSQL with PostGIS. Various point and line layers, such as Point of Interests, Road, Hotels and Restaurants etc. of map have been digitized to provide interactive decision making about near by places, point of interests, smallest route enabling effective trip planning.

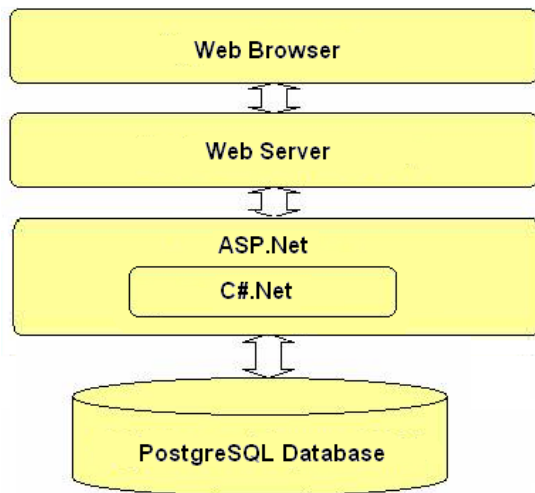


Figure 3. Organization of WTDSS Application

D. User Interface

The user interface design makes the user's interaction as simple and efficient, in terms of accomplishing user goals. For the developed system, it has been designed using Microsoft Visual Web Developer 2008 with Ajax for presenting and viewing the tourism data on the Web. Figure 3 presents a screen shoot of user interface which allows the users to select and input the query criteria in order to view the tourism data they want.

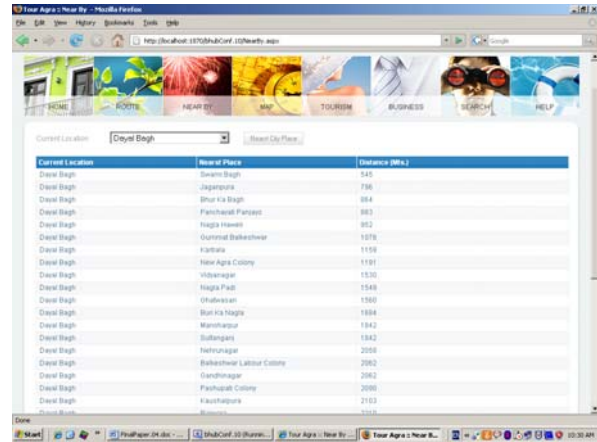


Figure 4. User Interface of developed WTDSS Application

V. BENEFITS OF WTDSS

One of the main advantages of Internet is its ability to provide almost unlimited access to information to everybody, who has technical possibilities to connect with the Web. 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 Agra. Using this kind of system increases convenience and efficiency in tourism activities by providing information for decision support in order to save money, manpower and time.

VI. CONCLUSION

In this study; WTDSS (Web-Based Tourist Decision Support System) intended to provide tourism information for tourists visiting the Agra city has been developed. The development of WTDSS has followed all necessary and required steps from capturing data to publishing on the web. The data is stored in a data base and contain historical, cultural, geographical, administrative and hospitality related information in order to be accessed by the tourists through Internet to improve the convenience, safety and efficiency of their travel.

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