



Web GIS application for customized tourist information system for Eastern U. P., India

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(Received: Nov 17, 2013; in final form Feb 28, 2014)

Abstract: Tourism planning involves a wide variety of variables and parameters involving spatial and non-spatial data which ought to be available to both, tourists as well as tourist service providers. It needs accurate, updated and rapid information about destinations for satisfaction of the consumers (tourists). Tourist satisfaction is the prime criteria to make their visit a pleasant experience. The rapid growth in information technology, particularly of internet, enables availability of highly customized, accessible and interactive source of information. The internet caters to information about travel activities of all kinds, ranging from virtual sightseeing and detailed information on travel sights, allowing users to plan their own itinerary. GIS (Geographical Information System) is an invaluable tool that provides spatial and non spatial information as well as images, maps and text documents because of its integrating capabilities. Web GIS has added the capabilities of GIS to internet. The study is an attempt to create a web GIS based database for the tourism industry of Eastern Uttar Pradesh and for this purpose open source Map Guide (Autodesk) – a web based platform has been used to customize and display GIS layers (prepared using Arc GIS 9.2) on web under the name www.easternuptourism.com. GPS technology has also been used for the generation of the spatial data.

Keywords: Web GIS, Map Guide Open Source, Customization, Tourist Information System, www.easternuptourism.com

1. Introduction

GIS (Geographical Information System) has clearly distinguished itself as a very special kind of information system, as it stores spatially reference data and makes provisions for the same to be displayed graphically. GIS has the capability to integrate spatial as well as non-spatial data and also has the ability to use different formats of data. GIS is a valuable tool in providing spatial information in the form of images, maps and other documents. The power of GIS lies not only in the ability to visualize spatial relationships but beyond the space to provide holistic view of the world with its many interconnected components and relationships.

In the field of tourism, communication plays very vital role because through communication, a potential customer (tourists) obtains information about the destination one proposes to visit. Travel and tourism being a service industry needs not only to be accurate but providing rapid information about the destinations becomes paramount for the satisfaction of the customers. The most important aspect of tourism is the information about destinations and various facilities available there, to be used by tourists. Information about these facilities and services is required by the tourist prior to his departure until he reaches back home, which makes the entire experience pleasant and worthwhile. With the recent advances of technology one would like to reach to solutions instantly.

With the tremendous growth of Web, today, all types of tourism information providers already have homepage on the Web for storing the comprehensive description of the tourist destinations and for

presenting the tourism products. Almost all home pages support static HTML page. Existing tourist information or Tourist Information System built on HTML lacks dynamic, scalable, extensible and interactive functionalities. They are also unable to integrate geographic data and tourism information. They fail in accessing and exchanging the data available in heterogeneous Tourist Information Systems (TISs). These limitations have necessitated development of sophisticated information system based on Web GIS standards. Web GIS based information system will provide flexible data interchange facilities as well as allowing dynamic and interactive presentation of tourist information. Web based GIS can be expected to meet these types of challenges. This type of customized information system will be very useful for the service providers and of course for the tourists.

Web based GIS have enabled the functionality of GIS on the Web page. There has been a remarkable growth in the field of open source GIS software and many applications have been developed. It can be used as a powerful tool to disseminate information and authentic facts about tourist infrastructure. This study is an attempt to provide Web based customized information system for Eastern Uttar Pradesh and display dynamic and interactive tourism information that will effectively help in promotion of tourism in this region.

2. Study area

Eastern Uttar Pradesh lies between 23°51' N to 28°30' N and 81°31' E to 84°39' E covering an area of about 85,298 km² and segmented into 27 districts (Fig.1), stretching about 550 km in north to south and 375 km

in east to west direction. The region borders Nepal (International boundary) in the north, Bihar and Jharkhand in the east, Chhattisgarh, M.P. in the south and western boundary of Bahriach, Gonda, Faizabad, Sultanpur, Pratapgarh, and Kaushambi districts of U.P. form the western boundary of Eastern U.P.

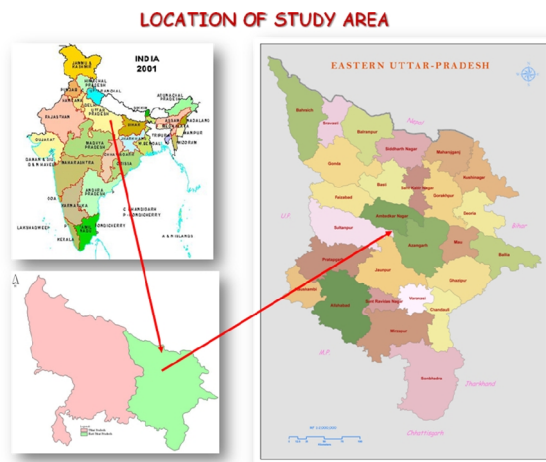


Figure 1: Location map of study area

Eastern U.P., the religious seat of Uttar Pradesh, has been endowed with many historical monuments, heritage sites, spiritual and traditional religious shrines of different religions and sects, wide spectrum of natural beauty, waterfalls, wildlife and bird sanctuaries, entertainment (water sports, fairs and festivals), shopping of ethnic goods, art, craft and has much more to offer, which add to the itinerary of the domestic as well as foreign tourists. A good number of rivers (river Ganges, Ghaghra, Rapti, Yamuna, Son, Gomti) and their tributaries traverse this region, ensuring the prosperity and their banks provided the right platforms for the development of religious/historical and cultural centres at different points of time.

This is the land of Lord Ram, Gautam Buddha, Mahaveer and other Jain Thirthankars. Many important religions have been associated with this region and their shrines, sacred pilgrim centres and monuments dot this entire area. As per Hindu mythology, Lord Ram was born here at Ayodhya and ruled over a great part of it in the ancient times. Allahabad (Prayag) and Varanasi (Kashi), which are supposed to be the oldest living cities in the world, are now the two biggest places of this region and are also among the most sacred pilgrim centres of Hindu religion. It is a matter of great pride for Eastern U.P. that this region has been the seat of Buddhism and could also be called the 'Cradle of Buddhism'. The entire region is dotted with monuments, relics, legends and history of Buddhism, which emerged here as a religion and spread across the world. Other than religious attractions and monuments, the region is lined up with many structures of architectural grandeur in the form of forts and palaces of medieval period. Cathedrals, churches and many buildings of British period show the influence of colonial architecture. Religious shrines located in

Eastern U.P. also have the representation from Sikhs and Sufi saints. The region has been the epicenter of different religions and spirituality, preaching peaceful co- existence and spreading the message of peace and non- violence to the entire world. That is why the region draws tourists from all over the world irrespective of their religion, caste and creed. In fact the existence of some of the tourist places is totally dependent on the incoming tourists and tourism related activities, viz., Sravasti, Kapilvastu, Kushinagar (Buddhist centres) etc.

There are 10 historical and religious centres, 8 wildlife sanctuaries (6 wildlife and 2 bird sanctuaries) and 206 excursion points which are covered in the study.

3. Web GIS

Web GIS provides a web based platform for the distribution of spatial data, data sharing between GIS users and also a platform for management of spatial data in fast and effective manner. It has extended the functionality, capability and applicability of GIS on the Web.

WMS (Web Map Service), is a means of displaying interactive maps on the web. They facilitates distribution of generated maps [usually in JPEG, PNG or GIF or even vector based geospatial element in SVG (Scalable Vector Graphic) format] through web browsers using various implementations of web based application programming interface (AJAX, Java, Flash etc.). This interactive information can be provided to stakeholders, organizations, public etc., with its easy access to information via the internet (i.e., web GIS).

4. Open source GIS

Many open source GIS servers are available now and it is possible to develop Web application using these softwares with ease. The trend towards open systems has facilitated information sharing by removing many incompatibilities in hardware interfaces, communication protocols, operating systems, query systems, query languages and graphical user environments (Croswell and Ahner, 1990). There are many advantages of Web GIS, like low cost, easy to use, data sharing through common database etc.

MapGuide Open Source, introduced by Autodesk, is a web-based platform that enables users to develop and deploy web mapping applications and geospatial web services. MapGuide features an interactive viewer that includes support for feature selection, property inspection, map tips, and operations such as buffer, select within, and measure. MapGuide includes an XML database for managing content, and supports most popular geospatial file formats, databases, and standards. MapGuide can be deployed on Linux or Windows, supports Apache and IIS web servers, and offers extensive PHP, .NET, Java, and JavaScript APIs for application development. MapGuide Open Source is licensed under the LGPL.

5. Methodology

The methodology followed in the present study for the development of Web GIS based customized Tourist Information System for Eastern Uttar Pradesh is given in Fig.2 and is briefly described here.

- The study is based on primary as well as on secondary data. Information about tourist destinations, excursion points around these destinations, available infrastructure (covering information on every aspect a tourist might be interested) have been collected through primary survey using GPS. Historical background of destinations, fair and festivals, tourist statistics and existing maps (Uttar Pradesh Gazetteers for Pratapgarh 1980; Gazipur and Sultanpur 1982; Allahabad and Balia 1986; Gorakhpur 1987; Bahraich, Basti, Deoria and Mirzapur 1988; Azamgarh, Gonda and Jaunpur 1989), guide maps of the region and destinations have been collected from various published (Anon. 1989; Kundu 1989) and unpublished sources.
- Spatial and non-spatial database has been created using Arc-GIS 9.2. After preparing the base maps for the tourist centres of the Eastern U.P., data collected through GPS was transferred on transport network layers to develop various thematic layers. These layers were verified through second field survey to know the accuracy of the data plotted and changes have been made wherever necessary.
- This GIS based database is made web enabled using open source GIS from Autodesk- Map Guide. Text (in HTML), photographs, video clippings with commentary (for virtual sightseeing) of the destinations as well as excursions and infrastructure details were linked with the point data plotted on the tourist maps of Eastern U.P. and tourist centres located in the region.
- A workshop, which was also a part of the study, was organized after completion of the website to create awareness about the work to the concerned departments and application of GIS in tourist industry.
- The study also looked into the problems and prospects of tourist industry to utilize the potential tourism resources of the region. Data related to this aspect has been collected through questionnaires, covering the problems of tourists, entrepreneurs and locals during field survey.

6. Analysis and results

The present study aimed to provide a Web based customized Tourism Information System (TIS) for Eastern U.P., built on GIS platform to facilitate

tourists, tourism department and other service providers to attain comprehensive, accurate, customized, updated and organized information in the form of maps, photographs, text, video clips with commentary for virtual sightseeing. This customized information system has been formulated on GIS platform to make it interactive and also linked to Internet to maximize the accessibility of reliable information.

6.1. Structure of web based database

Database and dynamic interactive maps available on this site were created on GIS platform and made web enabled through Map Guide open source. Information available on this web site has been divided into three segments:-

6.1.1. Eastern U.P. maps

Eastern U.P. maps show the location of tourist centres, wildlife sanctuaries, fairs and festivals sites with transport network in Eastern U.P. Detailed information (HTML document) about that particular centre is attached with the each point and can be accessed by clicking that particular centre.

6.1.2. Tourist centres' maps

This information is in the form of collection of detailed maps of tourists centres located in the Eastern U.P., viz., Allahabad, Ayodhya and Faizabad, Gorakhpur, Kushinagar, Mirzapur and Vindhyachal, Robertsganj, Sravasti and Varanasi (Fig.3).

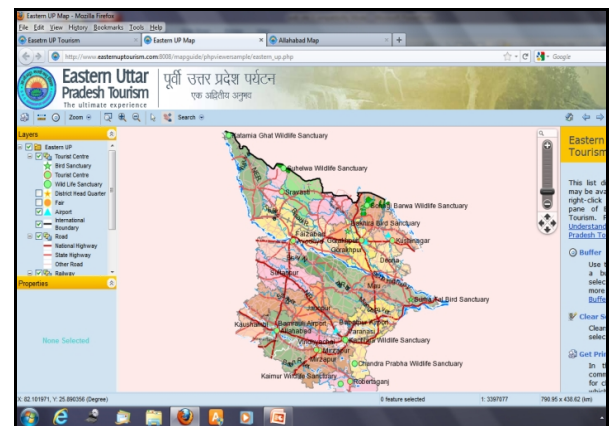


Figure 3: Map of Eastern U.P.

These maps show the location of tourist destinations (with embedded HTML document with detailed information, photographs and videos with running commentary), as well as location of infrastructure, viz., accommodation with types, restaurants, travel agents, hospitals/nursing homes, security, passport office, tourist office/information bureau, foreigner's registration office, banks, ATMs, cyber café, cinema halls, playground/ parks/ golf course/ clubs, post office, shopping area/malls, petrol pumps, mobile services.

Information about tourist destinations and the facilities plotted on the maps, can be accessed by clicking that particular point located on the map (Fig.4). Destination's information can also be accessed either directly through home page by using drop down menus or by clicking the information displayed at the lower side of the home page.

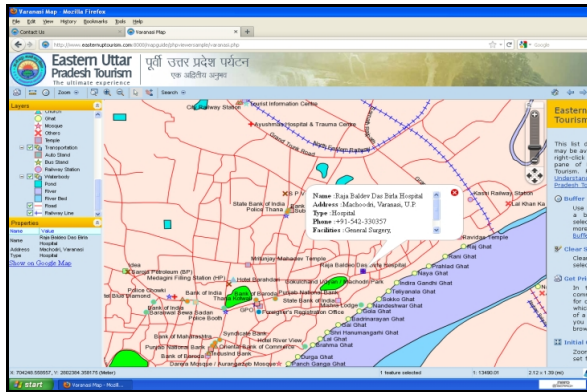


Figure 4: Tourist centre map

6.1.3. Excursions

The tourist attraction points are located around Allahabad, Ayodhya and Faizabad, Gorakhpur, Kushinagar, Mirzapur and Vindhyachal, Robertsganj, Sravasti and Varanasi, which are also shown on the maps. Excursion maps showing the important tourist attraction points located around the above said tourist centres are created in image form (jpeg) by exporting the shape files and information about them is linked in HTML with photograph format. Detailed information in the form of text, photographs and videos of these centres is available in two ways- first by selecting the centre from the excursion list from the page and second by clicking the particular point shown on the map, as well as selecting the centre from the list located downside of the excursion map of the particular centre.

6.1.4. Home page design

This page provides links to all types of information compiled under this web site. Upper side of the home page has a tool bar with drop down menus. This tool bar includes- general information about the region and tourist centres, excursions, fairs and festivals, wildlife sanctuaries and even a picture gallery with contact tab and feedback form. Same information can also be accessed from the links provided at the bottom of the home page (Fig.5).

Maps of the region and major tourist centres are available from the scrolling window on the right side of the page. This window provides links to the maps of Eastern U.P. and major tourist destinations. By selecting any map user will go directly to the map, prepared using Arc GIS and published using open source GIS- Map Guide and distributed over internet. In the middle part of the home page some photographs and map of Eastern U.P. are displayed.

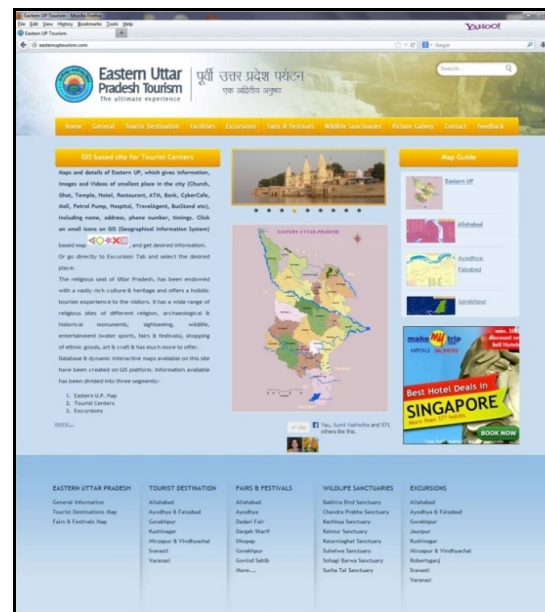


Figure 5: View of home page

6.2. Page design of maps

Rolling window on the right side of the home page provide access to the maps of the region as well as tourist destinations. User can click any map and the window of that particular map opens. Top side of this page is occupied by a GUI based tool bar having icons for different operations, which can be performed by the user (details in tool bar and functions) on each map. The left side of the window has a Table of Content (TOC), where all the layers of that centre are displayed. Here, user can check and uncheck any layer by clicking the layer. Lower side of the TOC also shows the properties as heading - under which details of the selected features on the maps are available. Map of the tourist centre is displayed in the middle part of the page with the slider to zoom in/out and tool to navigate the map. Panel located on the right side of the map shows the command list, which gives specification and details of each command. So that a non-GIS user can go through these details and can perform these functions. All the maps compiled on this web site have all these characteristics.

6.2.1. Tool bars

On the top side of each map there is a tool bar which is a GUI (Graphical User Interface) based menu bar and provides many easy to use tools to the user, viz., print, zoom in, zoom out, zoom rectangle, identify, pan, search based on attribute as well as spatial, measurement tool, buffer tool, initial map view, previous map view, select-polygon, radius, select within, clear selection, refresh, and search (Fig.-6).

6.2.2. Search feature

It is a very important tool, which can be used to search spatial and non-spatial information as well. This feature helps the user to find out any information in quick and easy way from this large database. User can

get information about tourist destinations and available infrastructure by using this tool in two ways. This feature is available on the top right corner of the home page (from where all HTML documents can be searched) and also with all the maps displayed on the site. There is search icon on the tool bar of every map and user can select the layer in which he/she wants to search. After selecting a particular layer user has to type a query and searched features list of that particular query will be displayed. Here, user can select any feature from the displayed searched list and it will take him direct to the spatial location of the same on the map. User can also access linked information with that particular feature by clicking at that particular point. Same information is also being displayed in the lower panel of the TOC under the heading properties.

6.3. Facilities mapping

Maps show all the infrastructure, a tourist might need while travelling in an unknown area. These facilities, along with the spatial information about the tourist destinations, are shown on the maps of the tourist centres and have linked information with details of the particular facility like- Accommodation with types, Restaurants, Travel Agents, Hospitals/Nursing Homes, Security, Passport Office, Tourist Office/Information Bureau, Foreigner's Registration Office, Banks, ATMs, Cyber Cafés, Cinema Halls, Playgrounds/Parks/Golf Course/ Clubs, Post Offices, Shopping Areas/Malls, Petrol Pumps, Mobile Services. These facilities are grouped in four layers for big tourist centres and in two layers for middle size centres, while only in one layer for small tourist centre.

6.4. Functions/activities

Functions available with all the maps of tourist centres to the users are- print (any part of the map can be zoomed in/out and can be printed), zoom in, zoom out, zoom rectangle, (user can use these three tools to see the maps at different level) identify, pan, search based on attribute as well as spatial, measurement tool to measure distance between the places/facilities on the map (in km., metres and miles), buffer tool- for knowing the different facilities available within the specified limit or in the vicinity of present location of tourist, initial map view, previous map view, select-polygon, radius, select within, clear selection, refresh, search, go to Google-which will connect the map with the Google map (Fig.4). All these functions are available for all the maps and for the convenience of the user all these functions have been clarified on the panel located at the right side of the map.

It is anticipated that this information system will help in attracting more and more tourists and entrepreneurs into this region. Thus, maximum utilization of the potential resources of the region will be ensured. Multiplier effect of tourism will create employment opportunities in transport, hotel, marketing and different services and there will be overall improvement in the economy of the region. This work

can be treated as a pilot project for the other parts of Uttar Pradesh and rest of the country as well.

7. Conclusions

In the present study, a web based customized Tourism Information System (TIS) for Eastern U.P. is developed. This is formulated on GIS platform to make it interactive and also linked to internet to maximize the accessibility of reliable information. Such a system is very useful to know the present status of tourism and carryout future tourism development programmes for Eastern U.P..

Acknowledgement

The study was carried out as a part of the project, funded by Natural Resources Data Management System (NRDMS) division of Department of Science and Technology (DST), New Delhi.

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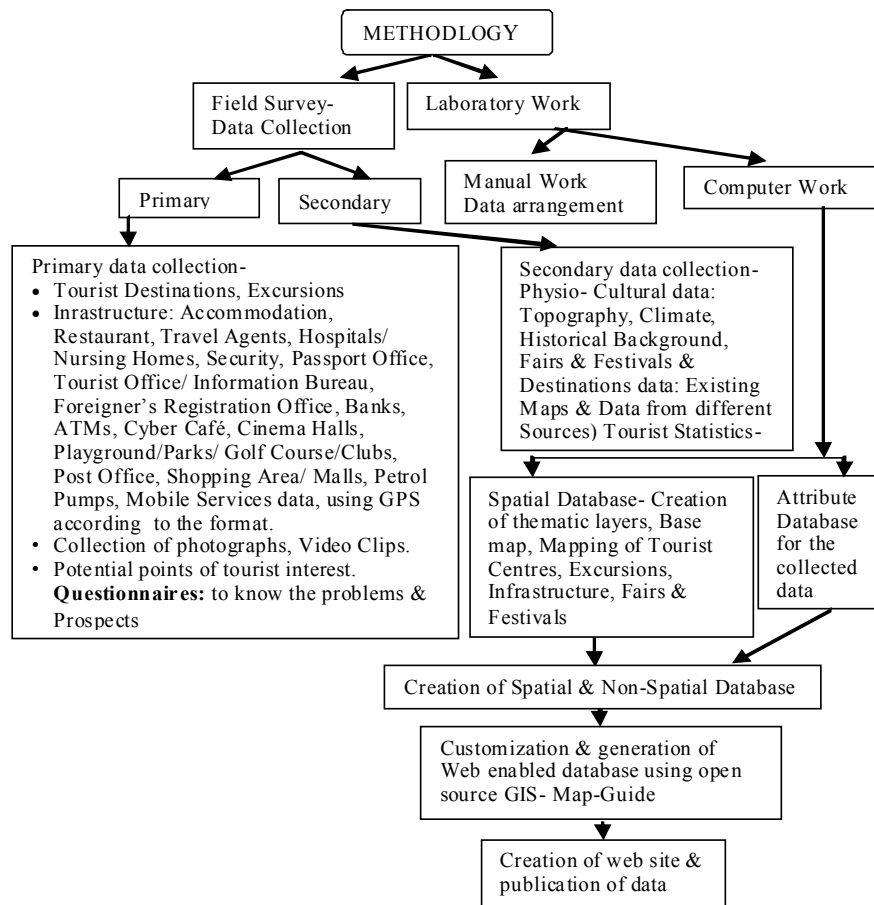


Figure 2: Flow chart of methodology

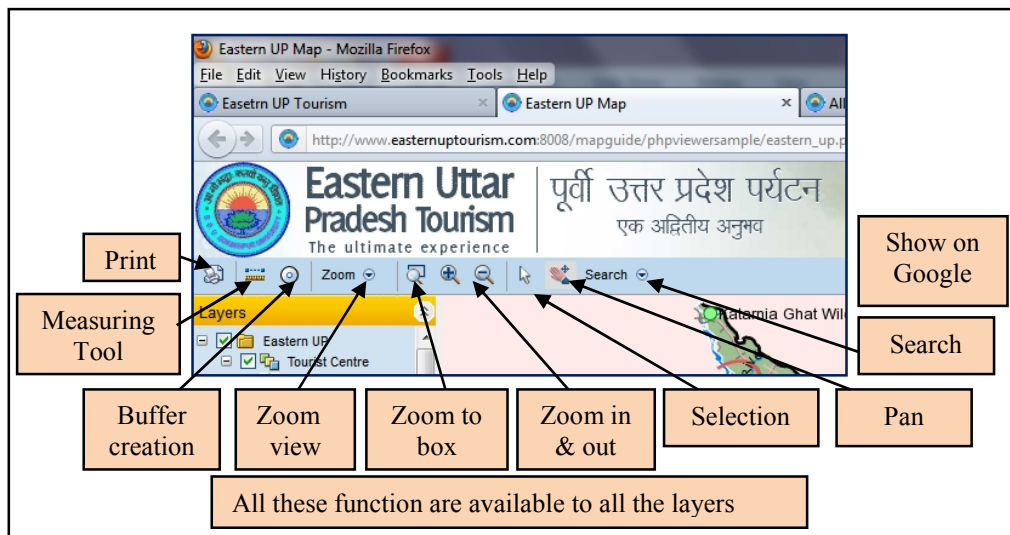


Figure 6: Features of the tool bar