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Research Paper

A Conceptual Architecture of Remote Sensing and Geographic Information System (Gis) Implementation for Tourism Planning

Management

KEYWORDS : Tourism Planning, RS and GIS, SDSS, Destination fetching, Geoportal

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ABSTRACT

Tourism industry is being multi – dimentional, and it has a multiplier effect which actually includes all the sectors. Being the world fastest growing industry, tourism requires proper scientific planning which can be developed throgh the implementation of Remote Sensing (RS) and Geograohic Information System (GIS). If RS and GIS technology is adopted to develop scientific planning in tourism, the success story will be different. The tourism related activity is related to space and therefore it can be modelled in RS and GIS environment. Using these technology, we can generate more authentic information for tourism industry like creation of geoportal, fetching new destination etc. It will facilitate the tourism development, advertisement and promotion. A new horizon will be opened in the the field of tourism industry in India.

1. Introduction

Presently tourism industry is passing through developmental stages (Patel 2002). It has become the most popular activity among the world's population. More emphasis is given to develop tourism as is has the best multiplier effect and can generate employment opportunity in any area. Irrespective of place, people and environment, tourism can be the bread and butter of any community. But the major distinguishing factor we find while developing tourism is unplanned development which results more and more problem in various sector can it be in the form of natural disaster or a cultural destruction.

Tourism is a collection of activities, services and industries that delivers a travel experience, including transport services, supplementary accommodations, eating and dining outlets, shops, entertainment establishments, facility services and other hospitality services rendered for individuals or groups travelling away from home. Tourism industry is world's largest and rapidly growing industry which is one of the key revenue generators for the major countries. This industry is also the key source of generating direct or indirect employment for almost every country (Budeanu, 2005).

Tourism is a multidimensional and deals with attractions which is primary motivator of travelling. Apart from attraction, natural resources, culture, ethnicity, entertainment are the other motivations for tourism. Good accommodation and transportation facilities are also the key factors for travelling away from home. The positive attitude of local community which is covers every tourism location that makes tourist feel comfortable and secured. More friendly interaction between tourist and local community results the success of the destination.

In the present scenario, the well known tourism destinations are overcrowded during the peak seasons. Moreover, Due to busy life schedule most of the recent generation tourists like to travel in the remote destination and want to enjoy the natural beauty. The international tourists are also like to visit the places which are uncommon or completely traditional. Providing visual information regarding the location of a place and route navigation information in the form of maps is also limited. The promotion of tourism through web is also a vital matter. Another problem which affects the tourism industry is natural disaster. The natural disaster cannot be control by the human beings, but it can be managed, forecast or precautions can be taken. Presently the tourism industries are faced such kind of problem and a proper planning is required. As tourism deals with complex phenomenon and engages into more and more planning process can be successfully helped by using remote sensing and GIS.

Remote sensing (RS) is a process of acquiring information about objects without any physical contact with them (Lillesand and Kiefer, 1994). Various airborne and satellite-based remote sensing sensors are used to collect information related to the Earth's surface. Space/satellite-based remote sensing platforms play an important role in collecting information about the Earth's surface material and process due to their repeatable continuous measurements and observational capabilities. The satellite images can be use for identification and detection of various new tourist planes. This technology can support the disaster mitigation plan and useful for visualization. It is essentially required for global, regional or local scale resource monitoring, assessment, planning and management.

GIS is a process of capturing, storing, retrieving, analysis and display of geographic information (Yang et al., 2010). It is a specialised computer based technology which coverts data into information. Data is captured and used in a GIS commonly are represented on digital or hard copy maps. GIS is capable to combine various data of different levels into a composite data layer that may become a base layer in a database. For example, wetlands, forests, deserted lands, terrains, and hilly regions can be combined to develop a single model of land storage site which can be incorporated into a permanent database of local agency or government which becomes a strong tool for making right decision in planning process. GIS system allow for full integration of various types data like satellite imagery or aerial photography, Digital Elevation Model (DEM) and any other maps and spatially related datasets which converts into vector layers like points, lines and polygons. This technique can be successfully utilized for modelling, planning or information system generation of any spatially related procedure or phenomena. The best benefits that can be obtained from GIS are synthesized or combine different layers of information to identify resource distribution patterns that may otherwise not be possible.

It is a challenging task to implement the RS and GIS for tourism planning. This technique is capable of handling spatial data and tourism related data or infoemation are generally linked with space, therefore, it can be analysed within the GIS framework. Attempts have been made by previous researchers for GIS oriented tourism planning. For example, David Mcadam (1999) has given a concept regarding the value and scope of GIS in tourism planning. The discussion focuses on the functionality and application of GIS in tourism development projects before moving on to assess the level of current interest and adoption of the technology through studies of tourism and GIS consultants. GIS can bring significant development in the decision making process through data analysis, modelling and forecasting. Limited awareness of GIS functionality, preference for using tried and tested non-computer-based methods of planning, and a widespread avoidance of the technology are the major resions for not utilizing this technology for planning and management purpose.

Dye and Shaw, (2005) presents a GIS-based spatial decision support system (SDSS) application that integrates 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. Tremblay (2005) utilized GIS techniques in tourism

and recreation planning for wildlife tourism. In Australia, it has been hypothesized, but never really established that a number of its wildlife inhabitants hold an iconic status and play a central role in attracting both domestic and international tourists. Concerns are growing over the impacts of increasing, seasonally concentrated tourist visits on relatively unspoiled locations, including the habitats of its core wildlife assets. In this regard GIS technique is used for the purpose of tourism planning. Boers and Cottrell, (2007) presents a conceptual GIS supported sustainable tourism infrastructure planning framework including attraction, service and transportation facilities. This framework focuses on tourism planning as an integrated approach based on sustainability criteria. The study aims to integrate a set of sustainability criteria (i.e. development objectives, visitor experience preferences, carrying capacity standards and resource impacts) into infrastructure planning via GIS. Based on these criteria, the study provides protected area management insights in the most sustainable locations and layout of future infrastructure.

Chu et al., 2011 developed a tour guiding information system and tourism services using mobile GIS and (Global positioning system) GPS. It is become important at various tourism destinations because the conventional methods seem no longer adequate to provide information to satisfy all tourist needs. Mobile GIS and GPS techniques are applied to provide guiding information and manage tourism destinations more effectively. The system includes four main functions, a graphic function, a GPS function, a Route function, and a Query function. In particular, this system combines mobile GIS and GPS techniques with location-based services (LBS) to provide tourists a better trip experience and deeper understanding of the importance of this valuable landscape. Gumusay 2003 studied the application of time management in the tourism environment using GIS. Once time is used sensibly, access to a lot of information is possible about a places. Determining the shortest routes to the historical places and natural beauties from their accommodation will be both timesaving and economical. GIS technologies provide us with these possibilities. This study implemented GIS design and network analysis by taking advantages of GIS possibilities for tourism. Jovanović and Njeguš (2008) review the GIS application for tourism planning. The study analyse that both tourism and IT increasingly provide strategic opportunities and powerful tools for economic growth, redistribution of wealth and development of equity around the globe. GIS technology offers great opportunities for the development of modern tourism applications using maps. This technology integrates common database operations such as query with the unique visualization and geographic analysis benefits offered by maps. In this research the authors used GIS in three types of applications such as inventory, analysis and evaluation of plan based on tourism development. Kushwaha et al. (2011) analysed a potentials of GIS in heritage and tourism. This study presents an overview of the research and includes a discussion of the heritage tourism potentials and promotion using GIS. Abomeh et al., 2013 studied how the utilisation of GIS technology can be use to improved tourism management in various tourism destinations like beach, museums, Parks and resorts, hotels, restaurants, clubs, bars, cinemas and fitness centres, as well as complementing tourism destination services which includes police post, clinics and hospital in Victoria Island Lagos. The study also model the accessibility to these points of interest mentioned above using GIS analytical tools and functions. They analyses to aid decision for management and future planning was carried out using the spatial statistical tools in the GIS application.

In the recent time, GIS is the answer of many complex modelling questions. Regardless of the application in which GIS technology is used, this system provides fast data access and multidimensional analysis and graphical representation capabilities that can result in more effective resource management decisions. It is an inter-disciplinary subject / technique which can be applied for problem solution, management and planning purpose.

The objective of this paper is to conceptualize the implementation of GIS technology in the field of tourism for advertisement and promotion, better planning and featching of new destination/spot for tourism development.

2. Destination Fetching

Most of the well known tourist spots are over crowded. During the tourist seasons, tourist travel to the existing tourist spots and people faced the deficulties in getting the accommodations and the present generation of internal as well as foreign tourists do not like those spot. Due to this reasons it is necessary to search of new tourist spots / destination for development of tourism. The new tourism spot could be located in various suitable places or in the vicinity of a well known tourist destination. These spot could be suitable for Summer tourism, Winter tourism, Pilgrimage tourism or Adventure tourism. Finding of those tourist spot is difficult in the present scenario.

In this regards, RS and GIS based modelling technique can be applied to find out the new tourist destinations. A multi-criteria based Spatial Decision Support System (SDSS) Modelling is required to find out the potential / new tourist site where development can be done as per above mentioned category. Multi-criteria based SDSS analysis provides a collection of techniques for structuring decision-making problems and designing and evaluation of alternative decisions (Malczewski 2006). Multi-criteria based SDSS is made available to decision and policy makers for taking important decisions (Goodchild 1993; Jankowski and Nyerges 2001; Malczewski 2006). The major aspect of SDSS are criteria selection and decision rule (Eastman et al. 1995).

Criteria are the base for any evaluation system. They are rules that determine the desirability of alternative decisions (Hwang and Yoon 1981). A factor is a criterion that enhances or reduces the suitability of a specific alternative for a particular activity, constraints reduce the number of alternatives that are available. Once the factors have been identified, they are reduced to a standardized scale and assigned weights to determine their relative importance to the objective being considered (Eastman et al. 1993b). This process by which all these criteria are combined to arrive at a particular decision is known as decision rule. A decision rule might involve only one criterion or multiple criteria. The actual implementation of the decision rule using multiple criteria is known as multi-criteria analysis (Eastman et al. 1995).

Assigning relative weights to the various criteria under consideration is a very critical in SDSS. Various methods are available in this respect. The important ones are Ranking methods, Rating methods, Pair-wise Comparison method and Trade-off analysis method (Malczewski 1999), nn which Pair-wise comparison method is easy and suitable for computing the weight. In this method, the decision maker has prior knowledge of the relative importance of different criteria for the area under consideration.

A rulesets need to generate for selection of new tourist spot. A set of criteria is required based on suitability. Different rulesets and factor will be necessary to identify the spot for summer, winter, pilgrimage or adventure tourism. For example, to find out tourist spot related to summer tourism the spatially related criteria will be

- Hilly location
- High altitude landscape
- Gentle slope
- Fevarable Aspect and Sun light availability
- Climatic condition (low temperature in the summer seasons, winter should not be rainy, Possibility of snowfall)
- Road connectivity
- Suitable underlying geological formation for preparation of structure / accommodation.
- Less prone to hazards and vulnerability

For selection of winter, pilgrimage or adventure tourism tourism spot, a similar criteria function should be laid down. All this factors can me model withis the SDSS framework spatiall to find out the suitable

location. Thereafter, field verification, proximity analysis and feasibility assessment need to carry out further for final decision and policy preparation.

The system required all kinds of raster and vector datasets. The major datasets will come from remote sensing such as satellite image, DEM, land use and land cover information, road network, drainage, vulnerability maps etc. to model in GIS environment. The major satellite datasets can be obtained as open source from Earth Explorar or Global Land Cover Facility (GLCF) data getway of NASA / USGS (http://earthexplorer.usgs.gov/; http://glcf.umd.edu/). The open street map can be taken for open source to model the road connectivity. A schematic representation is given in the Figure 1.

3. Development of a Geo-Portal

Presently, web-based information system is a key concept for advertisement and promotion of any field. Generally, various government agencies, authorities and public or private bodies creates website for tourism promotion and to attract the national and international tourist. The tourism activity is related to various location which is designated as 'space' in the field of GIS. Any activity, location, situation or temporal aspect can be converted to a location based information system using GIS. Therefore, otherthan creating a website for tourism development and promotion, a location oriented geoportal concept can be implemented using Web-GIS technology. The geoportal will provide more specific information to the tourist for their tourism planning. It will also help the government agencies or authorities for better management and future policy formation. The concept of geoportal and its relevance to improve the tourist information system as well as help to various public and private agencies are following:

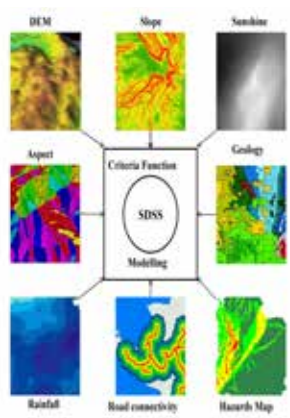

Figure 1: Schematic representation of SDSS

(i) The geo-portal will provide spatially referenced (map-based) information regarding a tourist spot. The ways to reach a tourist spot and travelling over the place can be depict over the portal. Any location related information can be incorporated over this portal which will help the national and international tourist to travel independently over a tourist spot.

(ii) It will display all kind of information (location of place of interest, maps, how to reach, accommodation, food, suitable time to visit, government or private tourist package etc.) which will be spatially linked and also gallery for attraction.

(iii) It can work as a guiding system to all national and international tourist for spot selection and reaching to any destination independently to enjoy the beauty of nature or heritage location as per choice.

(iv) A feedback system about the spot can be created for further information to new tourist based on review of the visited persons. This system will help the tourism regulatory authorities to improve the management over a spot and create policy accordingly.

(v) It can also depicts (mark on the map) that all the interesting places along the road or in diversion, so that tourist can see this. Option can be given to visited tourist to add information to enrich the portal. This will facilitate the tourism promotion of a location.

(vi) The local and international tourist can registrar their name and relevant information which can be further analyses to improve the tourism related facility and

A schematic representation of Geo-portal for tourism development is given in the Figure 2.

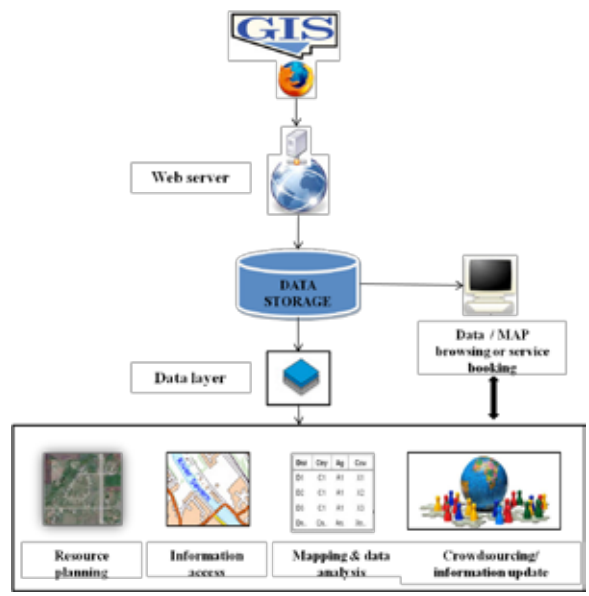

Figure 2: Schematic representation of geo-portal for tourism development

The information availability in the geoportal in terms of data layers and map is demonstrated on Figure 3.

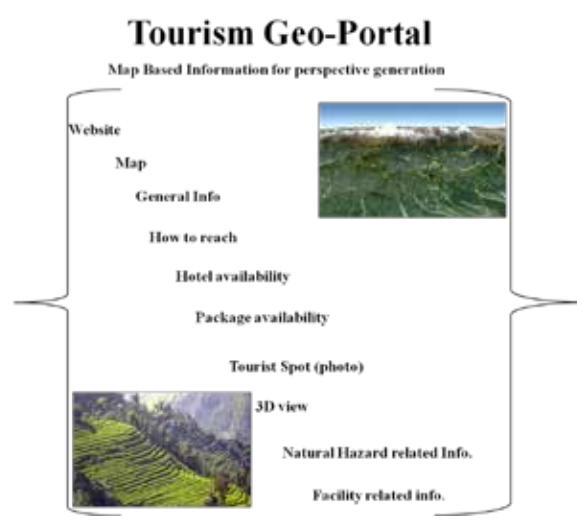

Figure 3: Schematic representation of data layer or information availability over geo-portal for tourism planning. For each tourist spot similar kind of information availability is necessary.

4. Significance of the study

The success of the tourism industry in any country depends on the ability of that country to develop, manage and market the tourism facilities and activities in that country. Applications of RS and GIS in tourism and recreation planning illustrate that it is a strong and effective tool that can help in tourism planning and decision-making, ultimately benefitting both the Government and the people of this region.

Implementation of this concept will improve the information and analysis system related to tourism for tourists and leveraging the employment and revenue for the common people of this state. This will facilitate the following advantages:

Flourishing of tourism industry: This will help in flourishing of tourism industries by improving the web advertising and well management process. The advertising will enable to attract the foreign tourist as well as internal tourist in a better way. This process will help the State Government's revenue generation process.

Escalation of tax collection of government: The better and documented management process of tourism industries will help government for collection of tax. In other way if the tourism industries grow, the tax collection will also increase simultaneously.

Rising of satellite industries depending on tourism: The new tourism (tourist spot) destination will help in rising of small industries or business centers which depends on tourism. This will directly or indirectly affect the occupation of local people.

Increase of income of local people: The development of overall tourism industries and the new tourist spot will increase the income of local people. It will help to solve the unemployment problem of the common people, improve their livelihood and generate unconventional new source of income.

Infrastructural growth: The development of new tourist spot will directly or indirectly contribute to the infrastructural growth like road, hospital, market, school, business centers etc.

Poverty alleviation and proliferation of health and educational support: This will help in poverty alleviation and proliferation of health and educational support for local people of Sikkim. Spreading the tourism industries will support for alleviation of poverty.

5. Conclusion

The present study deals with presentation of a conceptual archeture for better tourism development and planning and promotion using RS and GIS technique. Two conceptual design such as destination fetching using RS and GIS based SDSS modelling and advertisement and promotion of tourism using geoportal based web-GIS technique are discussed. Implementation of this methodology is very much required to solve the problem faced by the present day tourism industry. New tourist spot can be find out for tourism development and a detail plane of infrastructural development can be made. The geoportal concept will improve the tourism promotion and attract the people which will facilitate the tourism development. Government agencies, private sector and local people will be benifited if the this concept is implemented.

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