A Web-based GIS for Tourism Administration in Kerala

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Abstract

Geographic Information systems are used widely for Tourism administration in several countries, but not especially true in Kerala scenario. This paper attempts to present a GIS model for tourism administration in Kerala. Various applications of Tourism based GIS in the international arena have been examined in this paper. Data collected from different sources reveals the present status of Tourism GISs world over. The study focuses on areas where GIS can be applied in Kerala Tourism and gives outputs that can be generated using the proposed model. Tourism is essentially a cartographic phenomenon. In this context this paper assumes importance as various devices, both wired and wireless are increasingly used to accesses cartographic information. With internet becoming an unavoidable component of modern day life, map based information is the need of the hour. A web based GIS will benefit Kerala tourism in the coming years. The model proposed in this paper can act as a foundation for building a web based GIS for Kerala tourism.

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Introduction

Tourism is a spatial phenomenon which uses maps for tracking, interpreting, analyzing and refining data. A great deal of information is present in maps which cannot be easily analysed. Also, maps of various kinds are in use. The greatest problem faced by travelers and planners is the huge size of maps and its storage. With maps, information gets outdated over the years. Some of the maps which were created before the digital era had lot of errors and deficiencies. Rectifying these errors and updating information manually is not an easy task.

Here is where GIS can play a crucial role. GIS allows the user to view, understand, query, interpret and visualize data in many ways. Also updating and editing digital maps becomes easy as digitization techniques and GIS tools have become popular. Previously, only large organizations could afford to buy the GIS software required for this. With the advent of FOSS (Free and Open Source Software), GIS software is now available free of cost. Due to this smaller organizations have also started using this technology.

Patterns, relationships and trends can be analysed using digitized maps. Digitalization of maps essentially involves demarcating, say- the co-ordinates around a monument, tourist attraction or a hotel using a GPS device. This device links the physical location via a satellite and returns the latitude and longitude of a point on the earth's surface. Thus the co-ordintates associated with the boundaries (ie, four points or corners) around a specific spot can be obtained. This is transferred onto the digitized map along with details such as places around the location, roads, buildings, landmarks etc. Maps gain in value through acquisition of such data. Finally different themes are added as layers such as networks (roads, railway lines and water ways), points and polygons. The same process is used worldwide to solve problems applying GIS.

Kerala tourism does not have a full fledged GIS based Web application. This is a much needed addition to the existing website. Kerala tourism can harness the power of GIS to digitize the various maps available and use it in a web based application. The application in the Kerala tourism website which comes close to a GIS based solution suited to a specific need is the itinerary planner.

But this is not a standalone web based application. GIS has been used by many departments in the state like revenue, land survey, PWD, Water Authority and KSEB. Data available from these sources can be used to supplement tourist data. This can include roads, railway lines, district headquarters, sanctuaries etc.

The field of tourism has a lot to gain by using GIS since this technology has the ability to manipulate data and spatial attributes (Boyd & Butler, 1996). This means that GIS will be useful in creating tourism resource inventories (Baher & White, 1999). It is in this context that this can be used as an effective tool by Kerala tourism. Developing a GIS based model for Tourism Administration will hold the key to attracting more tourists to the state. A web based application with the appropriate hardware and software has to be designed and developed. This paper examines the present web based applications of GIS in the international scenario and its ramifications in the Kerala context.

Statement of the Problem

The problem stems from the fact that GIS, though used worldwide over the last two decades, is still not used in Kerala tourism effectively. Even though large volumes of data exist, they have not yet been thematically mapped using a GIS. This requires a great deal of expertise and tools in digitization, processing and incorporation of data into digitized maps. One of the main problems the implementing agency may face is obtaining reliable maps. Some map outlines are available as satellite images in websites such as www.mapsofindia.com. The difficulty lies in mapping every minute details such as tourist places, hotels, kiosks, railway/bus stations, tourist information centres etc. All this initial processes have to be completed before developing the application. Experts can be called upon once this is completed. The digitized map becomes richer and more useful when more themes are added. After completing the integration of the data and maps, this can be used as a desktop application or a web based one. This can be used as a value added service through the Kerala tourism website.

Review of Literature

GIS uses spatially referenced or geographical data. It uses various management and analysis tools on these data. The department of environment (1987) lists the capabilities that a well designed GIS should be able to provide and they are: 1. Quick and easy access to large volumes of data. 2. Ability to a) select details by area or theme b) Link or merge one data set with another c) Analyse spatial characteristics of data. d) Search for a particular characteristic or features of an area e) Update data quickly and cheaply   f) Model data and assess alternatives. 3. Output capabilities (maps, graphs, address lists and summary statistics) tailored to meet particular needs. In short GIS can be used to add value to spatial data (Heywood et al, 2010). GIS and map analysis developments began around the same time as related developments in computer cartography and spatial statistics began. These were promoted by the limitations of hard copy maps, problems with overlaying data sets and the increasing size and number of available datasets (Tomlinson, 2005).

By using automated mapping, a spatial framework to support decisions making can be implemented. For intelligent use of resources and managing both map made and natural resources such systems can be used. GIS provides a platform for quick decision making. GIS is being used widely in Tourism administration internationally. Stakeholders can get immediate feedback on the implications of their choices and reach consensus on outcomes quickly (Allen & Goers, 2002). GIS can be used for tourism planning. It is a long term process of readying a destination for tourists or improving the destination's attractiveness to tourists (Fridgen, 1991). It has been demonstrated that the applications of GIS in the identification of areas suitable for ecotourism is a reality (Boyd & Butler et al, 1996). The various applications of GIS such as data integration and management have in terms of planning, sustainability and development been demonstrated (Bahaire & Elliot-White, 1999). GIS can be used to determine the effects of the site on the surrounding environment and ecosystems, thus enabling the planner to minimize the potential negative impacts on the facility (McAdam, 1999). GIS can also be used to maximize the potential economic success of a

facility by incorporating market and economic demography into the evaluation of the sites (Walford, 2001).

A study reveals that the success of any tourism venture is based on three factors namely Tourism planning, Tourism development and research and Tourism marketing (Fridgen, 1991). It has been established that there is a direct link between tourism and cartography. (Arrgaon & Wessels , 1994). GIS could serve as a powerful tool in tourism management (Weiner, Warner & Levin, 1996). Information and communication technology (ICT) plays a key part in assisting DMOs in their operations, with important functions both in networking and local organization and in promoting destination brand and product in the global market. The Internet revolution has obviously impacted these activities strongly and DMOs have transferred much activity from traditional (mainly printed) media to the net (Buhalis, 2008).

GIS is widely used in Decision Support System (DSS). The idea of Spatial Decision Support System (SDSS) evolved in mid-1980s (Amstrong et al, 1986). The main characteristics of spatial decision problem include a) Large number of decision alternatives b) The outcome or consequences of the decision alternatives are spatially variable c) Each alternative is evaluated on the basis of multiple criteria d) Some of the criteria may be qualitative while others may be quantitative e) There are typically more than one decision maker (or interest group) involved in decision making process f) The decision makers have different preferences with respect to the relative importance of evaluation criteria or decision consequences g) The decisions are often surrounded by uncertainty, (Laurin & Thompson, 1992).

GIS Model Discussion

Geographical data essentially involves the use of spatial co-ordinates. Thus it is easy to visualize geographic data and evaluate the various options available. Tourism has been greatly benefited by use of visually appealing imageries. This has increased the destination's market value. Thus GIS can be used to filter data and later present the same visually through a linking mechanism such as website. A tourism GIS deals primarily three types of data.

- Relational or structured data

- Data based on multimedia

- Spatial data

Relational data may contain numeric, textual or date type information. The name of a hotel or a wild life sanctuary may be one of this. Multimedia data may contain audio - both narration and music- videos, pictures etc which may be related to a tourism spot. Spatial data are of two types, vector and raster formats. Vector format is ideally suited to represent data for separate individual spatial objects. Raster format is used to represent continuous spaces, terrain and wide spaces such as a lake or a wild life sanctuary.

To manage tourism resources effectively (eg. back waters, hill stations, rivers, beaches etc) for planning, execution and evaluation of projects, right information is the need of the hour. This is important for policy makers, administrators and other stake holders (both public and private). The geographical details of terrain and land use are difficult to monitor. This can be solved by using a web based GIS application. GIS can handle both spatial and attribute data. There is a direct link between these two in GIS. The study focuses on developing a web based GIS solution to support tourism planning, marketing and development in the state of Kerala.

As stated earlier, there are a number of databases available with each department in the state. Linking these databases holds the key to effective tourism administration. The managers of these databases have to be brought under a common umbrella for this. It is seen that Kerala tourism does not have an IT based policy decision support system. The proposed system can have databases related to tourism attractions, hospitality, tourism statistics, laws and private/public stake holders. The first three databases are available with the Department of tourism. The next two, namely laws and private/public state holders have to be developed with inputs from the stake holders. The other layers in addition to the basic infrastructure should include transportation, land use and terrain maps. The tourism resources can be further classified based on priority.
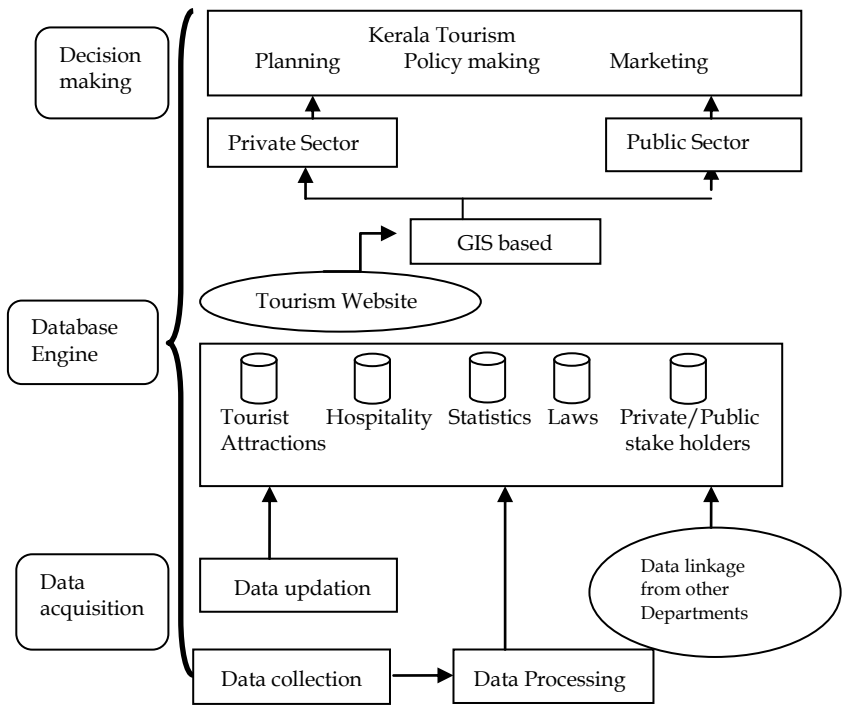
Fig. 1 The proposed model

This model depicts three levels

1. Data acquisition level – This involves data collection, formatting of data and processing. This data is uploaded and updated at regular intervals

2. Database engine – This layer is the most important part of the proposed system. This consists of five databases, namely, tourist attractions, hospitality, statistics, laws private/public stake holders and investors. Each database consists of appropriate fields as shown in figure. This database is connected to other databases from other departments.

3. The third layer is the GIS interface which consists of the following

    a) WINDOWS Internet Information Server (IIS) or Apache Tomcat Server

    b) Scripting module consisting of Action Script, Map Script, JavaScript and CSS – Cascading Style sheet

4. Database consisting of POSTGRESQL

Since Kerala tourism relies heavily on private sector participation in addition to Governmental agencies, both the sectors can be part of the design process. At the top level tourism policy makers, planning officers and marketing heads can use the outputs for decision making. This is in addition to various other outputs that can be generated. Using this model, it is possible to answer questions pertaining to location, trends and patterns.

Creation of databases

The creation of databases in a GIS involves

Acquiring maps (graphical format) of Kerala including terrain and the various layers

    a) Cross checking the exact location of tourist destinations and their relative positions (The source map has to be reliable)

    b) Converting paper maps to digitized format

    c) Error checking and correction

    d) Establishing relationship between map features by creating a topology

    e) Transforming points to real world co-ordinates

Database specifications

The shape files database contains various tables as shown below. The database specifications of the GIS shape files are as given below. Seven tables are listed

Table 1 Kerala Map.dbf

Name	Type	Width
map_id	Number	15
shape	Auto	
sname	Text	25
district_id	Number	15
date_created	Date	8

The above table contains the details of keralamap.shp shape file. It gives the overall diagram of the state of Kerala.

Table 2 District Map.dbf

Name	Type	Width
Map_id	Number	15
Shape	Auto	
District_id	Number	10
Districtname	Text	30
District_hq	String	30
Area	Number	20
Population	Number	20
Hotel_id	Number	20
Destination_id	Number	10

There are fourteen districts in Kerala. The above table contains touristic information about these districts

Table 3 Destination.dbf

Name	Type	Width
Destination_id	Number	15
Shape	Auto	
Dest_name	Text	30
Dest_type	Text	30
Hotlink	String	100
District_id	Number	15
Description	memo	
Tourist_id	Text	20

The above table contains details of each destination

Table 4 Hotels.dbf

Name	Type	Width
Hotel_id	Number	10
Hotel name	Text	30
Address	Memo	
No_of_rooms	Number	5
Classification	Text	15
Tourist_id	Text	20

Details of various hotels/resorts in the state are given in the above table

Table 5 Statistics.dbf

Name	Type	Width
District_id	Number	10
Domestic	Number	15
International	Number	15
Nationality	Text	20
Date_of_visit	Date	8
Date_of_return	Date	8
Tourist_id	Text	20

The above table contains the statistical details of the tourists both domestic and international

Table 6 Travelagency.dbf

Name	Type	Width
Agency_id	Number	8
Agency_name	Text	15
Address	Memo	
Telephone	Text	15

There are a number of travel agencies distributed all over the state. The above table contains their details.

Table 7 Touroperator.dbf

Name	Type	Width
Operator_id	Number	8
Operator_name	Text	15
Address	Memon	
Telephone	Text	15

The details of tour operators in the state are given in the above table.

There are a number of additional tables which may be appended to the database. The database can be created in MS-ACCESS or ORACLE.

Attribute data and multimedia content

If a tourist wishes to view the rooms in a resort, this can be done by giving images, video tour etc. Also a short commentary with audio clipping can be provided.

For this the following have to be done

   a. Compiling and adding text to tables
   b. The text should be connected to images and video clips
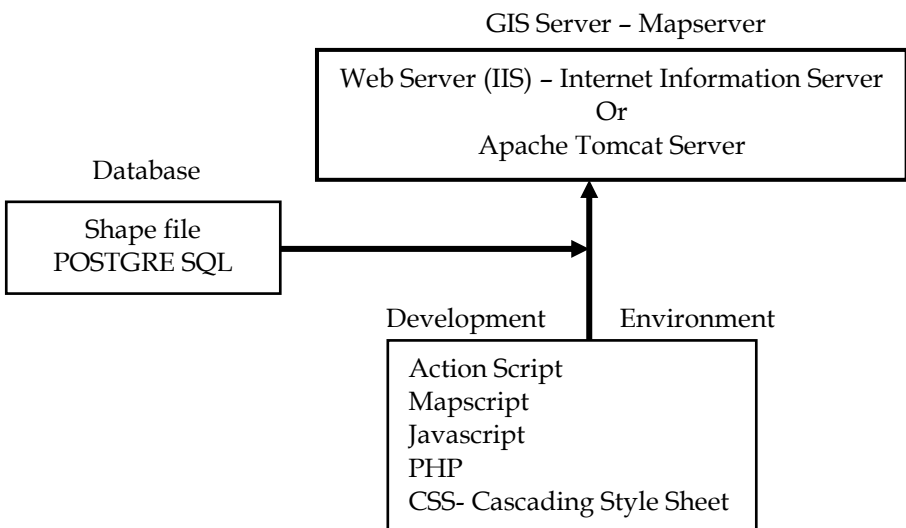   c. Also links to websites (say that of hotel) can be provided

GIS Server – Mapserver

Web Server (IIS) – Internet Information Server
Or
Apache Tomcat Server

Database

Shape file
POSTGRE SQL

Development   Environment

Action Script
Mapscript
Javascript
PHP
CSS- Cascading Style Sheet
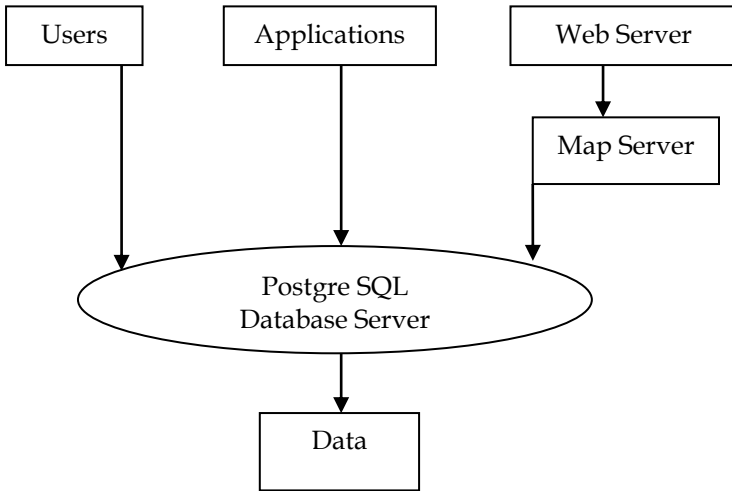
Fig. 2 GIS Interface
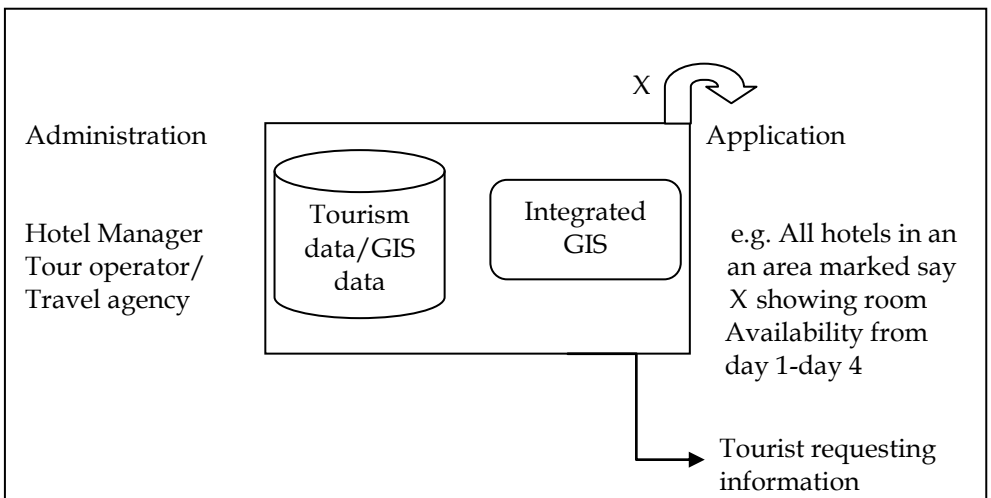
Fig. 3 Data flow in a GIS Interface

Fig. 4 an Integrated GIS System

Findings and Suggestions

During the study, academicians and practitioners of GIS were interviewed. Also, questionnaires were used to collect primary data.

The findings are as follows:

a. Applications of GIS were minimal in the Tourism scenario in Kerala

b. In the International arena GIS is used in Tourism on a large scale

c. GIS has been used for Tourism planning, Tourism marketing and to a limited extend in Tourism Policy formulation

d. The outputs generated out of a Tourism based GIS includes finding the shortest route, trip planning, representation of Tourist places and infrastructure facilities

e. The different analysis performed using a GIS involves finding out potential tourism destinations in a buffer area, distance, finding tourist arrivals based on nationality. In the case of domestic tourists it involves break up of arrivals state wise.

f. Formulation of special tourism packages in international scenario is a reality using GIS

g. 90% of respondents were of the opinion that web based GIS is a must for Tourism Administration

Suggestions

a. It is high time that Kerala Tourism Introduced a web based GIS for Tourism Administration

b. Different types of reports created from the GIS will help the top, middle and bottom level managers in taking appropriate actions and decisions.

c. Investors can be asked to use the official website of Kerala Tourism with a web enabled interface to use their resources judiciously.

d. Tourism laws can be framed based on the analyses performed using the GIS based systems.

e. Tourism Planning, Tourism marketing, and Tourism policy formulation can be made more effective by implementing this system.

f. The GIS proposed can be implemented in wireless web enabled device to widen the reach of the system and help administration.

Conclusion

Tourism and cartography go hand in hand. In the modern age IT enabled systems have replaced the traditional ways of information processing. GIS based systems offer a plethora of opportunities for the stake holders and administrators in Tourism. Kerala tourism has used IT to some extent in marketing its resources. Using a web enabled GIS, Kerala Tourism can strengthen its position in the global market. Using such a system, all the players including the general public can be benefitted. This paper has presented a GIS based system for Tourism administration in Kerala. Also the proposed model has been discussed in detail. With Tourism being the back bone of the economy of Kerala, using a GIS based model for Tourism administration will take Kerala Tourism to greater heights.

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