

# Application of Geospatial Technology for the Promotion of Tourist Industry in Srinagar City

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## **Abstract**

*Tourism is a relaxation place for people and people can plan their tourist places based on Information. GIS -based information is gaining greater importance among tourists as it allows to familiarize with places, have profound appeal for the trip planning. Srinagar city is famous tourist destination of India, visited by huge number of tourists from different parts of the world annually. The number of tourists visited the city in 1990 was 10623 which increased to 112012 in 2000 and in year 2013 more than 13 lakh, the number can be dramatically increased, given the nature of tourism potential of the city. But in the absence of Tourist Information System, tourists face various difficulties in locating various tourist related products. The Geospatial technology has transformed every sphere of life and tourism industry cannot be exception. The purpose of the present study is to develop an interactive and user-friendly Geographic Information System (GIS) enabled data base for various amenities viz. hotels, guest houses, house boats, road networks, airport, railway station, parks, shrines, play grounds, golf course, water bodies etc. in ESRI's ArcGIS 10.1 software which could be easily uploaded on web to disseminate proper information to world over. Toposheets, maps satellite images, GPS and field surveys were used to generate the above mentioned data layers and then multimedia data like video clips, audio narrations and photographs were integrated with each feature to make comprehensive tourist information system. A major strength of this paper is that TIS is one time investment and can be updated as and when needed. It provides tools to display raw data in the form of 3D maps, SQL, understand Patterns, relationships and trends and overlay those databases in highly interactive ways which is not possible with traditional spreadsheets. The present study actively demonstrated the potential of geospatial technology application to explore destination and its facilities like hospitals, ATM Centers, hotels, restaurants, resorts and filling stations etc. and developmental planning, project monitoring and publicity of tourist products. The present study can be indispensable for other allied departments' viz police, planning, public administration, disaster management, transportation, health etc.*

**Keywords:** *GIS, GIS, TIS Srinagar City, Tourism, House boats, Tourism Potential, Interactive*

## **1. Introduction**

Tourism is an industry with one of the strongest effect on the economy, because it helps in developing other sectors through multiplier effect. It is a composite of activities, facilities, services and industries that deliver a travel experience i.e. transportation, accommodation, eating and drinking establishments, entertainment, recreation, historical and cultural experiences, destination attractions, shopping and other services available to travelers away from home. In other words, tourism is defined

as sum of the phenomenon and relationships arising from the interaction of tourist and host communities in the process of attracting and hosting these tourists [1]. This definition shows that tourism is interactive in nature, geography is essentially a pivotal base of tourism, and because of this geographical base it offers fascinating environment for geographers and GIS experts to analyze different components of tourism in spatial context. Today's world is profoundly affected by the Information Communication Technology (ICT) revolution, which has enabled information and knowledge circulation at an unprecedented speed, changing all aspects of life and economic, political and socio-cultural mosaic of the world. In this information era, it is the ability of a country to use information and communication technology effectively and efficiently that increasingly determines the relevance and competitiveness of a country in the global economy.

Geographical Information System (GIS) is an integral part of information system and form a chain of operations from a survey, collection to storage, analysis and output of spatial information for supporting decision-making [2]. Sustainable tourism is rightly known as a catalyst for overall development of developing part of the world, on account of this it has attracted the interest of governments, communities and researchers, all these stake holders have reached to consensus that tourism needs to be developed in a planned way and Geographical Information System (GIS) can assist as a decision support system for planning strategies. Geographical Information Systems (GIS) integrates hardware, software, and data for capturing, managing, analyzing, and displaying all forms of geographically referenced information. Geographic Information Systems (GIS) and tourism share a common characteristic, that is, both cross the boundaries of disciplines and application areas. As such, the potential for GIS applications in tourism is significant. Geographical Information Systems (GIS) facilitate a toolbox of techniques and technologies of wide applicability to the achievement of sustainable tourism promotion and development. It has got diverse application, for instance, GIS has been implemented as a vital tool by a wide range of activities such as environmental planning, property management, infrastructure setting, emergency event planning, automobile navigation systems, urban studies, market analyses, and business demographics [3]. The application of GIS in tourism have dramatically increased recently *i.e.* park management, facility monitoring, visual resource assessment, and identifying suitable areas for developing tourism activities. Web GIS is a geographic information system distributed across a network of computer environment to integrate, disseminate and communicate geographic information visually on the World Wide Web (WWW) [4]. In recent times Public Participation Geographic Information System (PPGIS) has become an effective tool for tourism development, planning and monitoring because the method is place-based, cost effective and provides tighter coupling with land use planning controls such as zoning [5]. Moreover GIS technology can be a valuable tool for investigating specific questions that pertain to tourism development including location, condition of the area, trends and changes, routing to and through the site, and patterns associated with resource use [6] and can be potentially employed to provide: digital basic map, digital files for analyzing and mapping, digital files for mobile mapping and modeling, digital multimedia for promotion of tourism industry, government strategy and decision making [7].

## 2. Tourist Potential of Srinagar City

Srinagar city, located in the heart of picturesque Kashmir valley, is one of the most beautiful cities in Indian subcontinent in terms of natural splendor. The city embodies the poetry of nature, which no human language can interpret in words, natural beauty of the city not only lies in Majestic ice capped mountains, invigorating climate, verdant woods, lively rivers and fresh water lakes which form the landscape of this wonderland, but the tourist attraction equally lies in its cultural heritage as well. The Mughal emperor Jahangir was so captivated by the beauty of this land that he exclaimed “*Gar firdaus, bar ruhe zamin ast, hamin asto, hamin asto, hamin ast*”. (If there is a heaven on earth, it’s here, it’s here, and it’s here). It has achieved fame of paradise on earth because of its scintillating natural beauty numerous, Mughal gardens, crystal clear springs, and historical monuments. Undoubtedly, one of the most attractive scenic spot of the city is Dal Lake. It is the main source of attraction for tourist, it has been described as the “Lake Par excellence” and “Jewel in the crown of the valley” of Kashmir. The Dal Lake is also known for its magnificent house boats which are provide fascinating tranquil environment to tourist.

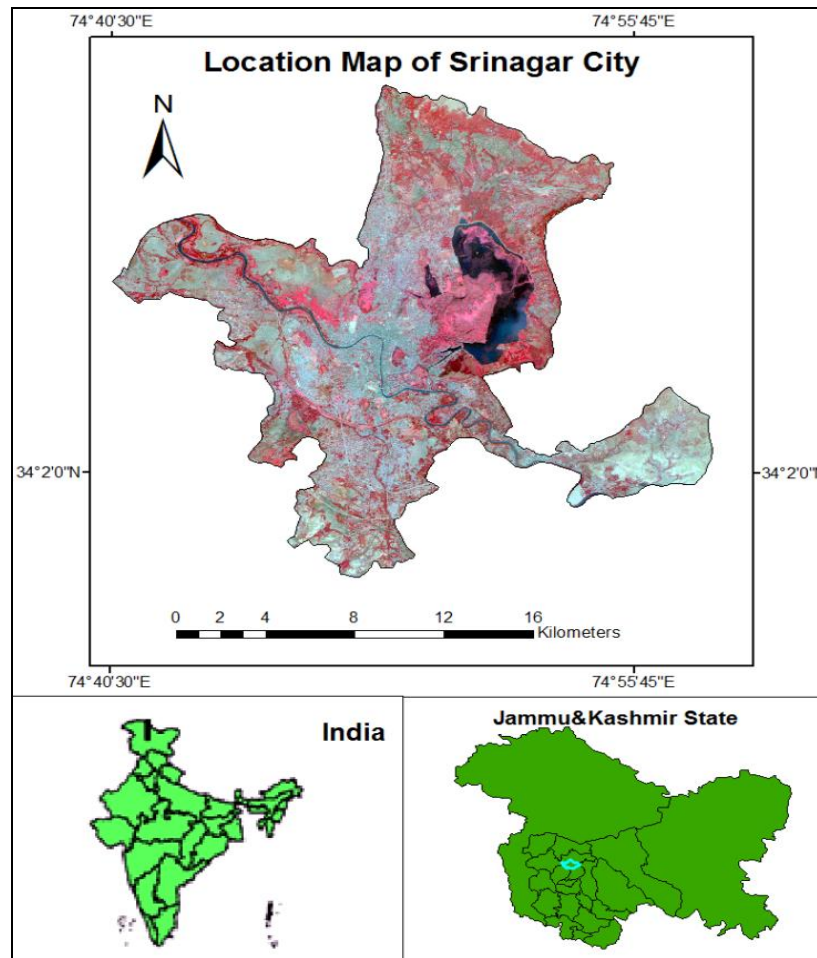


Figure 1.



**Figure 2. Magnificent Zabarwan Mountains**



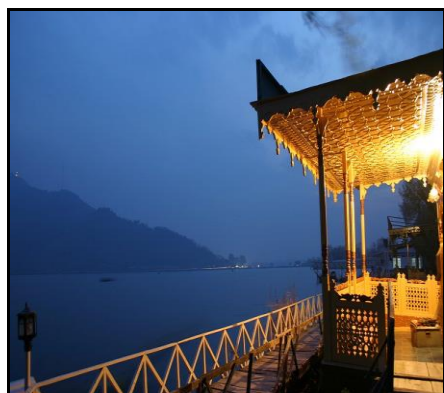
**Figure 3. Blooming Tulip Garden**



**Figure 4. View of Spring Season in Srinagar**



**Figure 5. Botanical Garden**



**Figure 6. Evening View of Dal Lake**



**Figure 7. Hazratbal Dargrah Shrine**

### 3. Use of GIS Technology in Tourism Planning

Spatial or geographical data refers to a known location on the Earth's surface, which is usually expressed as a grid coordinate or in degrees of latitude and longitude. Most organizations make use of implicit geographical references as place names, addresses, postcodes, and road numbers and so on; implicit spatial references can usually be geo-coded into explicit spatial references. Technological advance, particularly in software and hardware, has resulted in the development of systems which provide a range of searching, querying, presentation and analytical functions in a more user-friendly manner. Travel preferences are often hidden and are not explicitly known when users start to plan their trips, particularly if visiting an unfamiliar place [8]. According to [9] there has always been a direct relationship between tourism and cartography. Tourism is concerned with travelling between close and distant places and maps are an important aid for location of these places, therefore it is more concerned with maps and thematic information than other industries. Maps of travel routes and general information about the areas to visit are used in selecting the destination, planning travel and accommodation *etc.* Therefore Tourist Information System should contain a large amount of detailed up-to-date information about the destinations [10-11]. As [12] describes various GIS enabled three dimensional (3D) geovisualization methods for dealing with the spatio-temporal dimensions of travel patterns at the same time while avoiding the interpretative complexity of multivariate pattern generalization or recognition methods. Varied inputs of information on destinations may play a major role on tourists' choice and preferences [13] and Internet being a privileged tool can accomplish this task by information diffusion [14-15].

The decision to adopt tourism as an agent of development has been largely based on the expectation that tourism can increase foreign exchange earnings, create employment, attract foreign investment, and positively contribute to local economies and the national balance of payments [16]. Since the success of any tourism business in any destination is determined by tourism planning, tourism development, research and tourism marketing. Some of the key features of GIS that could benefit tourism planning include their ability to manipulate data and spatial attributes [17], and provide necessary value added information [18-19], the ease in allocating resources between what are often conflicting demands [20] their adaptability in requirements, needs and data changes over time [21] and their ability to identify patterns and spatial relationships [19]. Although the number of GIS applications in tourism and recreation management and planning are increasing, there are still many more potential opportunities [22] but tourism resource inventory is one of the very first and basic applications, such inventories may be further used for resource management, resource allocation and land use planning decisions [20]. Tourism marketing is another fascinating area where in geodemographics and lifestyle analysis can be performed by a GIS, which actually have a significant contribution in the needs of postmodern tourism marketing [23]. Therefore, managers, entrepreneurs and other stakeholders responsible for tourism marketing could be benefited from GIS in order to locate and analyze the characteristics of potential customers. The synthesizing of environmental, social and economic parameters in GIS format is easily possible, because GIS an integrating technology capable of working along with other technologies, such as remote sensing, GPS, CAD *etc.*, which could further facilitate more tools to sustainable tourism planning and marketing. Another competitive advantage of GIS technology is its addictiveness to add or remove thematic layers, constraints and data, in order to make

dynamic analysis. [21]. Furthermore Service Oriented Architecture (SOA) can be applied to re-manage the GIS resources and provide a dynamic, and reliable service system that could meet information and service requirements of different users over the internet instantly [24]. The Internet development contributed to the growing importance of GIS in various areas opening new perspectives for people who need to use spatial data [25], when making decisions, planning, analyzing the effect of changes, looking for patterns, etc. we may look at maps, tables, charts, lists, graphs and reports, and sometimes it is rather difficult or nearly impossible to pull all these sources of information together and make sense out of them.

Geographic Information Systems (GIS) however, have the capability to handle several kinds of information that can be related to a location or area. Using Geographic Information Systems (GIS), therefore, it becomes possible to integrate tourism information, visualize complex scenarios, present powerful ideas and derive effective solutions, otherwise not possible. Geographic Information Systems (GIS), allow the user to enter enquire to explore maps, analyze geographic locations, retrieve the information linked to these locations and download and print out of required information. The utility of the Internet allows information to be exchanged in a rapid and efficient manner, thereby helping tourists make important decisions. The database created in GIS format will answer following frequently asked question in user friendly manner.

- Where are the tourist destinations located?
- What is the shortest route to reach a particular destination?
- How is the geophysical environment of the destination?
- What is the best time of year to visit?
- What are types and class of accommodation available?
- What are distributional pattern of amenities and tourist products?
- Where are important shopping centers, ATM, parks etc. located?

#### **4. Objectives**

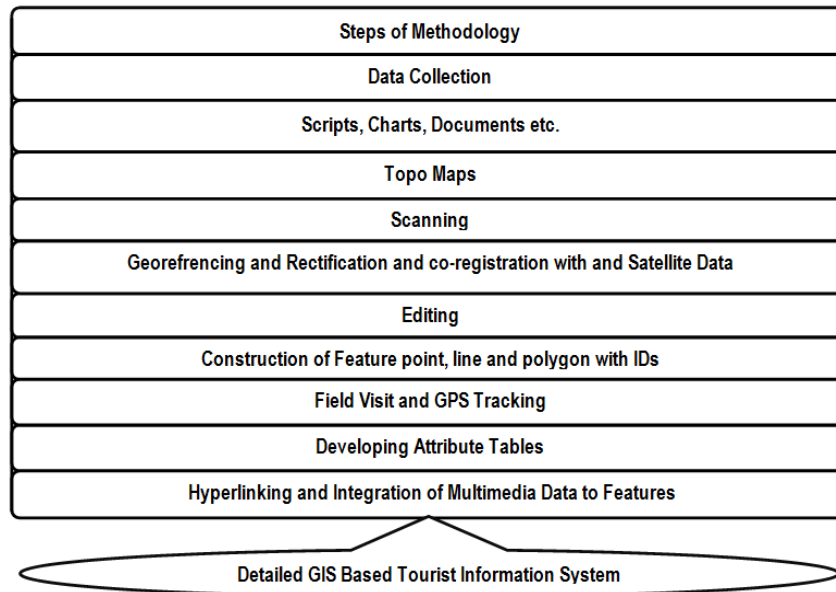
The study has been carried out with following objectives.

1. To develop geospatial enabled inventory of existing Tourist infrastructures of the city.
2. To provide awareness of the existence of Tourist products and related infrastructure to the visitors and concerned planners in a digital format

#### **5. Materials and Methods**

Base map of the Srinagar city was generated from scanned survey of India Toposheets bearing code number J12, J16 and K13 which were georeferenced and mosaic and co-registered with CARTO-SAT-1 satellite data (2.5 meter spatial resolution) and IRS LISS III satellite data (24.5 meter spatial resolution) satellite image of year 2012 in *Esri's Arc-GIS 10.1* to support the existing ground level situation. *Carto-Dem version-1*, was used for developing terrain, slope, aspect and drainage etc. Subsequently various thematic layers were generated *i.e.*, existing land use, road network, water bodies etc. Data regarding hotels, guest houses, house boats, restaurants, Dahbas, tea stalls, cool points, gardens, play grounds, fishing areas, parking zones and taxi stands, banks, ATMs, hospitals, shrines, colleges, fire stations, monuments etc. were obtained from various authorities. Subsequently the researchers moved round the

Srinagar city from 15 march 2012 to 15 July 2012 (four months) for field survey for detecting the location of above mentioned features with a handheld Global Positioning System (GPS) to validate and also update existence attribute information of each feature. Attribute information of all features were compiled and in addition photographs and audio and video descriptions have been hyperlinked to each feature. The audio narrations generally include a brief history of the feature, importance, available facilities and other potential expectations that a visitor could expect to know. Reliable sources of literature are used as a base for making the descriptions about the tourist products. The data base synthesized in this study, can be easily uploaded on web either using ArcGIS server or ArcGIS online to respond to the tourist’s query through easiest and the fastest icons and signs.

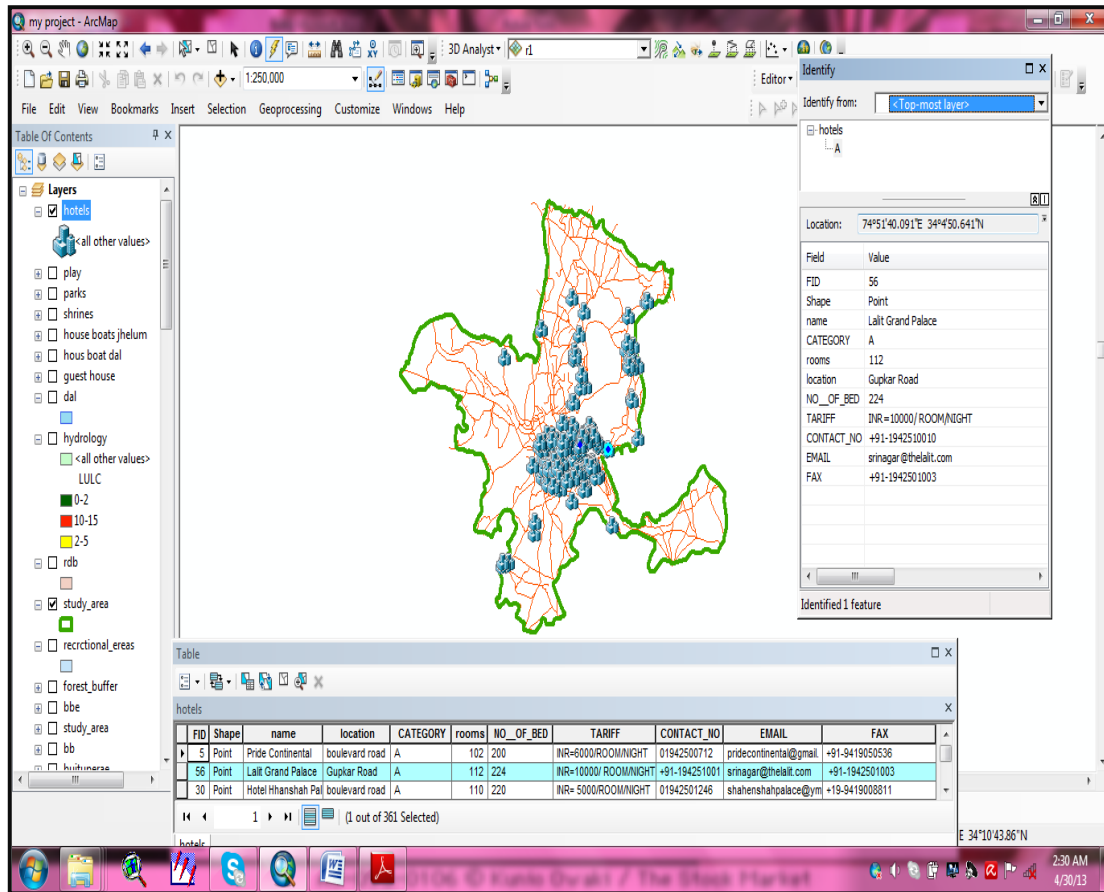


**Figure 8. Schematic Representation of Methodology Followed in the Study**

## 6. Analysis and Discussion

### 6.1. Distributional Pattern of Amenities

Spatial pattern is the manner of arrangement of events in space or simply how spatial feature are distributed. A spatial pattern can be described as regular, random or clustered, which is the product of certain processes at a particular time and space [26]. Visualization is the process of creating and viewing graphical images of data with the aim of increasing human understanding [27]. It is based on the premise that humans are able to reason a learn more effectively in a visual setting than when using textual and numerical data [28]. Accommodation is basic requirement for gearing up the pace of tourism industry of any destination, presently there are 362 hotels comprising over 10399 rooms and with 20301 bed capacity. The figure shows that tourists can easily use the attribute table to select any hotel on basic location, category, facilities, type of food, tariff, and can finalize the accommodation process through email, phone, or fax which is also given in the table.

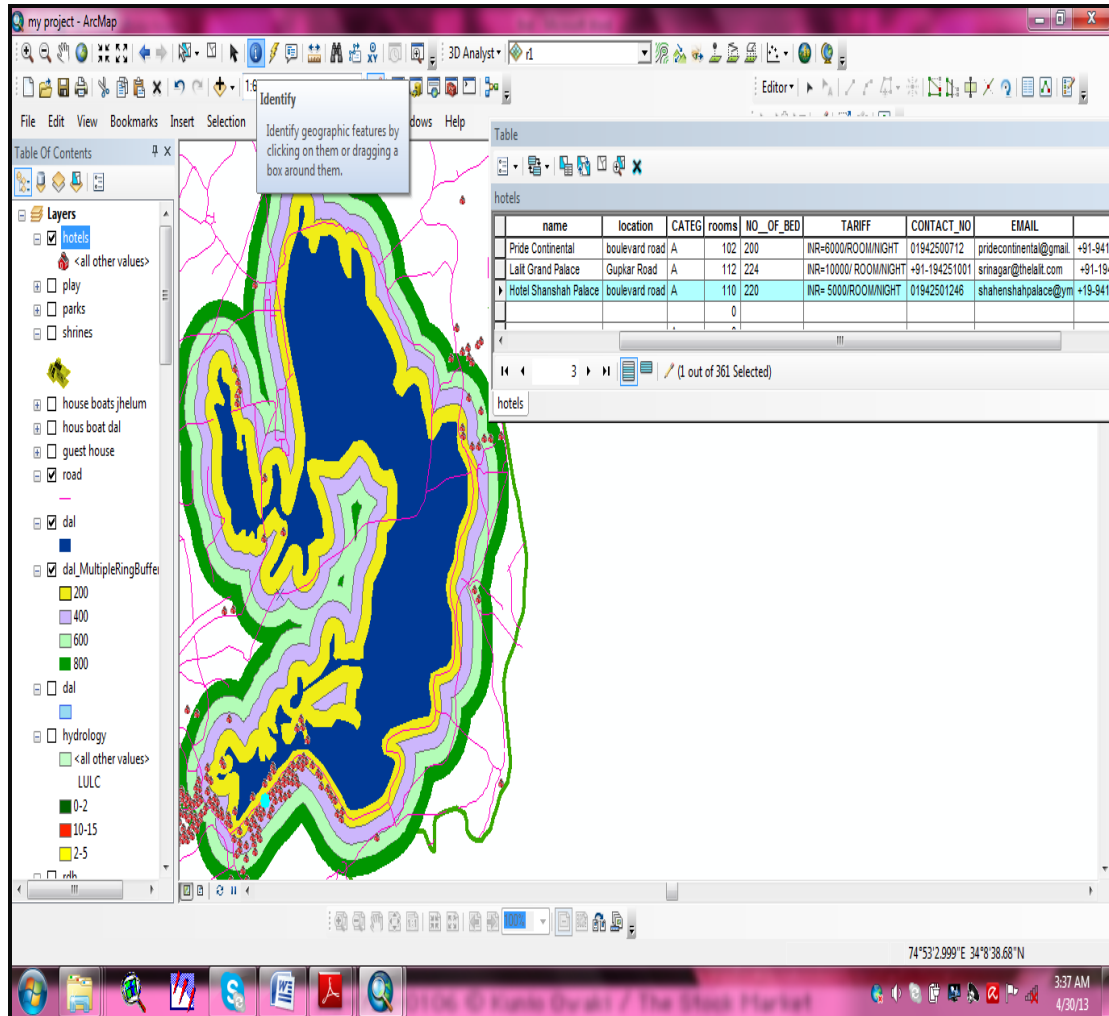


**Figure 9. Distributional Pattern of Amenities**

## 6.2. Identification of Preferred Accommodation

Srinagar city is blessed with much scenic beauty and unique geographical personality. Right through the middle of the city are two most beautiful lakes Dal Lake and Nigeen. Dal Lake is the particular focus of many domestic as well as international tourists. The houseboat offers an opportunity for tourists to escape into a world of overwhelming peace and tranquility. To visit Kashmir and miss Dal Lake house-boat experience is akin to ignoring Eiffel Tower in Paris and Statue of Liberty in New York, while being to these areas. The wish of every visitor is to have an accommodation in a hotel or guest house which should have close proximity to Dal Lake. In the map, an 800 meter buffer has been created around the lake at the interval of 200 meters, to make easier for the tourist to select accommodation at convenient distance from the lake.





**Figure 10. Application of Buffering Technique to Identify Preferred Accommodation**

### 6.3. Visualization of Shrines

In fact, Kashmir particularly Srinagar city has from times immemorial been the home of saints and renowned mystics. The numerous caves, temples, tombs, masques and shrines are living testimonials to corroborate the fact. Each and every shrine is unique, has a special importance in religious and socio-cultural fabrics, which could prove pillars of tourism industry of the city. The map portrays information of Hazratbal shrine which is famous for the holy relic of the Prophet Mohammad (PBUH) and therefore considered to be the most sacred to the Muslims. Multimedia data containing digital photos, audio and video files regarding the shrine can be easily visualized by tourists. Therefore such system can prove effective tool to popularize destination.

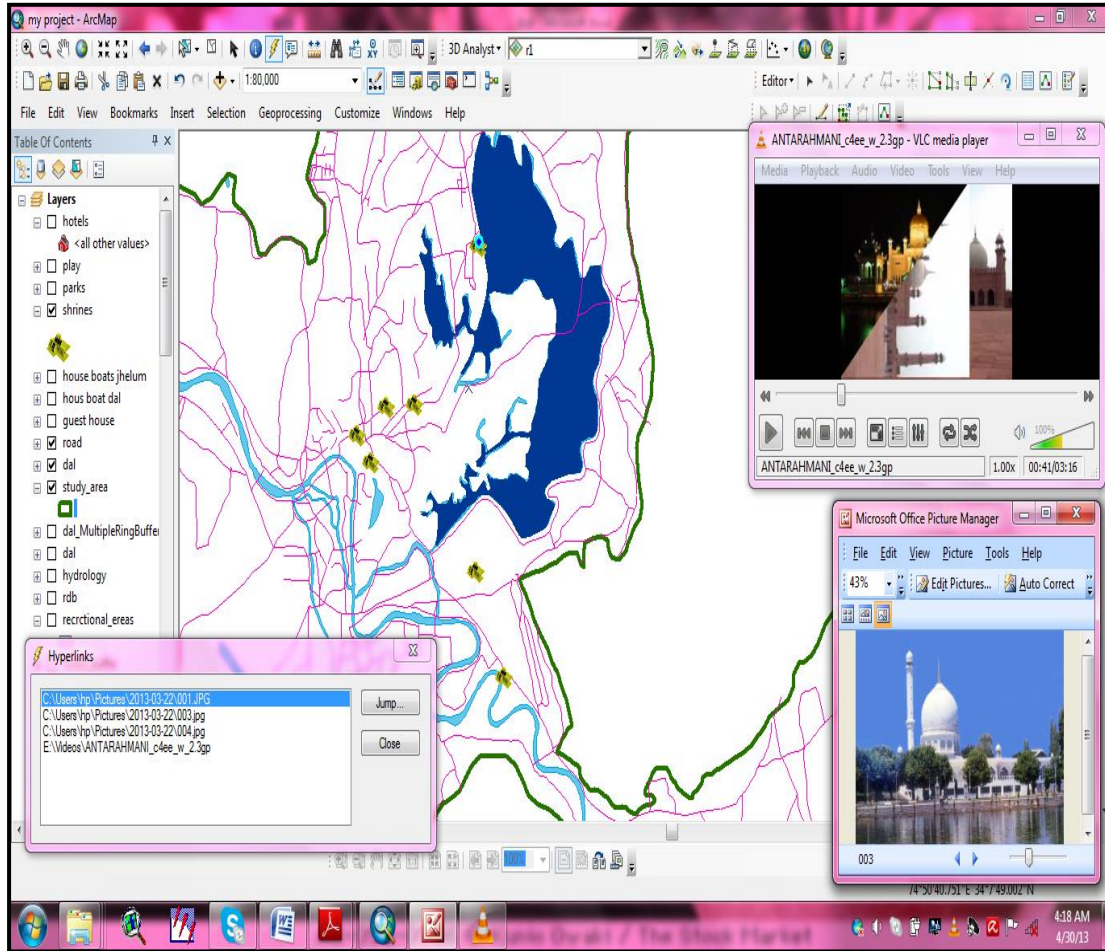


Figure 11. Interactive GIS and Multimedia Visualization of Shrines

#### 6.4. Visualization of Heritage Mughal Gardens

The Mughal Gardens are an important part of Kashmir's cultural heritage, which are located around banks of Dal Lake, developed by the great Mughals. Therefore due to their magnificent charm, the garden lures the attention of a number of travelers from different corners of the world and to visit the city. Tourists intending to visit Srinagar city can see videos and visualize the photographs regarding wonderful gardens, the figure portrays the show case of tulip garden, which is Asia's largest tulip garden. Since link between geographical data and multimedia data has been organized in such a user friendly manner, will definitely lure the attention of travelers from different corners of the world.

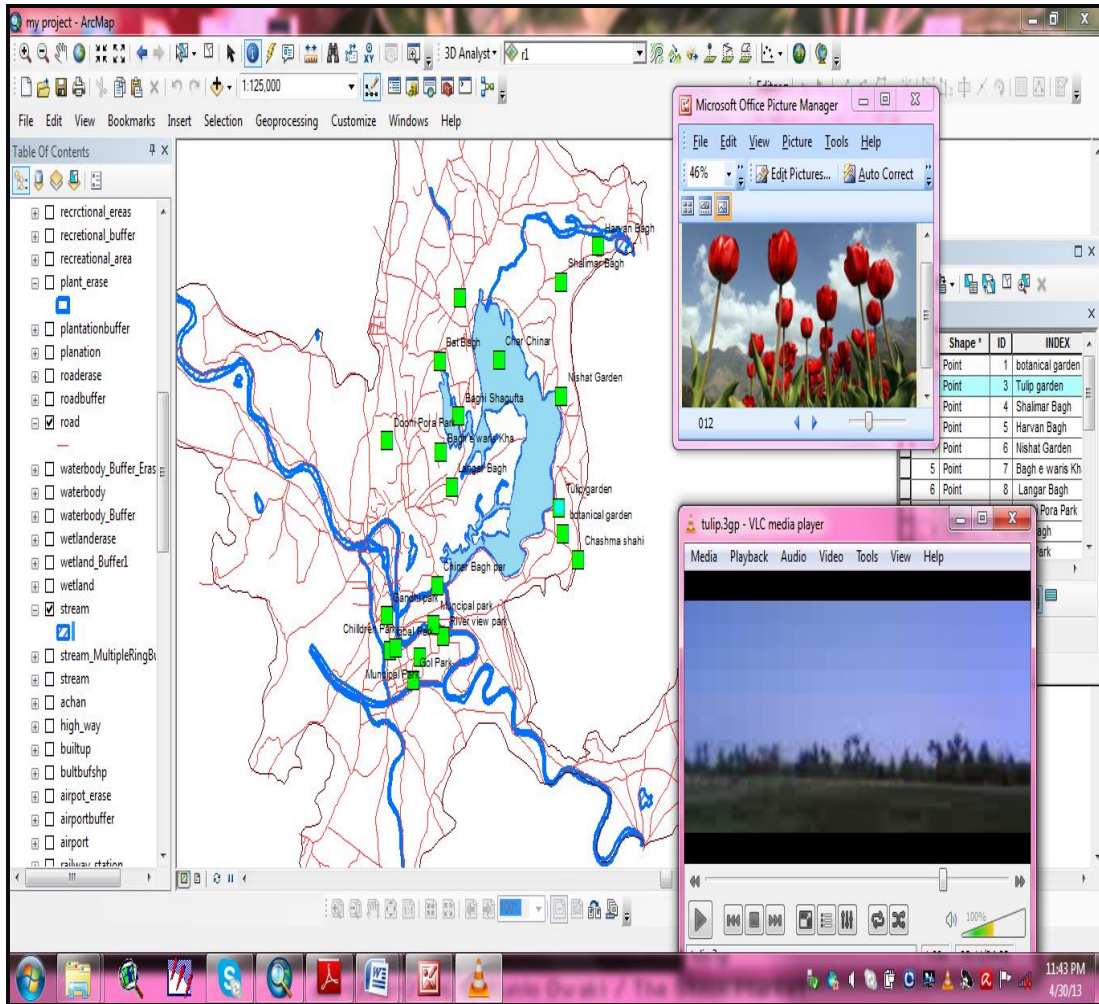
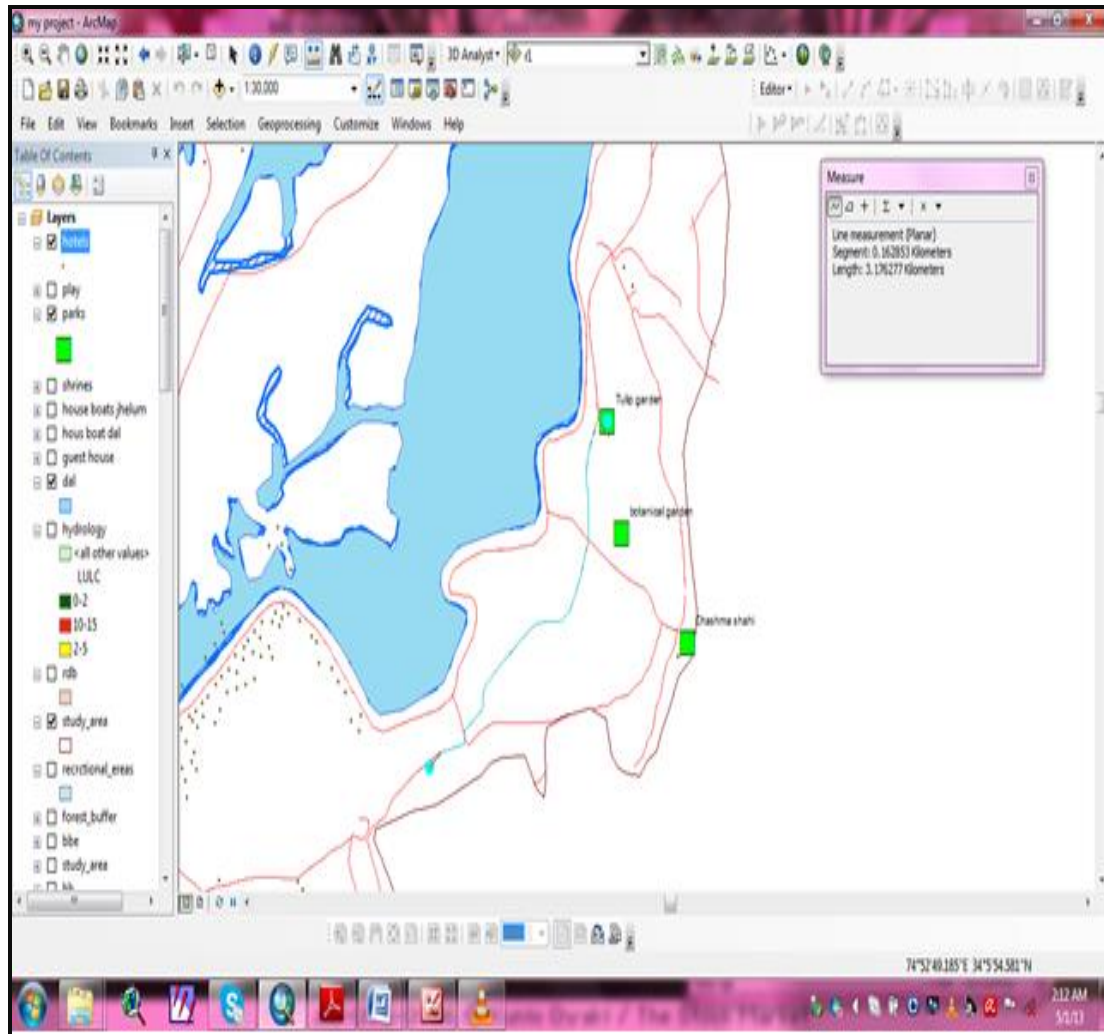


Figure 12. Interactive GIS and Multi Media Visualization of Heritage Mughal Gardens

### 6.5. Identify Shortest Route between Two Places

A traveler has limited spatial knowledge about the destination environment, and maps perform an essential function in the acquisition of spatial information about the travel destination. Web Based GIS Route Finder System that not only models and process the real road network to digital format but also provide user with different route finder options to ensure proper management of travel time, safety, reliability, passenger convenience and mitigating traffic congestion [29]. The figure shows how a tourist staying in Hotel Lalit Palace can select optimal route to reach the tulip garden. The distance can be easily measured as map show, the distance between the two places is 3.17 kms, while as there will be more wastage of time and lengthy travel in selecting other routes for getting to the garden from the hotel.



**Figure 13. Identification of Shortest Route between Two Places**

## 7. Conclusion

The dynamic and interactive GIS-based ways and methods of analyzing spatial data are useful for the exploratory analysis of different dimensions of travel patterns. They allow the researcher, tourist, planner and administrator to interact, explore and manipulate spatial and attribute of facilities, natural and cultural features constituting the tourism products of destination. GIS could help immensely not only to visual properties of tourism products but can also facilitate alteration at regular intervals to update date information. The GIS based Tourist Information System besides being helpful for tourists can help entrepreneurs, local authorities and other stakeholders in decision making process concerning territorial development and destination management. In this small study an attempt has been made to develop an interactive data set in which multimedia data is integrated combined with traditional GIS to develop a tourist information system for Srinagar city which could be easily uploaded on web for wide spread publicity of its tourism potential. It can facilitate the identification of complex spatial relations and the comparison of patterns generated by diverse features like hotels, trekking routes, biking routes, parks, gardens, taxi stands *etc.* The

proposed GIS based Tourist Information System will produce accurate and valuable answers to tourist queries, expected to expand the tourist markets of the city. The system described in this paper could also serve as a potential model for developing Web GIS multimedia system for other field as well, like police department, health department, urban planning department and education department.

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