



Web Based Land Information System of Tuticorin(LIST), Tamilnadu, India.

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Abstract: The increasing popularity of the internet from online surfing to e-commerce to interactive chatting has made the internet an integral part of our society. The nearly ubiquitous access to the internet and interactive content of the WorldWide Web(WWW) have made them a powerful means for people to access, exchange and process information. Internet GIS is a research and application area that utilizes the internet and other internetworking systems to facilitate the access, processing and dissemination of geographic information and spatial analysis knowledge. This paper examine the Web based land information of system of Tuticorin (LIST) using the state of art Web GIS software ArcIMS. LIST is designed specifically to create, visualize, analyze report and publish land-based data such as Geology, Geomorphology, Soil, land use and land cover and Road network of Tuticorin. The land information should lead to better decisions about the use of land and better management of resources

Keywords: web GIS, ArcIMS, Land information system, Tuticorin, remote sensing, client/server

I. INTRODUCTION

Web GIS is a cheap and easy way of disseminating geospatial data and processing tools. Many organizations are interested to distribute maps and processing tools without time and location restriction to users. Internet technology has made its way to many government organizations as well as numerous households. The ability to get information through Internet made spatial data providers to explore the Internet resources for disseminating spatial information. Web GIS is similar to the client/server i.e typical three-tier architecture

Client/Server computing is a new technology that yields solutions to many data management problems faced by modern organizations. The term Client/Server is used to describe a computing model for the development of computerized systems. This model is based on distribution of functions between two types of independent and autonomous processes: Server and Client. A Client is any process that request specific services from the server process. A Server is a process that provides requested services for the Client. Client and Server processes can reside in same computer or in different computers linked by a network.

When Client and Server processes reside on two or more independent computers on a network, the Server can provide services for more than one Client. In addition, a client can request services from several servers on the network of unknown location or the physical characteristics of the computer in which the Server process resides. The network ties the server and client together, providing the medium through which the clients and the server communicate. The Figure 1 shows a basic Client/Server computing model

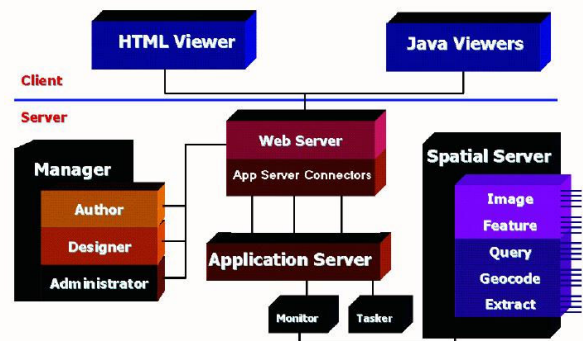


Figure1. Client/Server computing model

Geospatial technology is an emerging multidisciplinary approach which involves computer science, geography, photogrammetry, cartography, remote sensing, surveying, GPS technology, statistics and other disciplines concerned with handling and analyzing spatially referenced data [1]. Traditional GIS can serve only dedicated users with sophisticated software and hardware with limited impact on the public. The web enabled GIS facilitate decision making at the strategic, tactical, and operational levels; support administrative operations; and serves as a gateway for decision makers and general users to access the system conveniently and effectively [2] and [3]. The network infrastructure and hardware specification for Internet GIS (based on the client/server model) provide high-speed communication channels for pub-

lishing and accessing geographic information through the computer network [4], [5] and [6].

Keeping these perspectives an, attempt has been made to provide opportunities to realize a strategic assessment to determine the current status of land use, land suitability information, identification of the patterns of change during the past years, assessment of the impact of infrastructure development in terms of zoning regulations, transportation facilities, public utilities, drainage system, population, industry, tourism etc to meet the challenges in Planning and Management of Tuticorin City using integrated remote sensing and GIS technology

II. THE STUDY AREA

The Tuticorin lies between 8° 39' and 8° 51' N latitude and 78° 57' and 78° 12' E longitude in the district of Tuticorin in the state of Tamilnadu, India. The study area spreads a geographical area of 358 sq.km. Tuticorin is a coastal town with Major sea port. Major problem with the study area can be identifies as are (i) Rapid Growth of Population within the Two decades till date and (ii) Unplanned growth of the city both horizontally in all direction and vertically also. There is a rapid growth of population in the city from 326066 to 405363 within a period of 20 years from 1981 to 2001 (Census of India, 1981 and 2001). The rapid increase in population of the city coupled with its importance in terms of being the center of social, commercial, educational, political and industrial activities made the city to be the important center of the entire southern region of India. Many of the developments have come up in the recent years, which have affected the study area in a drastic way. So there is a need for proper planning for the careful handling of this alarming situation

III. DATA USED

Type of Data	Details of Data	Source of Data
Survey of Inida (SOI)Toposheets	58H/13,58H/14, 58L/1&5,58L/2	Survey of India
Thematic maps	Geomorphology, Soil,Geology	Agricultural and Engineering Department, Tamilnadu
Remote Sensing digital data	IRS 1C LISS III 13th june,2006	National Remote Sensing Agency (NRSA) Hyderabad

IV. METHODOLOGY

The satellite data were processed and classified using supervised classification method to prepare the land use/land cover map. The Tuticorin drainage network, road and railway network were prepared by digitizing toposheets and Remote sensing digital data using arcgis 9.2 software. The Geology, Geomorphology and Soil map were prepared in the software ArcGIS 9.2 using topographic sheets and paper maps

A. Web GIS Technology

Web based LIST is a client server concept we are using the Internet Map Server and Web Server to host the designed web site.

Internet Map Server (IMS) applications allow GIS database custodians to easily make their spatial data accessible through a web browser interface to end-users. High-speed corporate intranets make an ideal network for distributing data in this manner, given the fact that bandwidth requirements can be high. Making data available to the entire world is certainly feasible and any organization that has a public website can certainly add an IMS without opening up too many additional security holes [7],[8] and [9].

For a working IMS, software requires two components for processing the data. A geospatial data processing engine that runs on the server side as a service, Servlet or Common Gateway Interface (CGI) application, and processes the raw spatial data into a map and a standard web server that manages the incoming requests and replies with the proper map data back to the client side browser or application window. The end product is either a JPEG or GIF image or vector, which is transmitted back to the client browser or a stream of data that is interpreted by a plug-in to the client browser. IMS that transmit back an image have a limited capability that does not extend much beyond pan, zoom, and basic vector attribute query. The feature streaming IMS requires a downloadable plug-in, but allows for advanced buffer, query, labeling and sub setting operations to be performed. Some IMS sites offer both a plug-in and a simple HTML version, which is nice for plug-in weary surfers.

B. Web Server

This machine stores and retrieves Internet (and intranet) data for the enterprise. Some documents, data, etc., reside on web servers. Web application provides access to documents and other data. "Thin" clients typically use a web browser to request those documents. Such servers share documents across intranets, or across the Internet (or extranets). The most commonly used protocol is HTTP (Hyper Text Transfer Protocol). Web application servers are now augmenting simple web servers. The examples of web application servers are Microsoft's Internet Information Server (IIS), Netscape's iPlanet IBM's WebSphere, BEA's WebLogic and Oracle Application Server ArcIMS is used in developing the GIS web-base application as it is an Internet Map Server software which provides the components required for web development such as authoring, designing, publishing and administering Internet mapping application. It allows web clients, map server, data server and Web Server to communicate between one another. Through ArcIMS, developers are able to build the web-based GIS faster and manage MapService over the internet

C. Deigning a web site

The entire database has been converted to a web-supported format, which makes it more accessible, and faster information system for a large number of users. Moreover it is customized to offer multiple query facilities which enables any individual to extract any information regarding any area, plot or individual plot owner

a) *Author*: ArcIMS Author to create a map for your Web site by performing such tasks as adding data layers, setting layer symbology, and creating stored queries. Author always saves your map content in a configuration file with the .axl file extension. In the present web based LIST, Geology, Geomorphology, Soil, land use and land cover and Road networks shape files are created using ArcGIS 9.2 software has been converted in to web supported configuration file format.

b) *Administrator*: The Administrator can create, start, stop, and remove services. Administrator can set and change service properties, such as the Virtual Server assignment. Administrator also lets you work with servers (map server, image server and feature server) and with Map Notes and Edit Notes. Saving service properties in Administrator ensures that your services are restored each time you reboot your computer

c) *Designer*: ArcIMS Designer is an application that guides you through the viewer design process. One can design the web page using HTML or JAVA. In the java, designer can create a web page using java standard or java custom tool sets. Most of the tools do not appear if you choose the Java Standard. The web based LIST is having two web pages The Geology, land use and land cover and road networks are layered in HTML Web page and Geomorphology and Soil maps in java based web page.

d) *Viewer*: A viewer is a Web site or HTML page that you create using Designer. Your users use the viewer to view and work with the maps you serve them via ArcIMS. You can choose among three ArcIMS Viewers: HTML, Java Standard, or Java Custom.

e) *The HTML Viewer*: The HTML Viewer interface consists of a map display area, title, toolbar, layer list, scale bar, North arrow, and overview map. The toolbar appears to the left of the map display area. It includes all the tools you selected when designing your Web site as well as two buttons unique to the HTML Viewer: Toggle Between Legend and Layer List and Toggle Overview Map. The layer list appears to the right of the map display area. Click Active to make a layer active. The active layer is the layer against which querying, buffering, and so on, will be performed. Check a layer to make it visible; uncheck it to remove it from the map display. After making changes, you must click the Refresh Map button for your changes to be reflected on the map.

f) *The Java Standard and Custom Viewers*: Both the Java Standard Viewer and the Java Custom Viewer have the same elements: a map display area, title, toolbar, legend, scalebar, and overview map. The primary differences are the organization of the elements and the contents of the toolbar. The illustration on this page is the Java Custom Viewer. In the Java Standard Viewer, the toolbar is above the map display area, the legend is to the left of the map display area, and the overview map is above the legend.

The toolbar contains only the tools you specified when you designed your Web site. It does not include the Viewer Elements and Cancel Data Retrieval buttons found on the Java Standard Viewer toolbar. Also, instead of a Pan One Direction button, the Java Custom Viewer has four separate buttons for panning north, south, east, and west. Instead of a single Select Features tool, the Java Custom Viewer has four tools: Select by Rectangle, Select by Circle, Select by Line, and Select by Polygon.

D. MapNotes

The MapNotes tools (for Java Viewers only) bring to life the concept of collaborative GIS—not only the sharing of data but also the sharing of ideas about data over the Internet. Use the MapNotes tools to add text or graphics about a map to a MapNotes layer, then submit your notes to the ArcIMS site administrator. The MapNotes toolbar contains a full suite of tools to add, delete, and change the appearance of the notes that you create. When you click the MapNotes button, the MapNotes toolbar appears. Existing MapNotes layers created by you or other users are automatically loaded. Use the following tools to create and edit MapNotes layers. When you are done, submit your MapNotes. A MapNotes item will appear in the ArcIMS site administrator's MapNotes folder with a time stamp and description. After you have submitted your layer, others accessing the same Internet GIS application will also be able to see the MapNotes layer you created

E. Edit Notes

Like the MapNotes tools, the EditNotes tools (for Java Viewers only) enable the sharing of ideas about data. Use the EditNotes tools to make simple edits to spatial and attribute data, then submit your edits to the ArcIMS site administrator. The EditNotes toolbar contains tools for selecting, adding, moving, and deleting the features of a layer belonging to a Feature Service. When you click the EditNotes button, the EditNotes toolbar appears. Use the following tools to edit features. When you are finished editing, submit your session. An EditNotes item appears in the ArcIMS site administrator's EditNotes folder with a time stamp and description. The features you added or moved can be converted to shapefile format. All your changes can be converted to XML file format.

V. RESULT AND DISCUSSION

The state of the art Web-based GIS are built on integration of multi-related technologies that include object-oriented language, GIS package and language, such as HTML, CGI, ASP and java. The implementation of Web-based GIS is more towards inviting public participation apart from providing information in the form of maps and data for public access, and paving the path for data sharing with agencies having the same interest. The implementation concept based on global data sharing permits users to acquire and implement the activities of interest through the local area network.

The Developed LIST is placed on the web server in the Department of Geotechnology Manonmaniam Sundaranar University, Tirunelveli, India as intranet applications. The web based LIST is a powerful special support system. The information from the server is accessed by the other permitted department/organization to avoid any legal issues. The same principle can be used to upload in the internet through approved link server. The web server is connected with 500 clients. It is very much useful for the Agriculturalist, Geologist, land owners, Industrialist, Urban planner and also for the public who approaches the sever manager of the Department.

Tuticorin over the years has grown as port and petrochemical city. Due to industrialization the land use and land cover is altered in the many parts of city. Land use change is

an inevitable phenomenon in an urban space. How the use of land change from one to another could have inter connection with various entities and interaction between them in the spatial and temporal environment. It requires a comprehensive understanding and continuous monitoring of various factors, which influence the transformation of the land [10]. By using the Identify tool in the web based LIST it is easy to find out the particular type of land (Figure – 2).

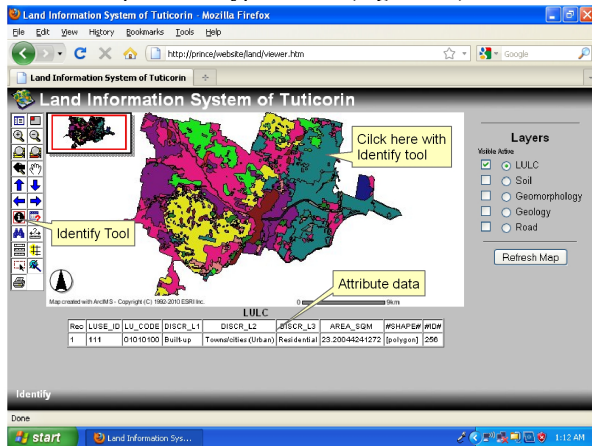


Figure – 2. Identify the particular land type and its attribute data using identify tool

Query tool is one of the best option in the web based LIST. The Query is written using SQL (structured query language). We can use Query with logic algorithm and basic arithmetic functions. The query function is used to select the particular soil type as shown in the Figure – 3.

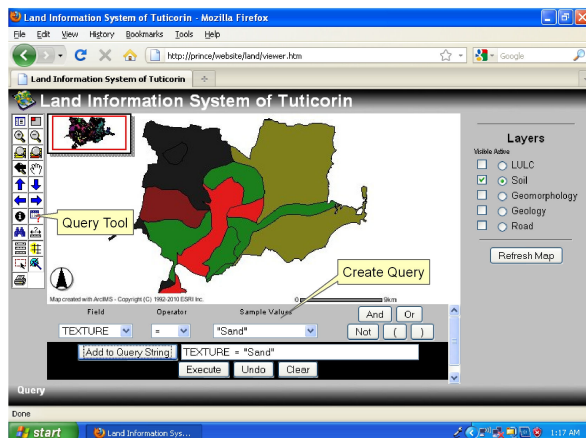


Figure – 3. Query function used to select the particular soil type

LIST provides information particular rock type and its subtype by entering the map features with an attribute value matching a string that you type. Searching for a particular rock type in the geology map is shown in the Figure – 4. Suppose if the user wants to measure the distance between two points or a path way, measure tool is used. Click the starting point and on the next click the distance in km is shown in the top of the map (Figure – 5). If the user wants to create a buffer area for a particular Road he can use buffer tool. Buffer tool selects the features of one layer that are within the specified buffer distance of selected features of another layer. The buffer zone created for the particular Road map is shown in the Figure 6.

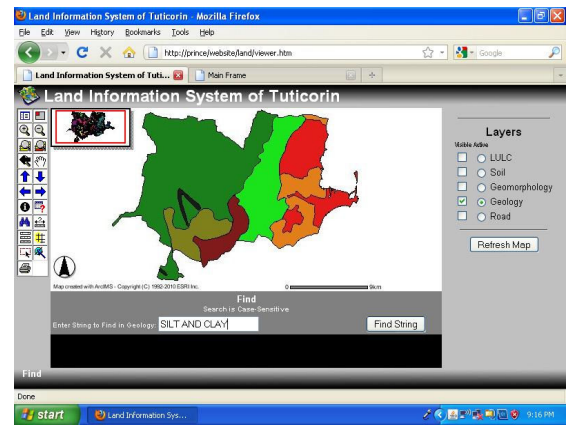


Figure – 4. Searching for a particular rock type

The web based LIST gives clear information about the Geology, Geomorphology, Soil, land use and land cover and Road network map. User can easily gather information according to their requirements. If user have any suggestion or want to know more detail about the location, he can use the Map Note tool and mark the area using the tool in the Map note tool bar and send it to the administrator (Figure – 7). Suppose user wants to add some attribute values to the map it is possible in the LIST using Edit Note tool. Then he can edit feature and send it to the administrator.

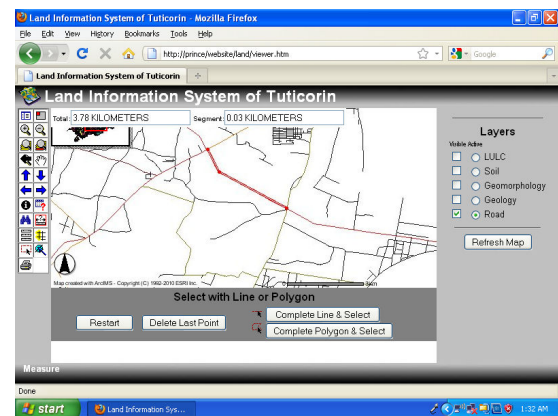


Figure5. Measuring the distance between two points

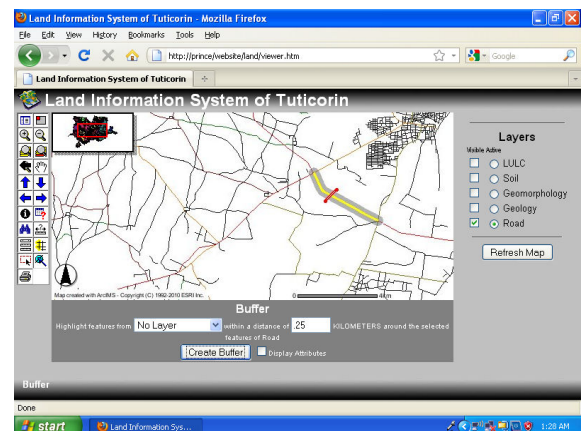


Figure 6. The buffer zone created for the particular Road map

VI. CONCLUSION

The integrated remote sensing and GIS methodology is to develop web based LIST which is found to be very useful in monitoring the urban growth of a thickly populated and rapidly increasing city like Tuticorin, Tamilnadu in India. LIST provides important tools for the developers and planners to extract information of the infrastructure facilities.

The Web based LIST is developed as better decision making by sharing data. It saves time from manual data gathering, elimination of redundant data entry and maintenance. LIST work faster and give more accurate information for citizen and other agencies in a less cost. The system will be able to support planning and decision-making because it offers relatively quick response on analytical questions and monitoring issues.

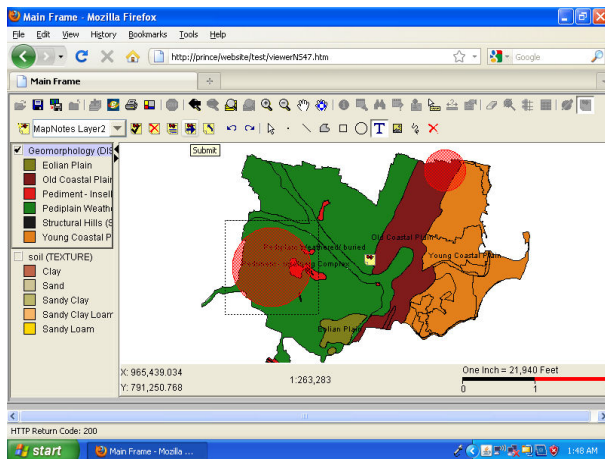


Figure – 7. Mark the area using the tool in the Map note tool and send it to the administrator

VII. REFERENCES

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