

**Web Enabled Master Plan**

Kamal Jain\*, Sumit Agarwal\*\*, Karamjit Bhatia\*\*

\*Department of Civil Engineering, Indian Institute of Technology, Roorkee

\*\*Department of Computer Science, Gurugu Kangari Vishwavidyalaya, Hardwar

[sumitagarwal78@yahoo.com](mailto:sumitagarwal78@yahoo.com)

**ABSTRACT**

Master plan of an area involves not only textual information (non spatial information) but also geographical information i.e. spatial information. Normal database management system handles non spatial information well but has limitation in handling spatial information. Therefore, to handle a problem involving spatial and non-spatial data for storing, managing, retrieving and querying, a broad base information system is required. GIS in recent years has shown ability to satisfy these requirements.

A Geographic Information System is a computer-based tool for mapping and analysing geographic information. GIS relate the spatial and non-spatial information together in GIS application. For sharing information, GIS application should give accessibility to different users on Internet without requirement of GIS package to run it. Web GIS can provide solution to this.

This paper explores the possibilities of sharing resource in order to provide on-line mapping capabilities to individuals who would have access to geographic data. The objective of the present paper is to produce the Master plan of IIT campus on web with details of buildings, apartments, proposed buildings, resident name, roads etc to user.

There are number of software that supports this type of internet-based mapping application. In the present work GeoMedia Professional version 5.1, GeoMedia WebMap Professional a product of Intergraph is used along with ASP, Java Script, Visual Basic Script (VBScript), HTML. In the design system user is able to perform various functions like panning, zoom, area-measure, location, queries and displaying various features.

Keywords: Master Plan, GIS, GeoMedia Professional, GeoMedia WebMap Professional. ASP, Jawa Script, VBScript, HTML, IIT Roorkee

**INTRODUCTION**

The most valuable asset an enterprise owns is its information. The challenge is to make that information quickly and easily available to users so that they can use for productive works.

In earlier days, if a person wanted to get information about an urban area, he was required to approach different authorities and the information was available on different scale with different accuracy. Combining this information was a difficult task. Each department carry out their own mapping work independent of other department thereby different departments duplicates much of work. This problem may be overcomes if there is a centralized information system for an area. This can effectively be done using GIS, which relate the spatial and non-spatial database. For providing the spatial and non-spatial

information on Internet the web GIS is used. Web GIS allows user to create Web sites or web pages that put control over the creation and display of GIS data over the net.

GeoMedia Web Map is a Web-based map visualization and analysis tool that provides real-time links to GIS data warehouses. User can query a database and see information described in a map – or click on a map feature or area and see selected database information about that particular map feature. GeoMedia Web Map enables user to access and analyze data anywhere, anytime. It enables users to access data in its native format – without translation or conversion – and performs queries on live data to get the answers they need. User is able to pan, zoom, area-measure, location, queries and displaying various features.

### Objective of Present Study

The main objective of report is to develop a web based master plan of IIT Roorkee campus in graphical form. User can query a database and see information about buildings, apartments, hostels, canteens, buildings to be demolished, proposed buildings, proposed roads, exiting roads, labels, and departments using GeoMedia Web Map.

### MASTER PLAN OF IIT-ROORKEE CAMPUS

The University of Roorkee, the fountainhead of technical education in India has been transformed into Indian Institute of Technology Roorkee recently. Being the pioneering institute in technical education in the whole of Asia, its campus has a glorious heritage developed over a long period of 155 years. This phase of transformation from the old University of Roorkee to Indian Institute of Technology, Roorkee in its all aspects is very crucial from the point of view of its further development. This has provided a golden opportunity to prepare a comprehensive Master Plan document to ensure a well-balanced sustainable future growth of the campus.

### Present Status of the Campus:

Table- 1 shows the present population of the campus area and table -2 gives the area in acre of different utilization.

**Table 1: Population status of the campus. [1]**

<b>Population</b>	
Students	3200 nos.
Faculty in position	352 nos.
Faculty sanctioned	628 nos.
Non teaching 'A' 'B' 'C' 'D' in position	1255 nos.
Sanctioned	1438 nos.
Total population	12497
Gross density	35 persons or 7 families/acre
Net density (exclusive of students)	21 families/acre

**Table 2: Area distribution status of the campus. [2]**

Area distribution		
Housing	100 acres	30%
Hostels	50 acres	15%
Academics	50 acres	15%
Central facilities	20 acres	5%
Roads	60 acres	15%
Open spaces	78.5 acres	20%

**Present Challenges:**

In the preparation of the Master Plan document following challenges / issues have been identified which will have to be addressed in an explicit manner for achieving the overall vision of the Master Plan:

- a) Most of the single or double storied houses occupies large open areas with very low-density i.e. approximately 30 persons per acre. Also, many buildings are very old and require huge maintenance cost. So the densification of the campus is a challenge.
- b) Due to the major flexibility brought about in the curriculum by the introduction of the institute's and the departmental electives, there is an immediate need to build number of sizeable lecture hall complex and increase the number of smaller lecture classrooms as per the individual needs of the departments.
- c) The Main Building, a great heritage edifice of the campus, does not have a dignified and respectable access. At present, it is approached mainly from behind.
- d) With the increase in the number of vehicles on the campus, like cars and scooters, it has almost become a challenge to provide proper parking lots for the main building and other departments also.
- e) The unique feature of this campus due to its glorious development of 155 years is its well-recognized heritage buildings. It will be a stupendous task for the institute to restore them in their original character and also to preserve them for posterity.
- f) Due to the long period of growth of the campus, much of its drainage system, being an open drainage system, has become obsolete. Moreover, the increasing burden of waste disposal is another major challenge facing the institution.

**Objective of Master Plan**

The following main objectives have to be fulfilled to transform the Master Plan into reality.

- a) To ensure overall security of the campus.
- b) To create safe, convenient, academically live environment.
- c) To increase the density of housing / dwelling units /acre.
- d) To cater the immediate needs and have adequate provision for future needs.
- e) To maintain harmony between its glorious heritage edifices and new development.
- f) To achieve appropriate balance between spatial allocations of housing, academic, physical infrastructure areas.

- g) To rejuvenate its eco-friendly, arcological built environment.
- h) To prepare overall conceptual framework to ensure quality of life in the present time and of future development as well.

## **WORK PLAN & RESULT**

### **Study Area**

The Study area Indian Institute of Technology, Roorkee, Formerly University of Roorkee, is situated in Roorkee town in Hardwar district of Uttaranchal state, India. The study area is bounded by latitude 29°-52'-00'' N and longitude 77°-53'-52''E. Topographically it is almost flat, sloping eastward. Solani River, a tributary of the river Ganges, passes by the side of the area. The study area mainly comprises of built-up land, undulating land with or without vegetation, but it does not contain forestland.

### **Data Used**

The following data is used in the present work

- a) Soft copy of digital topographical map of IITR campus area of scale 1:1000
- b) Proposed master plan document vision 2020
- c) The Data regarding name of the buildings, area of the buildings, height of the buildings, and construction year of the buildings was collected from construction division of IITR.

### **Software Used**

- a) GeoMedia Professional 5.1
- b) GeoMedia Web Map Professional 5.1
- c) Front Page.
- d) Visual Studio.

### **GIS Application Development Tools**

In this work plan custom application using scripting language and GeoMedia objects are used.

**Work Plan:** The flow diagram of work done is shown in Fig. 1.

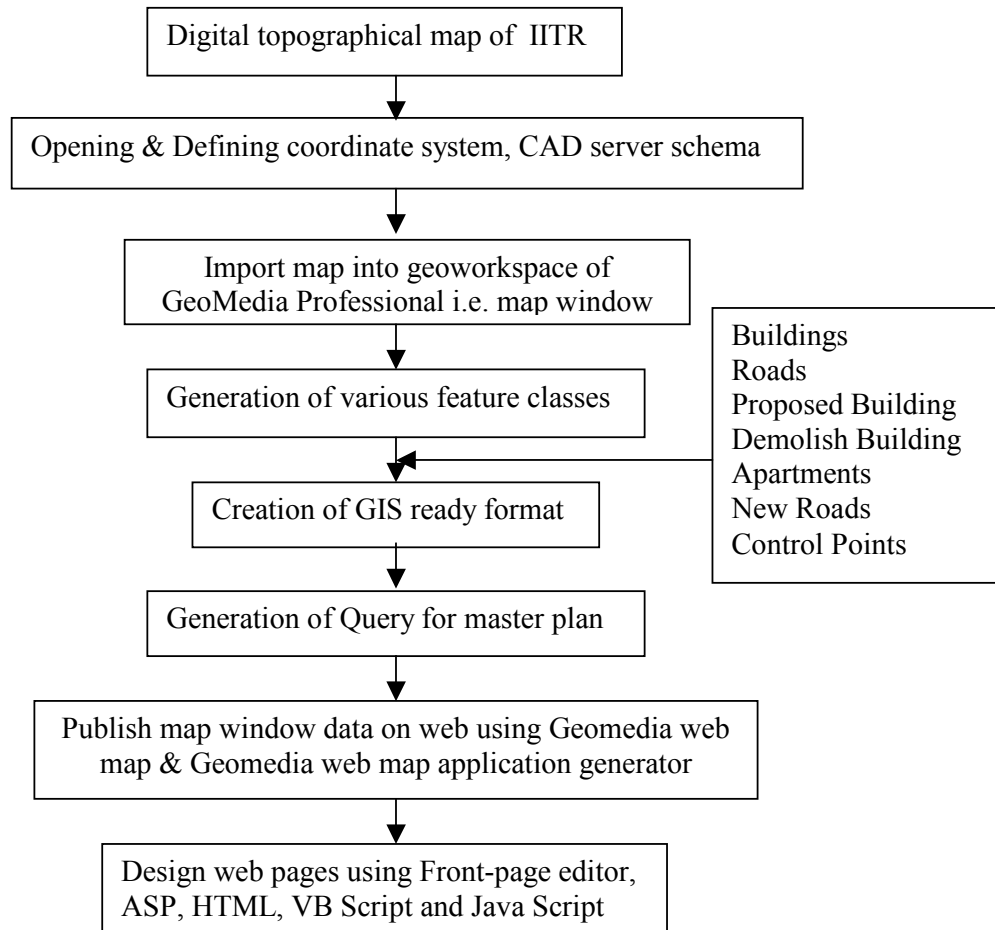


Fig. 1 Flow diagram of work done

### Generation of Various Features:

The design files of various features like buildings, road network, proposed buildings, new roads etc are exported into GeoMedia Professional Geoworkspace database was created for polygon features, line features and point features. The attributes for polygon features were building name, class (i.e. which class it belongs to), year of building, area of building, type of the building and year of construction of building. The attributes for point features are name, apartment number.

To make the project reliable various line & polygon themes are generated like buildings, roads, proposed demolition, proposed new buildings, proposed master plan. Table 3 shows the attribute data of various generated themes.

**Table 3 Shows the attribute data of various themes**

Features	Types of Features	Fields	Description
Buildings	Entire buildings Heritage buildings Hostel buildings Departments	Name	Name of the building Contains information of which type of building
		Year of construction	Contains information of construction year of building
		Area	Contains information of class of building Contains information of area of building
Demolish Phases		Text, Integer	Year of Construction, Location, Building Number
Apartment		Integer, Text	Contains information of Apt. No., name, residence phone, office phone, building name, building number.
Block		Text, Integer	Contains name of different colonies

**Software development**

The software development is carried out in ASP, HTML, VB Script, and Java Script programming which are compatible with GeoMedia Web Map. ASP has a set of commands, which can perform specific tasks based on our requirements. Using the methodology discussed the web page is designed as shown in Fig.1

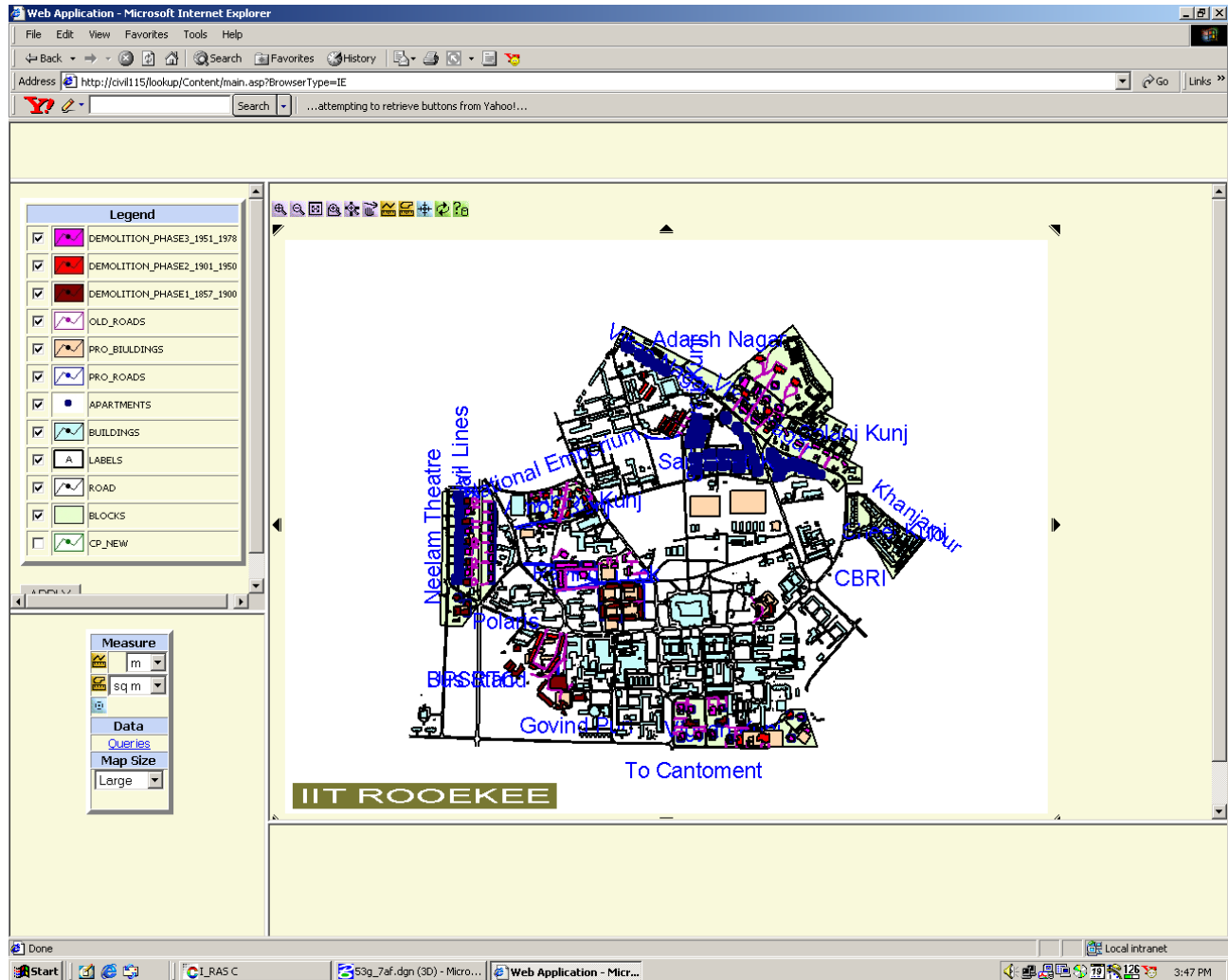


Fig. 2 Main Web Page

## Result

Using the methodology discussed in above the out put of the work is as follows

### *Run Through Work Flow of Web Application*

1. Open the web page of the application (containing the map) using the appropriate Internet address. (*http://node1/lookup/default.asp* the name of machine was *civil115*.)

*The web page is displayed.*

2. The top frame is the **Header** frame, which shows the logo and text that we specified.
3. In the **Tools** frame, select **Large/mediam** from drop-down list to change the **Map Size**.
4. Moving the mouse over various buildings display the building information.

5. Pan arrows for the following directions: N, S, W, E, NW, NE, SW, SE shifts the map by 50% of the map extent in the selected direction.
  - a) **Zoom In** - Zooms in by 50% of the map extent.
  - b) **Zoom Out** - Zooms out by 200% of the map extent.
  - c) **Zoom By Rectangle** - Zooms to a rectangle (by two points) that one specifies on the map.
  - d) **Zoom To Location** - Zooms around a point on the map that one specifies.
  - e) **Load Base Map** - Regenerates the map at the base scale and position.
  - f) **Vector Pan** - Lets one drag a point to another location that he selects.
  - g) **Refresh Map** - Refreshes the map and updates changes.
  
6. Select one or more of the following options to measure distance and area and to get a location, as follows:
  - a) Click **Linear Measure** to measure the distance between two or more points on the map. After placing a series of points on the map, double-click to indicate finish. The resulting distance is displayed directly above the scale bar.
  - b) Click **Area Measure** to measure the area of a rectangle using the two points that are placed on the map. The resulting area is displayed directly above the scale bar.
  - c) Click **Get Location** and place a point on the map. If the coordinate system is geographic, the location is displayed in degrees (longitude-latitude). If the coordinate system is projected, the location is displayed in the distance units. The resulting location is displayed directly above the scale bar.

Next is **Legend** frame.

7. Click on a legend entry check box to show or hide the corresponding map feature. Press the **Apply** button (at the bottom of the legend) to apply selection.
8. Click on the style key of a legend entry (beside the entry's check box) to modify the display rules.
9. Press the **Apply** button to apply changes.
10. In the **Tools** frame, select **Queries** to display the query input form in the **Data** frame.
11. In the **Data** frame, select the **Apartment** query, and click **Go**.
12. Keep the default values of a name, building number, and show first **20** records.
13. Press the **Submit Query** button (at the bottom of the **Data** frame) to report the query result.

*The results are displayed in the **Data** frame (or Data window), where one row corresponds to one record.*

The report comprises the first group of records.

14. Click on the **Map** field of a selected record to locate the corresponding feature on the map.
15. When you have finished using the web application, close the web browser.

Different Query Results:

**Building Query Result:**

- From drop down list in data frame select building, enter GO (Fig.3). Fig. shows other choice e.g. DEMOLITION\_PHASE1\_1857\_1900 as one of the option which is obtain by submitting the query for marking all building constructed during 1857 to 1900, similarly for other period.
- Form with name, Type of Building come, enters the required data and press submits. (Fig.4)
- Form with name of building, type of building, building number etc. with map which can display the location of building is shown in Fig.5
- Clicking on map in Fig. 5 will display location of building in enlarged map shown in Fig. 6.
- Fig. 7 shows all the proposed building along with proposed road, recreation centre, sports ground etc. along with legends used.

**Fig 3 Query form with drop down list**

**Fig 4 Query form data form to be fill by user**

Type\_of\_Building = = Department,  
 AND B\_Name = = Earthquake Engg. ,

Building_Number	Type_of_Building	Class	B_Name	Map
0	Department	0	Earthquake Engg.	<a href="#">Map</a>

**Fig 5 Data presented for required building**

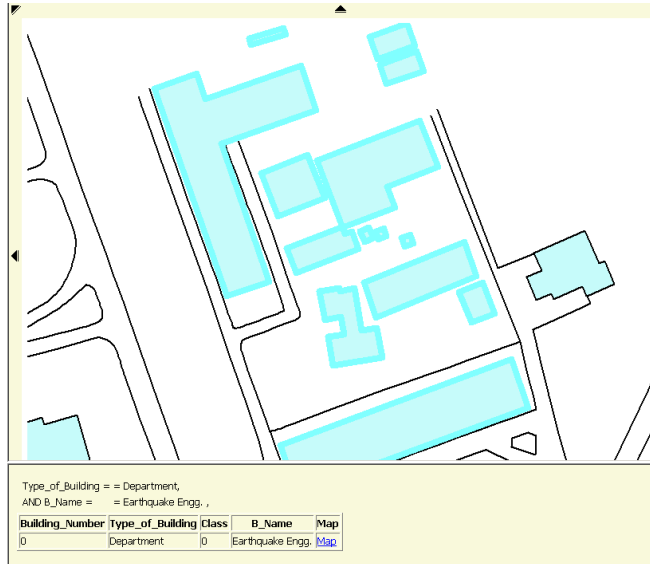


Fig 6 The geographical location of building in map (earth quake department)

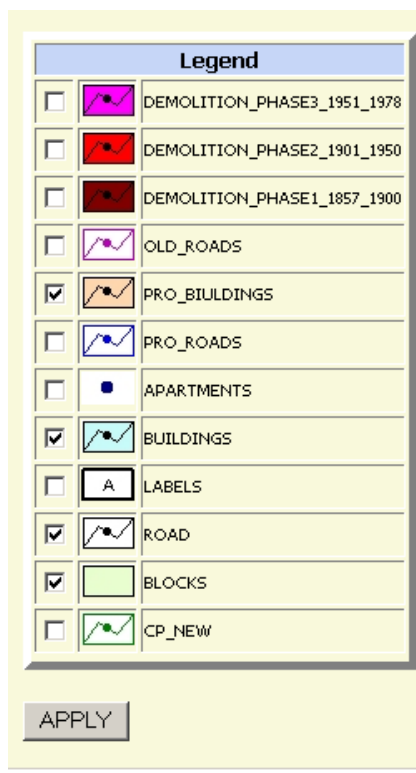


Fig 7 Proposed, Demolish, Existing Roads

**CONCLUSION**

The following Conclusions are drawn from the present work:

**Fast and Easy Access:** One can access and use geographic data to obtain frequently requested information from sources such as department, hostel, utilities, Apartments, main building, sports facilities customer service, public access along with geographical locations. People don't have to come to the data – the data comes to them. Since the map

is a live view of the geographical information, users always view current information. Build on your current assets.

**Online Mapping:** user can zoom in; zoom out, area measure, location, pan, vector map, refresh map on Internet.

**Online Query:** Our system provides the functions of query from map to attribute and also from attribute to the map. Query about different important buildings, demolish phases of buildings and the proposed buildings in campus area according to campus need. These values will greatly help user making his decision.

**Online Analysis:** Each feature in the map is linked to its attribute information, enabling the user to see a report about that feature.

The present work is a Client-side Internet GIS application, which requires Microsoft Internet Explorer 5.0 or later.

## **REFERENCES**

1. Master plan 2020 document of IITR campus.
2. Agarwal Sumit, MCA dissertation 2003 on Web based Geographical Information System for IIT Roorkee master plan submitted in Department of Computer Science, Gurukul Kangari Vishwavidyalaya, Hardwar.

## **ACKNOWLEDGEMENT**

Authors acknowledge the contribution of Intergraph Mapping and Geospatial Solutions for providing GeoMedia products under Team GeoMedia Registered Research Laboratory program.