

# **DEVELOPMENT OF GNU/LINUX DISTRIBUTIONS**

**B. Tech Computer Semester - VIII**

Prepared At



**Bhaskaracharya Institute for Space Applications & Geo-informatics  
Govt.of Gujarat, Science & Technology, Gandhinagar**

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**Gandhinagar**

Submitted to



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

**NIRMA UNIVERSITY, AHMEDABAD-382481**

**MAY 2012**

# **DEVELOPMENT OF GNU/LINUX DISTRIBUTION**

**Major Project**

Prepared at



**Bhaskaracharya Institute for Space Applications & Geo-informatics  
Govt.of Gujarat,Science & Technology, Gandhinagar  
Submitted in partial fulfillment of the requirements for the degree of  
Bachelor of Technology in (Computer Engineering)**

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Bhaskaracharya Institute for Space Applications and Geo-informatics



ISO 9001:2008  
ISO 27001:2005

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## BISAG Certificate

This is to certify that the project report compiled by **Mr Arpan Chavda(09bce006)** and **Mr Hitesh Piprotar(09bce054)** students of 8th Semester B.Tech from Department Of Computer Science, Institute of Technology, Nirma University have completed their final semester project satisfactorily. To the best of our knowledge this is an original and bonafide work done by them. They have worked on Development of GNU/Linux Distributions, starting from January 7th, 2012 to April 24th, 2013. During their tenure at this Institute, they were found to be sincere and meticulous in their work. We appreciate their enthusiasm & dedication towards the work assigned to them. We wish them every success.

**Mr. Miren Karamta**

Project Manager,

BISAG, Gandhinagar

**T. P. Singh**

Director,

BISAG, Gandhinagar

## Nirma Certificate

This is to certify that the Major Project entitled "**Development of GNU/Linux Distributions**" submitted by **Arpan Chavda (ID: 09BCE006)** and **Hitesh Piprotar (ID: 09BCE054)**, towards the partial fulfillment of the requirements for the degree of Bachelor of Technology in Computer Engineering of Nirma University, Ahmedabad is the record of work carried out by them under my supervision and guidance. In my opinion, the submitted work has reached a level required for being accepted for examination. The results embodied in this Project work, to the best of my knowledge, haven't been submitted to any other university or institution for award of any degree or diploma.

**Dr. S. N. Pradhan**

Professor,

Dept. of Computer Science & Engg.,  
Institute of Technology,  
Nirma University, Ahmedabad

**Prof. D. J. Patel**

Professor and Head,

Dept. of Computer Science & Engg.,  
Institute of Technology,  
Nirma University, Ahmedabad

## About the company

### Introduction of the company



Figure 1: BISAG

The applications of space technologies and geo-informatics contribute significantly towards socio-economic development of the society. Recognizing the importance and need of Space technology and geo-informatics for developmental planning purposes, the Government of Gujarat established the Bhaskaracharya Institute for Space Applications and Geo-informatics (BISAG) in the year 1997, as the State nodal agency to utilize space technology and geo-informatics for various developmental activities of the State.

Since its foundation, the Institute has experienced extensive growth in the spheres of space technology and geo-informatics. The objective with which BISAG was established is manifested in the extent of services its renders to almost all departments of the State. Year after year the institute has been endeavoring to increase its outreach to disseminate the use of geo-informatics up to grassroots level. In this span of eleven years, BISAG has assumed multi-dimensional roles and achieved several milestones to become an integral part of the development process of the Gujarat State. **Profile**

BISAGs has strengthened its role as a facility provider, a technology developer and as a facilitator for transferring technology to the grass root level. Further reinforcing

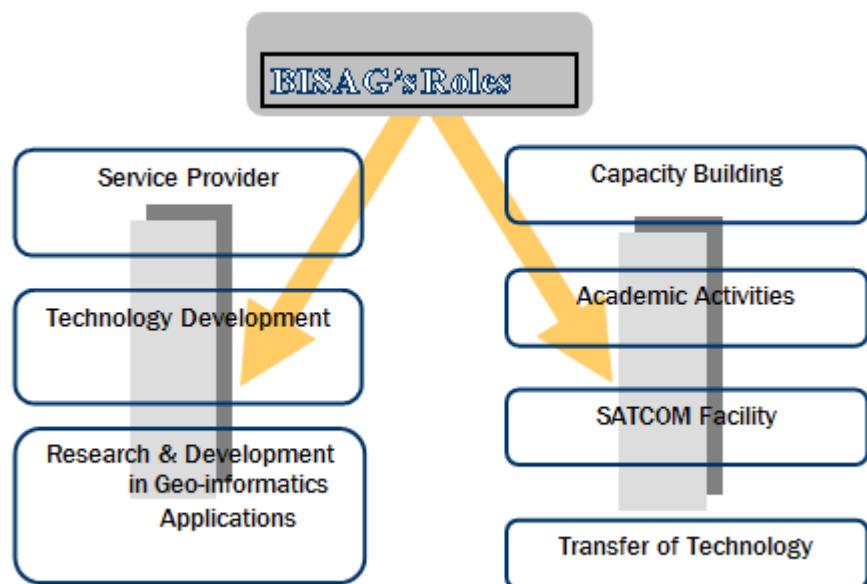


Figure 2: BISAG's Role

its functions, BISAG has achieved ISO 9001:2008 and ISO 27001:2005 certifications for quality management and security management services respectively. This has led to an organized and systematic development of its services and outputs.

### **Activities Of BISAG**

BISAGs activities are multi-fold and have expanded in a big way and focused on the following:

- **Satellite Communication :** Promoting and facilitating the use of satellite broadcasting networks for distant interactive training, education and extensions
- **Remote Sensing :** Inventory mapping, developmental planning and monitoring of natural and man-made resources

- **Geo-informatics System :** Conceptualizing, creating and organizing multi-purpose common geo-spatial database for sectoral and thematic applications for various users
- **Photogrammetry :** Creation of Digital Elevation Model, Terrain characteristics, Resource planning,etc.
- **Global Navigation Satellite System :** Location based services, geo-referencing, engineering applications and research
- **Software Development :** For providing low-cost Decision Support Systems, desktop as well as web-based geo-informatics applications to users for wider usage.
- **Disaster Management :** For preparing geo-spatial information to provide necessary inputs to the Government to assess and mitigate extent of damage in the event of a disaster
- **Education, Research and Training :** For providing education, research and training facilities to promote number of end users through the Academy for Geo-informatics.
- **Value Added Services :** For providing services which can be customized as per the needs of the users.
- **Technology Transfer :** Transferring technology to a large number of end users.

## **Units of BISAG**

BISAG initially set up to carry out Space Technology applications, has evolved into an Academic Institute, a Centre for Research and Technology Innovations, a Facility Provider, a Technology Developer and a Facilitator for transferring technology to the grass root level. BISAG is the first such State Centre having such multifarious

activities with ISO certification. BISAG has gradually progressed over the years and has grown into several units. Each unit focuses on specific functions and objectives to ensure efficiency in over all activities of the institute.

- **Gujarat Satellite Communication Network (GUJSAT):** SATCOM facilitates the promotion and facilitation of the use of broadcast and teleconferencing networks for distant interactive training, education and extension.
- **Centre for Geo-Informatics Applications:** The Centre for Geo-informatics provides services for the developmental and planning activities pertaining to Agriculture, Land and Water Resources Management, Wasteland/ Watershed development, Forestry, Disaster Management, Infrastructure etc.
- **Software Development:** For wider usage of geo-spatial applications, customised software are developed by the Software Development Team. The institute has provided many indigenous software solutions in the field of Geographic Information Systems, Decision Support Systems and Image Processing.
- **Academy of Geo-informatics:** The Academy for Geo-informatics carries out Education, Research and Training activities.
- **Disaster Management Information cell:** BISAG works closely with the Gujarat State Disaster Management Authority (GSDMA), for assessment of existing situation through integrated analysis and for planning appropriate preventive and preparatory measures, providing necessary support through data generation and analysis.

### **Infrastructure Developement**

The growth and progress of any institute is gauged by the infrastructure it develops and possesses. BISAG has a sound infrastructure setup that has developed in tandem with the growth of the institute. Having started with one building, there are now dedicated facilities for different units. The laboratories are equipped with state-of the

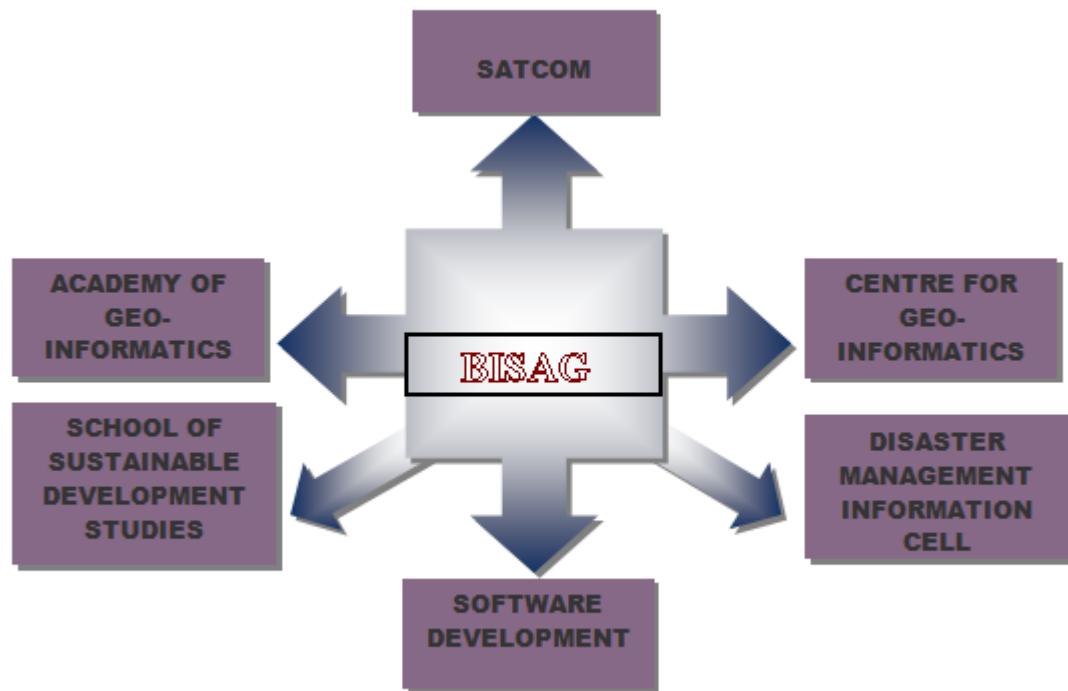


Figure 3: Units of BISAG

art technology with latest Hardware and Software required for executing its activities. BISAG also has a rich satellite data archive, which includes Satellite data of different spatial, spectral and temporal resolutions.

#### **Collaborations of BISAG...Creating A Sense Of Ownership**

BISAG works with almost all Government Departments and Organizations. Each of these Departments/Organization contributes in preparation of the respective projects. With strong Government support and proactive efforts on part of the staff of BISAG, the list of Collaborators is expanding and increasing.

**Institutional Strengthening** BISAG has achieved institutional strengthening through:

- **Reinforcement of Decision Support Systems**

Developing customized solutions as per user requirements through partnerships

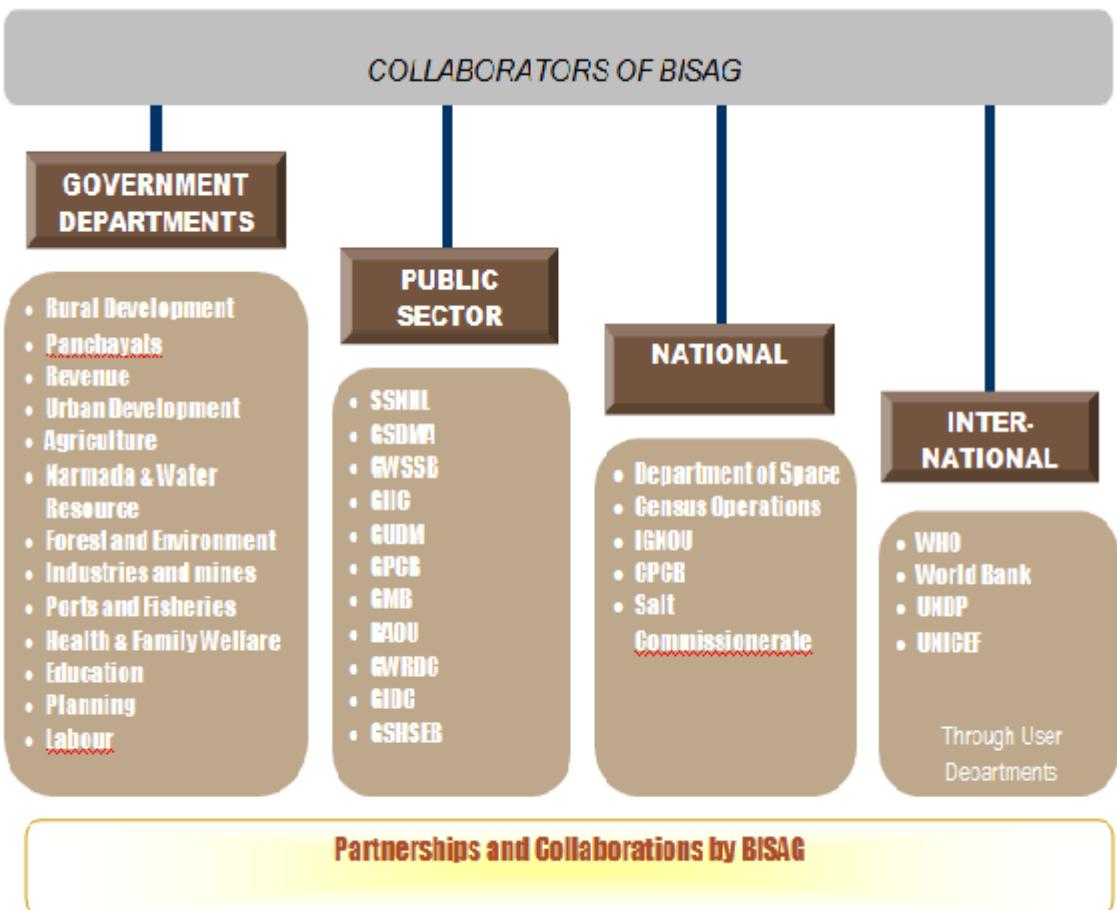


Figure 4: Partnerships and Collaborations by BISAG

and collaborations, which are affordable and easy to use. Areas of natural and manmade resources, socio-economic parameters, are being effectively addressed with the help of Geo-informatics.

- **Establishing Linkage between Government and People through GUJSAT**

GUJSAT facility is being constantly employed for the promotion and facilitation of the use of teleconferencing networks for distant interactive training, edu-

tion and extension. Experts, leaders, specialists and professionals can conduct their programs from a central location reaching out to remote areas through two-way audio-video channel making them interactive and meaningful.

- **Developing Innovative Education Programmes**

Innovative educational programmes are conducted regularly through GUJSAT, allowing people residing in remote areas to have an access to good quality educational and awareness programmes.

- **Solving real life problems through Human Resource Development**

The institute has a young multi-disciplinary team of professionals and a continuing induction programme. Multi-nationals and IT agencies pick up the trained staff that in turn is replaced by new people. This results in availability of more and more trained manpower in the realm of space applications. Every year BISAG provides training to about 300 students in the field of Geo-informatics.

- **Creation of the multipurpose sectoral comprehensive databases for the entire state of Gujarat**

The institute has made efforts towards conceptualization, creation and organization of multi-purpose common digital database for sectoral / integrated decision support systems. This has provided impetus to planning and developmental activities at grass root level as well as monitoring and management potential in various disciplines like water resources, land resources, disaster management, infrastructure, urban management.

## **Communication**

The project was undertaken at BISAG, Gandhinagar and BISAG can be contacted at the following:-

Near Ch-0 Circle,

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Gandhinagar-Ahmedabad highway,

Gandhinagar-382007

Gujarat, India

Phone No:- +91 79 23213081/82/90

## Candidates Declaration

We declare that final semester report entitled **Desktop GIS Application** is our own work conducted under the supervision of the external guide **Dr. Naveenchandra N. Srivastava** from BISAG (Bhaskaracharya Institute for Space Applications & Geo-informatics). We further declare that to the best of my knowledge the report for B.Tech Computer Science final semester does not contain part of the work which has been submitted for the award of Bachelor Degree either in this or any other university without proper citation.

Candidate 1s Signature

Aliasgar Hada

Student ID: 08BCE098

Candidate 2s Signature

Krupesh Patel

Student ID: 08BCE108

Submitted To:

Department Of Computer Science,  
Institute of Technology,  
Nirma University,  
Ahmedabad.

## Acknowledgements

”Gratitude is a feeling which is more eloquent than words, more tranquil than silence.

We are grateful to **T.P.Singh**, Director (BISAG) for giving us this opportunity to work the guidance of renowned people of the field of GIS also providing us with the required resources in the company. We would like to express our endless thanks to our external guide **Dr. Naveenchandra N. Srivastava**, Project Manager at Bhaskaracharya Institute of Space Application and Geo-informatics for their sincere and dedicated guidance throughout the project development. Also our hearty gratitude to our Head of Department, **Mr. D. J. Patel** and internal guide **Dr. S. N. Pradhan** for giving us encouragement and technical support on the project.

The blessings of God and our family members made the way for completion of the major project. We are very much grateful to them.

We are immensely thankful to our friends, who always stood beside and motivated me throughout this course.

**Aliasgar Hada**

**ID: 08BCE098**

**Krupesh Patel**

**ID: 08BCE108**

## Abstract

The project named Desktop GIS Application is being developed for a Government organization.

A geographic information system is an information management tool that helps us to store, organize and utilize spatial information in a form that will enable everyday tasks to be completed more efficiently. Since its rapid growth over the last two decades, GIS technology has become a vital element for us to maintain and integrate information. GIS software, and the hardware required to operate it, have become much more affordable and easy to use. This has resulted in the ability to develop a GIS without making large investments in software .

The proposed desktop application is designed to work on geographical data. The system does the processing on the various maps . The system also includes the processing of database information which is related to the maps.

Geo-Information System is a System that explores fundamental principle of geography, the location is important in Human life. GIS is used to inventory, analysis and manage many aspect of the world. GIS takes number & words from the database & put on map

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# Chapter 1

## Introduction

### 1.1 The System

#### 1.1.1 Definition of System

The proposed Desktop GIS application is designed to work on geo graphical data. The system does the processing on the various maps. The system also includes the processing of database information which is related to the maps.

#### 1.1.2 Project Development Model

A software development model is a simplified description/abstract representation of a software process which is presented from a particular perspective. A development model for software engineering is chosen based on the nature of the project and application, the methods and the tools to be used, and the controls and the deliverables that are required.

All software development can be characterized as a problem solving loop in which four distinct stages are encountered:

- **Status Quo:** Represents the current state of affairs.
- **Problem Definition:** Identifies the specific problem to be solved.

- **Technical Development:** Solves the problem through application of some technology.
- **Solution Integration:** Delivers the results like documents, programs, data, etc. to those who requested the solution.

There are many software development models. In this project spiral model is followed.

**SPIRAL MODEL** The spiral model of software development and evolution represents a risk driven approach to software process analysis and structuring. This approach incorporates elements of specification-driven, prototype-driven process methods, together with the classic software life cycle. It does so by representing iterative development cycles as an expanding spiral, with inner cycles denoting early system analysis and prototyping, and outer cycles denoting the classic software life cycle. Every iterative cycle of the spiral model consists of the following:

- Customer Communication
- Planning
- Risk Analysis
- Engineering
- Construction and Release
- Customer Evaluation

The evolutionary process starts from the core of the spiral from the customer communication region and revolves in a clockwise direction as if it was coming out of the spiral. The spiral model is considered as one of the most popular system process flow model as it contains the repeated execution of SDLC till the completion of the process. Some of its benefits are:

- Focuses attention on reuse options.
- Focuses attention on early error elimination.
- Puts quality objectives upfront.
- Integrates development and maintenance.
- Provides a framework for hardware/software development.

### 1.1.3 Concerned Audiences And Users

Users of the system Desktop GIS Application are as follows:- Any user with Geo referenced Data can use this software to manipulate its data and solve the desired purpose.

### 1.1.4 Purpose and Objective

The Desktop GIS Application has a primary purpose of providing all round support to the customer. It fulfills the following objectives:

A geographic information system is an information management tool that helps us to store, organize and utilize spatial information in a form that will enable everyday tasks to be completed more efficiently. Since its rapid growth over the last two decades, GIS technology has become a vital element for us to maintain and integrate information. GIS software, and the hardware required to operate it, have become much more affordable and easy to use. This has resulted in the ability to develop a GIS without making large investments in software

### 1.1.5 About Existing system

Esri ArcGIS. From my experience its slow to navigate around maps and quite verbose to program in causing quite a lead time in development. But

major disadvantage of it is, it's cost. ArcGIS is too costly for small businesses. Esri is also the most expensive product on the market, and i believe also the most popular. There are OpenSource Libraries

- FDO
- GDAL/OGR
- GeoTools
- GEOS
- MetaCRS
- PostGIS

Using these one can build our own software and make it openSource. So future enhancement and development can be done by other people.

### 1.1.6 Proposed System

#### Functional Requirements

- Provide the user with a choice of geospatial data formats
- Pan the extent of the map by clicking on the map image and dragging the mouse.
- Zoom in the extent of the map by either:
- Clicking and dragging a box on the current map extent in order to select the new Extent
- Zoom out the extent of the map out by clicking a point on the map in order to zoom the map out a preset amount

- This tool enables the user to perform a rough distance measure (in some default unit of measure) by clicking two points on the map.
- This feature will present a small full-extent image of the currently selected data set and indicate with a bounding box the geographic extent that is currently being viewed in the main map window.
- A simple single-click ID tool will enable the user to visually select a geographic feature from the map in order to ascertain a listing of attribute data affiliated with that geographic feature. The purpose of the tool is to enable the user to quickly and easily orient themselves by performing a simple spot-check on the geographic data. Multiple records would only be retrieved by this selection in the event that multiple features are stacked on top of one another in an indiscernible fashion.
- The user will have the ability to selectively toggle the visibility of any map layer on or off.
- The user will have the ability to order the map layers in any way they choose.
- The user will have the ability to select a single map layer to become the active data layer the layer on which identify queries are performed.
- The user will have the ability to save the current map view that is displayed as an image file to their local workstation.
- An enhanced zoom out function will provide the user with the ability to drag a box and have the current visible extent reduced to the size of that box, thus revealing a broader viewable area overall.

- Feature Filter Tool: This feature allows the user to filter features selected for extract by filtering on an attribute
- The user can perform Query on the Map Database
- The User can measure distance between two points in Map
- The user can find the country or state from the given Map
- The user can change the CRS of shape file and save the modified shape file.

### Non-Functional Requirements

- Reliability of the system is of primary importance. As the system is internet based and would be accessed many times by various different clients for various different purposes, it should entirely robust and reliable.
- Maintainability The system should be designed to be easily maintainable and get the least complaints from the users and would guarantee high customer satisfaction and minimum downtime.
- Adaptability: The system must be entirely adaptable and should easily gel with the parent modules without causing much of rework or displacement.
- Extensibility: The system should be designed to be extensible to changes. Changes might be a result of
  - User requirement change.
  - Compliance to follow some new company policy.

- Facility provided by the technology employed should be utilized to its maximum. This refers to strict employment of the tools and technology being used.
- Development should be in accordance to the Software Design Document. This rule stresses the importance of the Software Design documents. They are the main source of requirements for off site developers. And depending on various versions of the SDD the change requests are recorded. Finally the extra effort involved in solving these change requests is recovered from the client.
- All deliverables should undergo a self review by the developer. This business rule stresses on the rechecking process to be carried out by the developer. This implies that once the deliverable undergoes QA it should be with minimum errors and in turn involve minimum rework.
  - Security and Privacy Requirements
  - Environmental Requirements
  - Computer Resource Requirements
  - Computer Hardware Requirements
  - Computer Hardware Resource Utilization Requirements
  - Computer Software Requirements
  - Software Quality Factors
  - Packaging Requirements
  - Precedence and Criticality of Requirements
  - The system must be user friendly
  - It must be persistant
  - Future Modification and requirement can be adaptable.
  - The system must be maintainable.

## **1.2 Project Profile**

### **1.2.1 Project Title**

Desktop GIS Application

### **1.2.2 Scope of Project**

The proposed desktop application is designed to work on geo graphical data. The system does the processing on the various maps. The system also includes the processing of database information which is related to the maps.

### **1.2.3 Project Team**

External Project Guide : Dr. Naveenchandra N. Shrivastava

Internal Project Guide : Dr. S. N. Pradhan

Team Members : Krupesh Patel

                                  Aliasgar Hada

### **1.2.4 Hardware/Software environment in company**

#### **Hardware**

Hard Disk : 150 GB

RAM : 3 GB

Processor : Intel Core2Duo 1.80 GHz

#### **Software**

OS :Windows 7

Netbeans 7.0

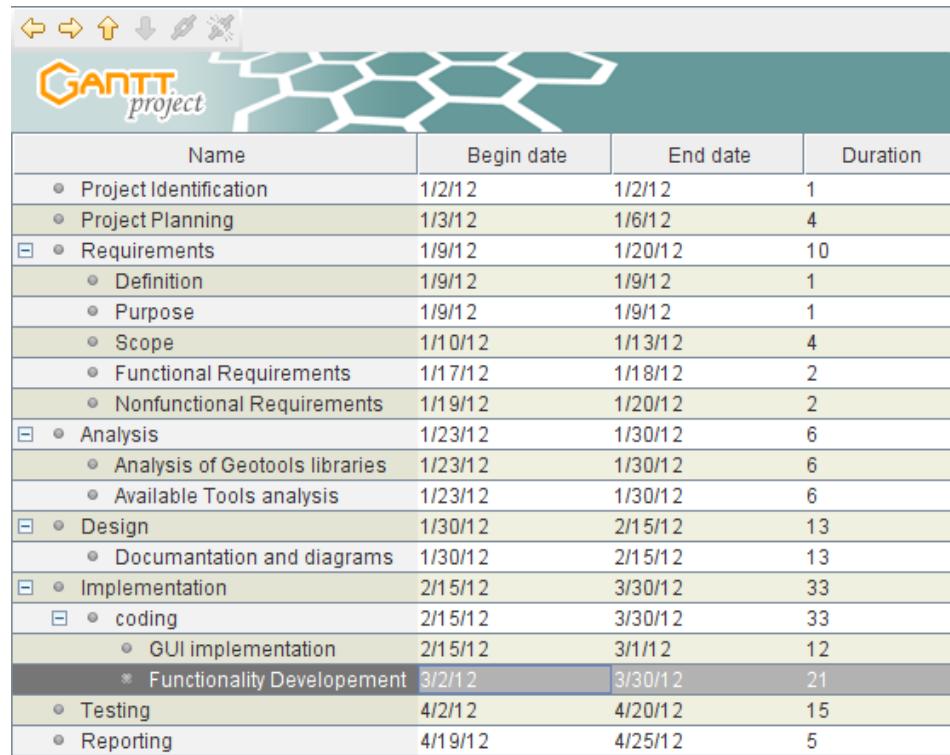
Java 6

Geotools Library

Rational Rose

## Gantt Project

### 1.2.5 Project plan



The screenshot shows a Gantt chart application window titled "GANTT project". The interface includes a toolbar with icons for file operations and a main area displaying a hierarchical project plan table.

Name	Begin date	End date	Duration
• Project Identification	1/2/12	1/2/12	1
• Project Planning	1/3/12	1/6/12	4
▫ • Requirements	1/9/12	1/20/12	10
• Definition	1/9/12	1/9/12	1
• Purpose	1/9/12	1/9/12	1
• Scope	1/10/12	1/13/12	4
• Functional Requirements	1/17/12	1/18/12	2
• Nonfunctional Requirements	1/19/12	1/20/12	2
▫ • Analysis	1/23/12	1/30/12	6
• Analysis of Geotools libraries	1/23/12	1/30/12	6
• Available Tools analysis	1/23/12	1/30/12	6
▫ • Design	1/30/12	2/15/12	13
• Documentation and diagrams	1/30/12	2/15/12	13
▫ • Implementation	2/15/12	3/30/12	33
▫ • coding	2/15/12	3/30/12	33
• GUI implementation	2/15/12	3/1/12	12
• Functionality Development	3/2/12	3/30/12	21
• Testing	4/2/12	4/20/12	15
• Reporting	4/19/12	4/25/12	5

Figure 1.1: Project Plan

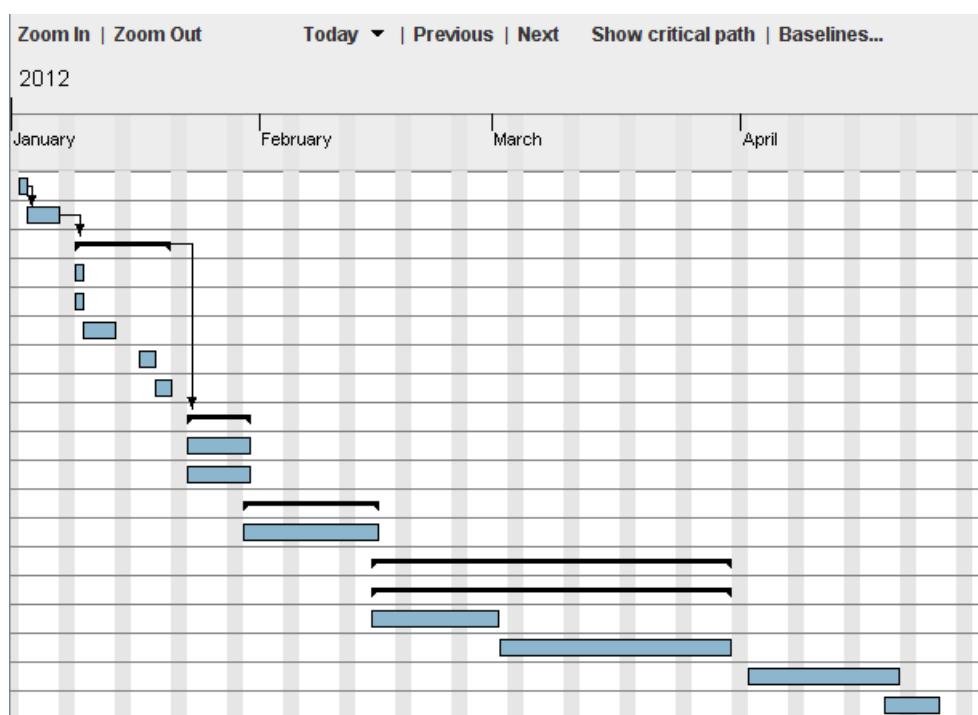


Figure 1.2: Project Plan - Timeline

# **Chapter 2**

## **System Analysis**

### **2.1 Feasibility Study**

**The Objective of the Feasibility study:** The purpose of the Feasibility study is to find out if an information system project can be done and to suggest possible alternate solution. Feasibility study of the system is very important stage during the system design. Feasibility study is a test of a system proposal according to its workability impact on the organization, ability to meet user needs, and effective use of resources. (Hardware, Software, or other equipments), It is also use to determine whether the system gives benefit to people or society or not? Feasibility study decides whether the proposed system is properly developed or not or it properly work as per the expectation of the company or not.

**Need for Feasibility Study:** A feasibility study is written approach to evaluating your idea and can help you identify:

- If your idea is viable or not
- Useful facts and figures to aid decision-making
- Alternative approaches and solutions to putting your idea into practice

There are many reasons why new community ventures fail, but lack of planning and research is the main one. As you plan, your knowledge of your market, customers and the environment in which you will work will grow. This process considers all areas of your idea and ensures you have something concrete on paper.

What does a feasibility study involve?

It can involve some or all of the following:

- An assessment of the current market
- An assessment of your potential position in the market
- An evaluation of the possible options for entry into the market
- A short list of the possible options

There are some aspects in feasibility study portion of the preliminary investigation.

- a. Technical Feasibility.
- b. Economic Feasibility.
- c. Operational Feasibility.
- d. Social Feasibility.
- e. Legal Feasibility
- f. Time Feasibility of the project.

### 2.1.1 Technical feasibility

A large part of determining resources has to do with assessing technical feasibility. It must be find out whether current technical resources can be

upgraded or added in a manner that fulfills the request under consideration. It is willing to improve its technical abilities of the project will be handled on the computerized concept so it has to improve some hardware and software abilities to maintain this system and it billing to improve and give all the supported facilities. Here, the Proposed System which is to be developed requires Hardware as well as Software Resources. A Hardware requirement includes PC with 40GB Hard disk and 1GB RAM. Software requirement includes Java. File requirement: Shape Files or geo referenced .jpg or .tiff file It may be affordable for any organization to employ new professional thus, the requirement makes it technical feasible.

### **2.1.2 Economic feasibility**

Economic feasibility looks at the financial aspects of the project. Economic feasibility concerns with the returns from the investments in a project. It determines whether it is worthwhile to invest the money in the proposed system. It is not worthwhile spending a lot of money on a project for no returns. To carry out an economic feasibility for a system, it is necessary to place actual money value against any purchases or activities needed to implement the project. The proposed system that is going to develop its benefit is indirect benefit and cost is direct cost that is to be paid. It costs for its development and hiring of the Server space. But it gives indirect benefit to businessmans tourist etc.

### **2.1.3 Operational feasibility**

The System will hold good GUI facilities which attract the user to use the System. The System will be developed using new technologies so the user will even get a chance work with and learn new technology and environment. Company is having sufficient employees for designing, im-

plementing, testing, deploying and the training the employee to uses that system. In the system operational feasibility checks, whether the user who is going to use the system is able to work with the softwares with which the system is coded and also the mind of the user going to use the system. If the user does not understand or is able to work on the system further development is of waste.

#### **2.1.4 Social feasibility**

The System is going to be developed is it beneficial to society? Yes, as this System gives the details of the district to the user and admin and user can edit the shape files and get better view of the map also by having charts can save as image which can be useful as map

#### **2.1.5 Legal feasibility**

The Proposed System should be such that the System do not misguide or gives wrong information to user. The System should give proper information and should be reliable source of information to user.

#### **2.1.6 Time feasibility**

The Proposed System is a Desktop Application so it will take some duration of time to satisfy the objective of completing the System (Application). The duration that is allocated to develop the System is quite feasible in respect to time. 4 months is enough to develop System.

## 2.2 Requirement Analysis

### 2.2.1 Facts finding techniques

The client in most cases is not sure of what exactly is desired and has a poor understanding of the computing environment

- Inception of the Project
- Basic Elicitation
  - Problems of Scope
  - Problems of Understanding
  - Problems of Volatility
- Elaboration
- Negotiation
- Specification
- Validation
- Management (Continuous)
- The following techniques are present unambiguously throughout the project and possess enormous power with regard to requirement gathering.

#### Interview

The requirement analysis phase begins after the inception of the project. The first phase of interviews is mainly a kind of informal discussions with the client. In this phase the analysts who are the evangelists in the process of requirement elicitation generally do the following:

- Ask a set of Informal Context Free Questions regarding the system.
- Talk through with the client to know his intention with regard to the project.
- Define a business case for the idea along with the performance of certain kind of market analysis.
- Identify a working description of the projects scope.

The later phases of interviews involve the following kind of facets:

- Discussion on the Division of the entire thing into manageable and doable modules.
- Module wise interviews with the various personnel involved.
- Certain kind of debatable presentations which may be clubbed with brainstorming or prototyping sessions.

This mode of requirement gathering is the one that provides the maximum amount of information regarding the project and hence is used very effectively. This mode can turn into all various forms ranging from strict one room interviews to large debatable discussions.

### Questionnaire

This mode of requirement elicitation is generally employed during change management and while laying out basic system explanations. Questionnaires used in the project are framed keeping into mind the following things:

- Amount and the kind of information to be extracted through this channel.
- The kind of stake holder to whom the questionnaire is addressed.

- The reusability and abstractness of these questionnaires.

### Record Review

The records analyzed by me were mainly the following:

- Software Design Document This gave me the actual requirements of the GUI plus the backend logic right till statement of logical queries which may be employed in some or the other form. It also incorporated the sample GUI so that any changes to the prototypes submitted earlier can be checked and tracked.
- Technical SRS (with Business Analysis) This was a typical SRS that gave me the specific requirements along with the Business rules that need to be employed.
- Class Diagrams The class diagram made me understand the entire architecture that was employed and allowed me to extend it in my system.

### Observation

This is also the method employed very widely in the project being developed. The developers working onsite generally engage in the observation of the following things:

- Work Environment of the organization.
- The technical expertise of the employees of the organization.
- The volume of customers entertained.
- The kind of system expected.
- The resistance in the organization due while the organization gets the system installed.

- The usage of any of the available systems.

During the continuous management phase that starts once the system is installed and is running the observation regarding system usage, system inconveniences and system benefits is carried out.

### 2.2.2 Data Flow Diagrams

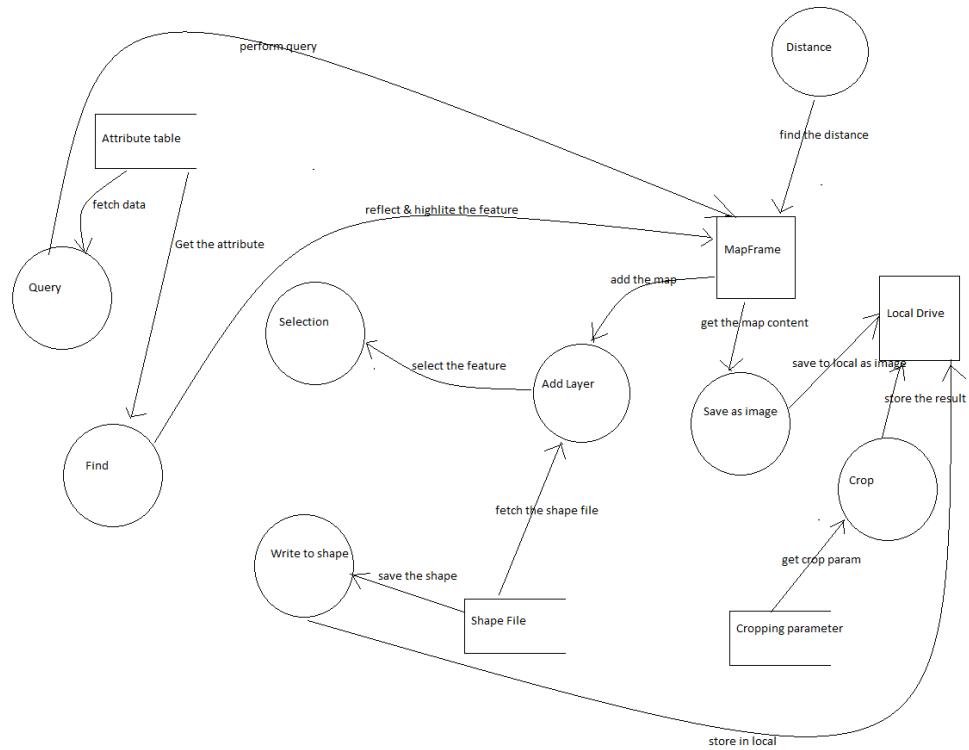


Figure 2.1: Data flow diagram of desktop GIS application

# Chapter 3

## Use Case Diagram

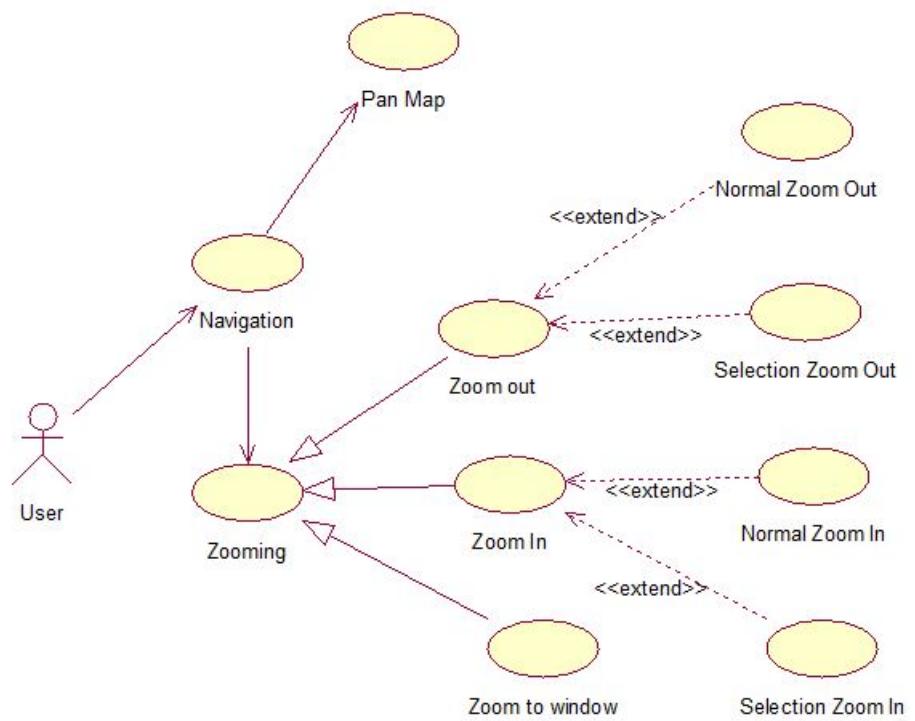


Figure 3.1: Use case diagram of navigation of map

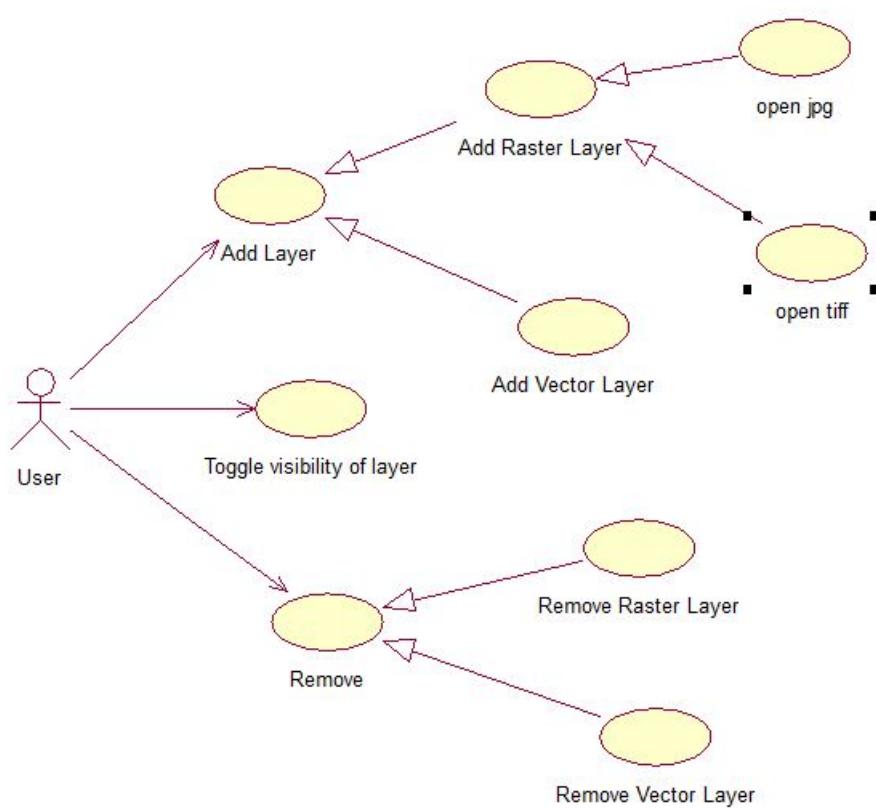


Figure 3.2: Use case diagram of layer subsystem

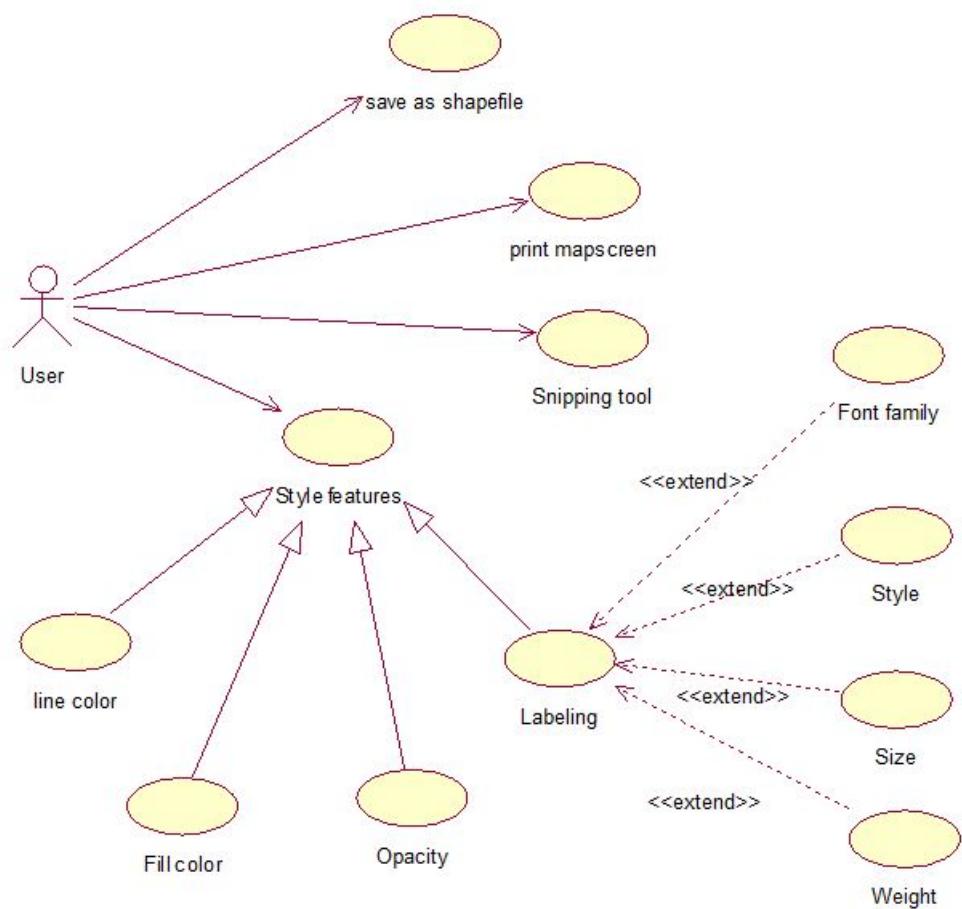


Figure 3.3: Use case diagram of print functionality

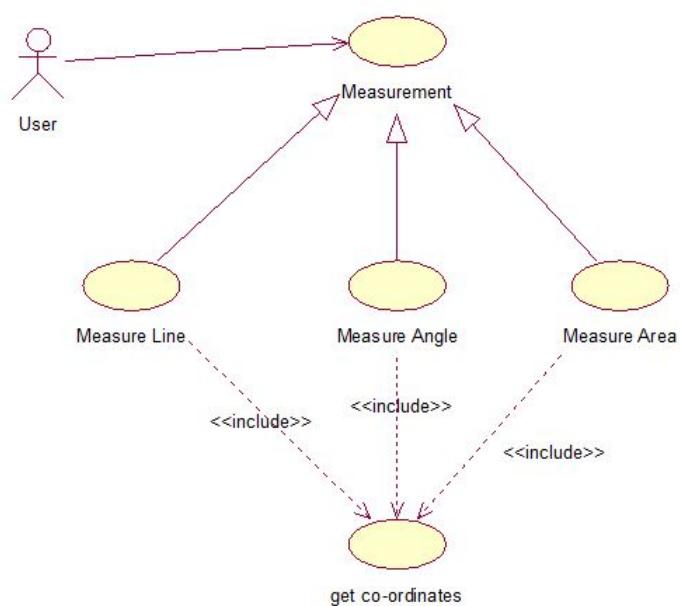


Figure 3.4: Use case of measurement

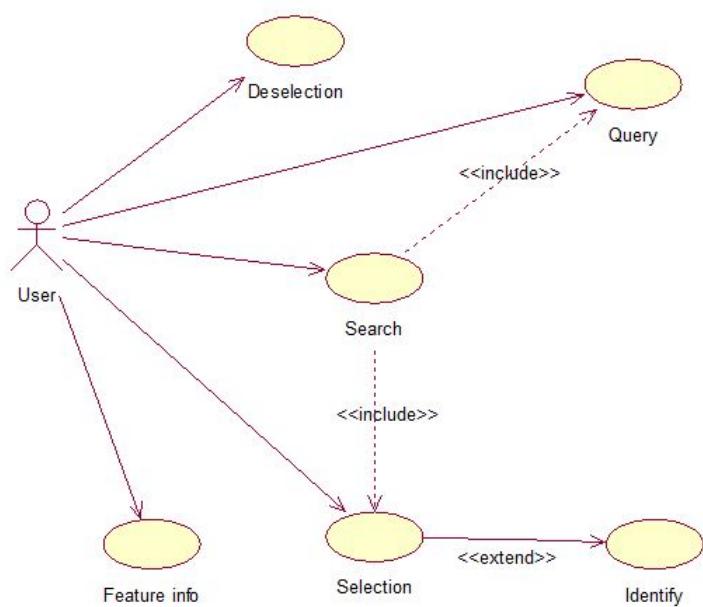


Figure 3.5: Use case of selection functionality

# Chapter 4

## Class Diagram and CRC card

### 4.1 Class Diagram

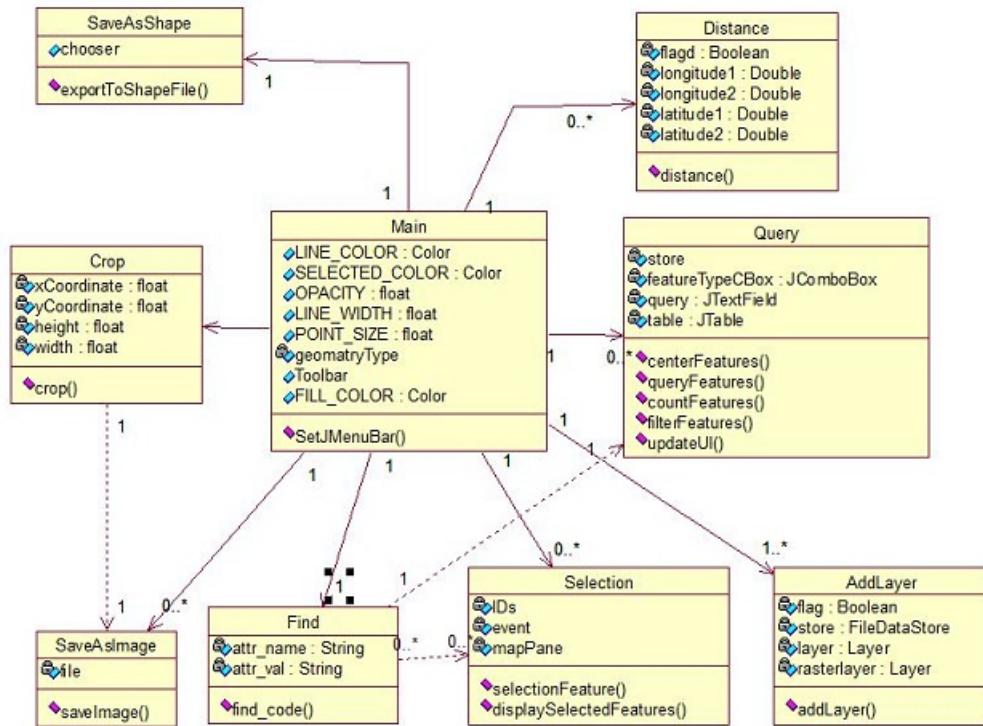


Figure 4.1: class diagram of entire system

## 4.2 CRC Index Card

<b>Class Name : Main</b>	
<b>Class Type : interaction, connection</b>	
<b>Class Characteristics : secure, sequential, permanent</b>	
<b>Responsibilities</b>	<b>Collaborators</b>
Create main window	Selection
Open layers	Find Save as Image Crop Add Layer Query Distance

Table I: CRC card - Main

<b>Class Name : Selection</b>	
<b>Class Type : interaction, connection</b>	
<b>Class Characteristics : secure, sequential, temporary</b>	
<b>Responsibilities</b>	<b>Collaborators</b>
Make selection of raster file	Find
Make selection of vector file	

Table II: CRC card - Selection

<b>Class Name : Query</b>	
<b>Class Type : interaction, connection</b>	
<b>Class Characteristics : secure, sequential, temporary</b>	
<b>Responsibilities</b>	<b>Collaborators</b>
Get feature from Layer	Main
Apply query on feature	

Table III: CRC card - Query

<b>Class Name :</b> Save as Shape	
<b>Class Type :</b> interaction, device	
<b>Class Characteristics :</b> secure, sequential, permanent	
Responsibilities	Collaborators
Get the name of layer Get the name of selected feature Get name of new layer Read the content of selected attribute Write the content into new layer	jMapFrame jLayerTable

Table IV: CRC card - Save as Shape

<b>Class Name :</b> Save as Image	
<b>Class Type :</b> interaction, device	
<b>Class Characteristics :</b> secure, sequential, permanent	
Responsibilities	Collaborators
Get the name of layer Get the content of mapframe Get name of new imagefile Read the content of frame Write the content into local file as image	

Table V: CRC card - Save as Image

<b>Class Name :</b> Distance	
<b>Class Type :</b> interaction, connection	
<b>Class Characteristics :</b> secure, sequential, permanent	
Responsibilities	Collaborators
Get the points Apply the algorithm Display result in Km.	Main

Table VI: CRC card - Distance

<b>Class Name : Crop</b>	
<b>Class Type : interaction, connection, device</b>	
<b>Class Characteristics : secure, sequential, permanent</b>	
<b>Responsibilities</b>	<b>Collaborators</b>
Get the cropping parameter Save the temporary result in image Crop that image Save the Cropped result in Local file	Main save as image

Table VII: CRC card - Crop

# Chapter 5

## User Manuals

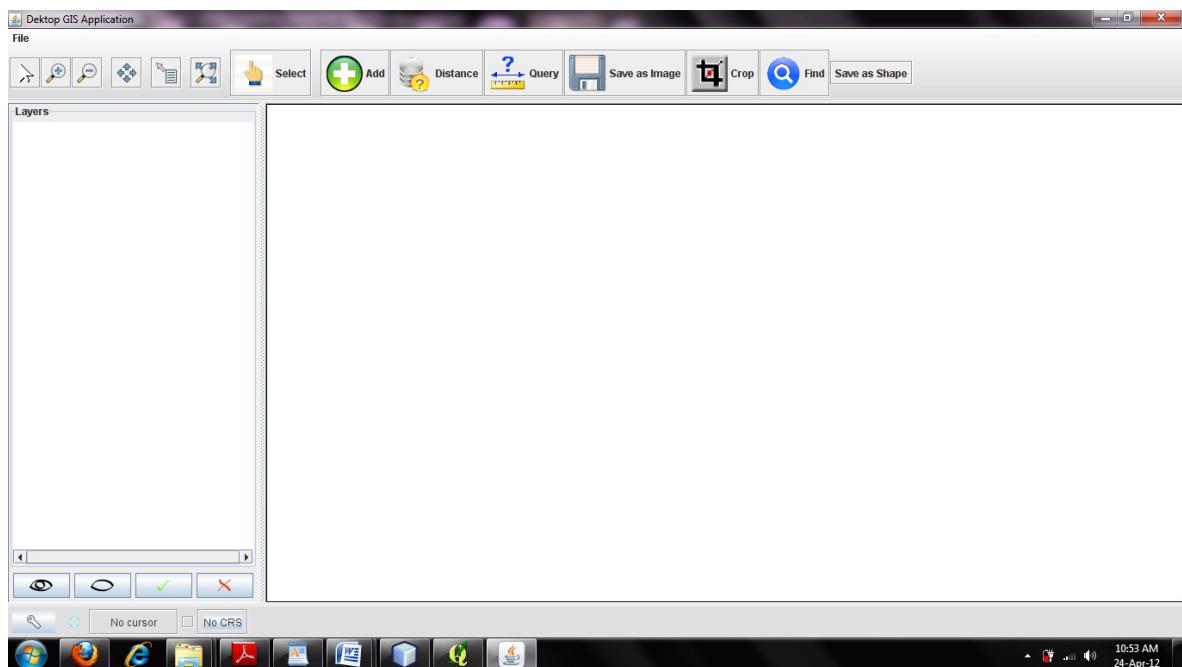


Figure 5.1: Main outlook of Application

**Description:** Above is the basic outlook of Application. The left side is Layer Table. The main area is MapFrame. On the Top menubar and toolbar for performing various functionality.

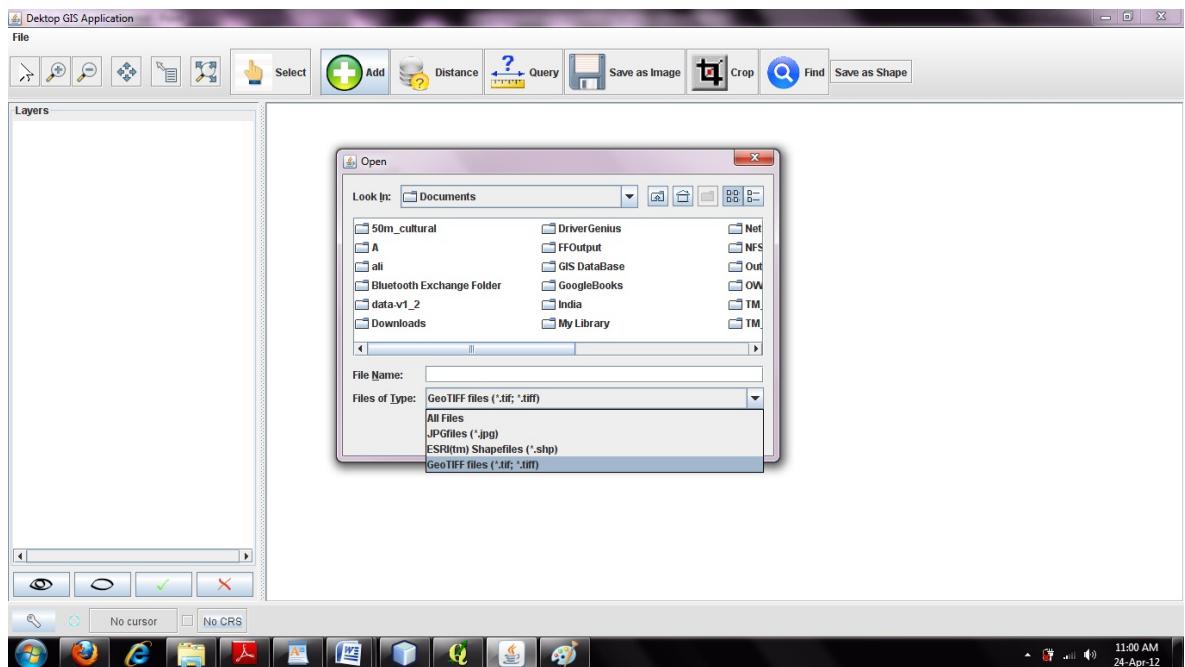


Figure 5.2: Add button Function

Description: Above is the outcome when user clicked on the ADD button. It prompt for selecting the input of Raster(.jpg,.tiff) as well as Vector(.shp) data.

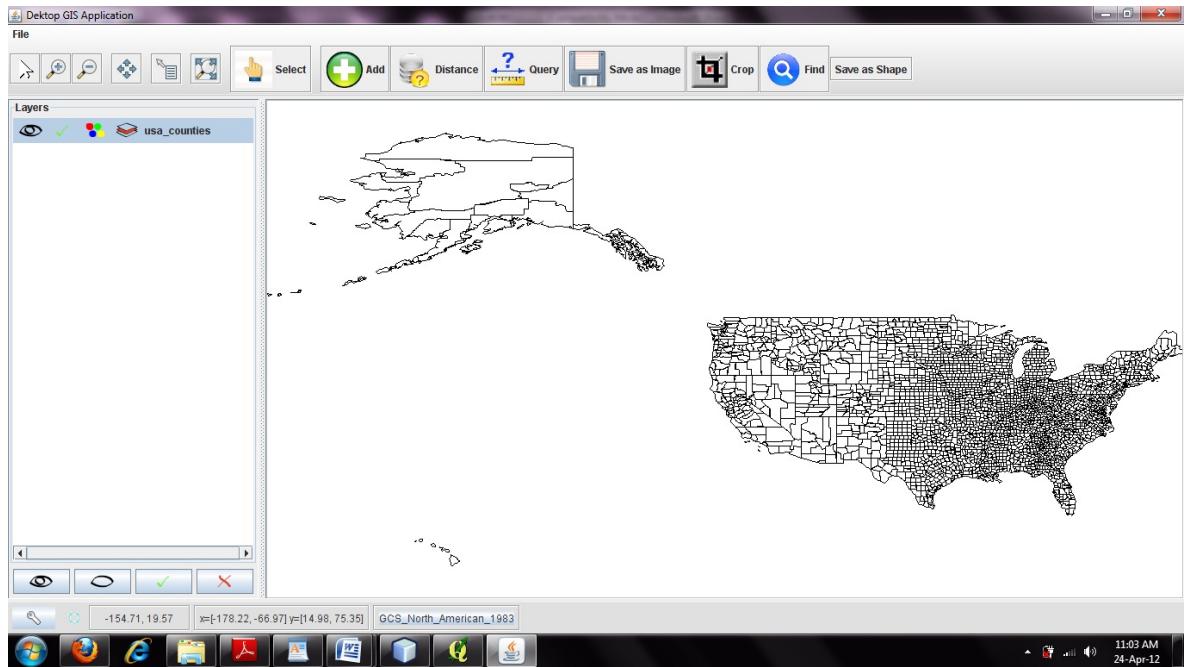


Figure 5.3: Basic rendering of Simple Map

**Description:** Above is the output when user select some shape file from the JFiledatachooser. In the Layer Table he/she can see the option to remove, select/deselect, set layer style and toggling visibility option. At the bottom he/she can see the status bar which shows the CRS of the current Layer rendered in MapFrame.

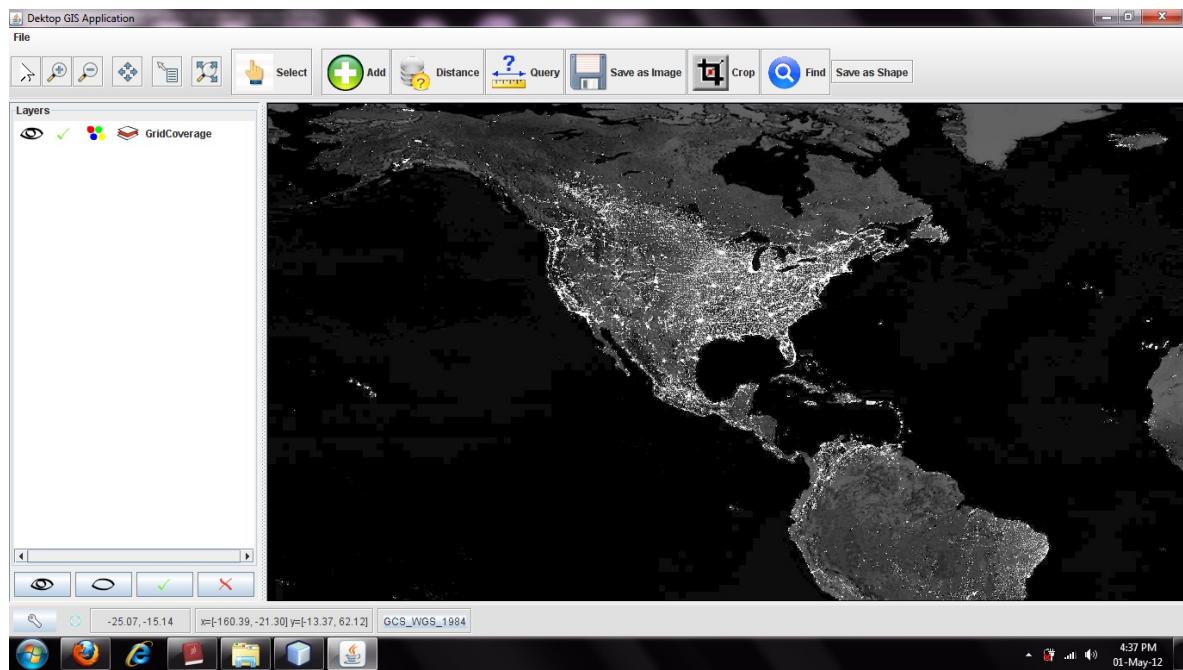


Figure 5.4: Basic rendering of Raster data

Description: Above is rendering of geo-referenced JPEG file.

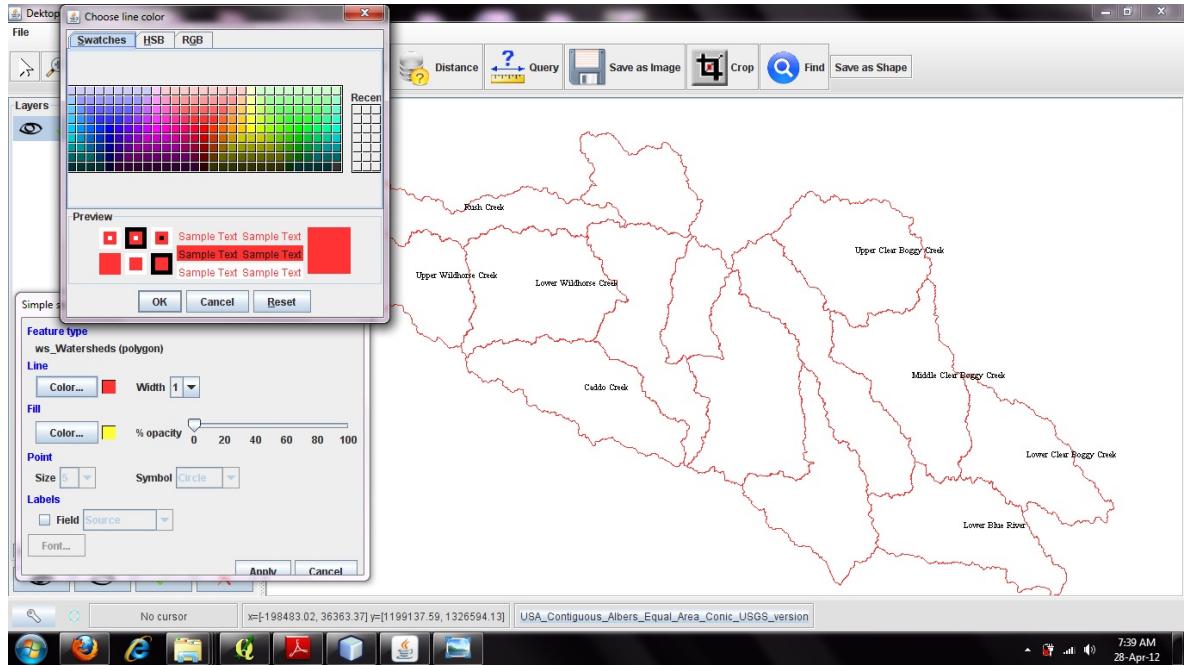


Figure 5.5: Use of Layer table options function

**Description:** Above is the use of functionality provided by Layer table option. User can color the boundy of Map. User can feel the color in Map also. User can Lable the Map using attribute Tables field.

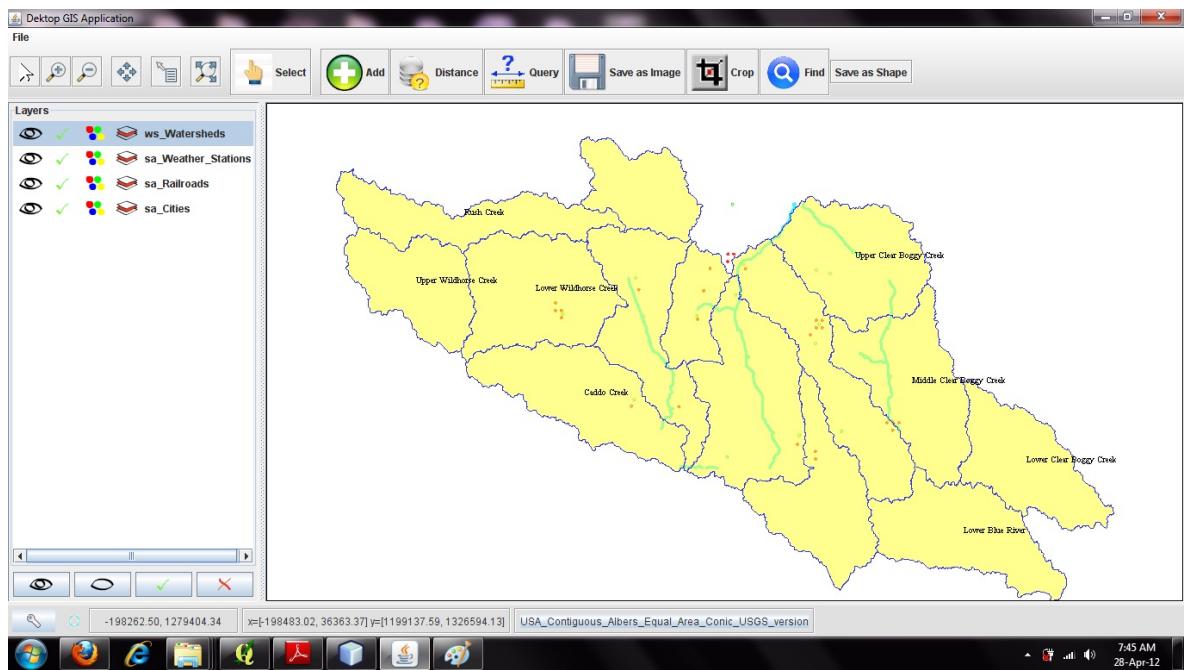


Figure 5.6: Multilayering

Description: Above is output of multilayering with two vector and one raster layer. User have colored the vector data and labeling it.

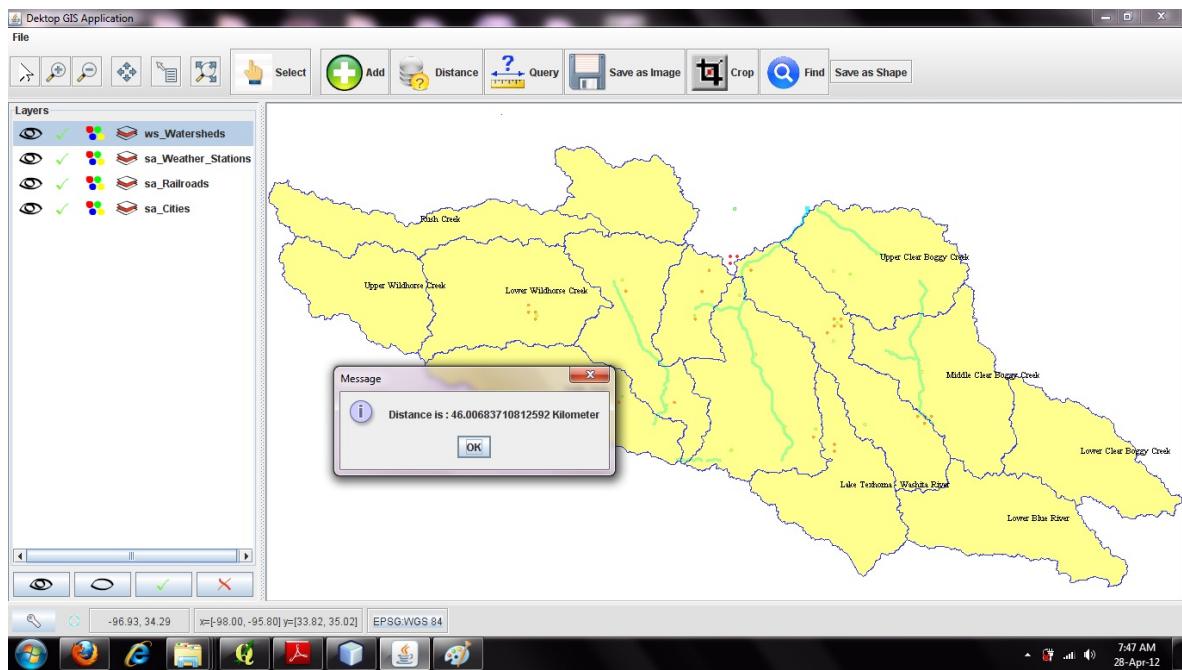


Figure 5.7: Distance feature

**Description:** Above feature is useful to calculate distance between two points in Map in kilometers.

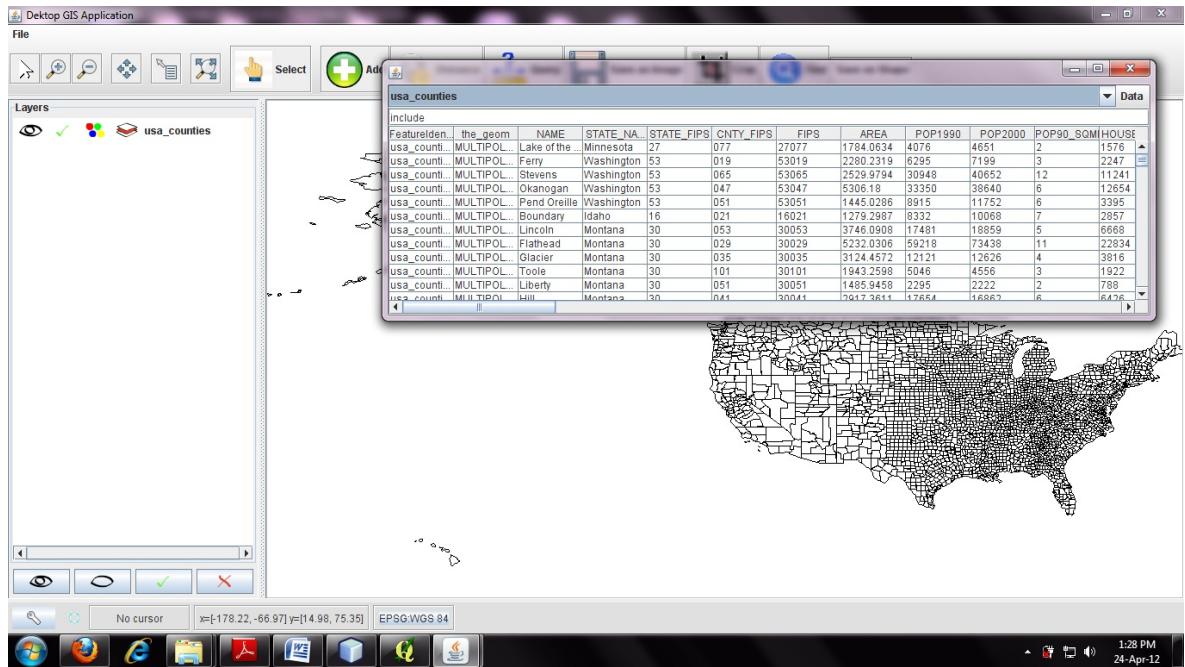


Figure 5.8: Attribute Table of Map

Description: Above is the display of attribute table of a given Map in Layer table.

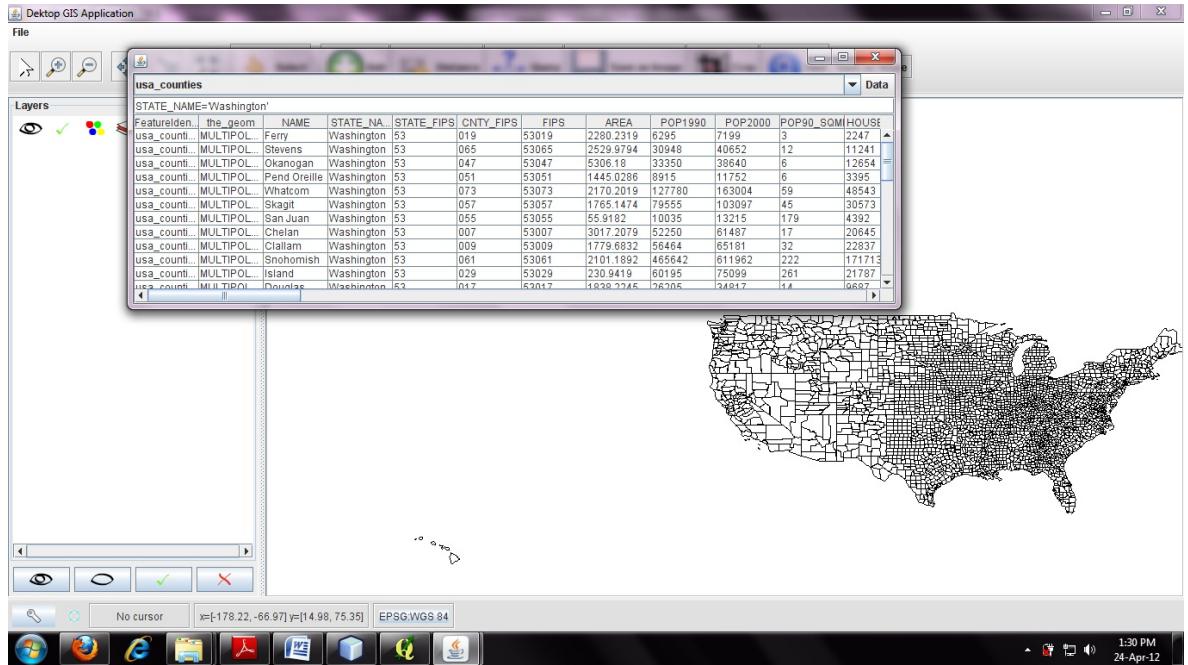


Figure 5.9: Query performance on Attribute

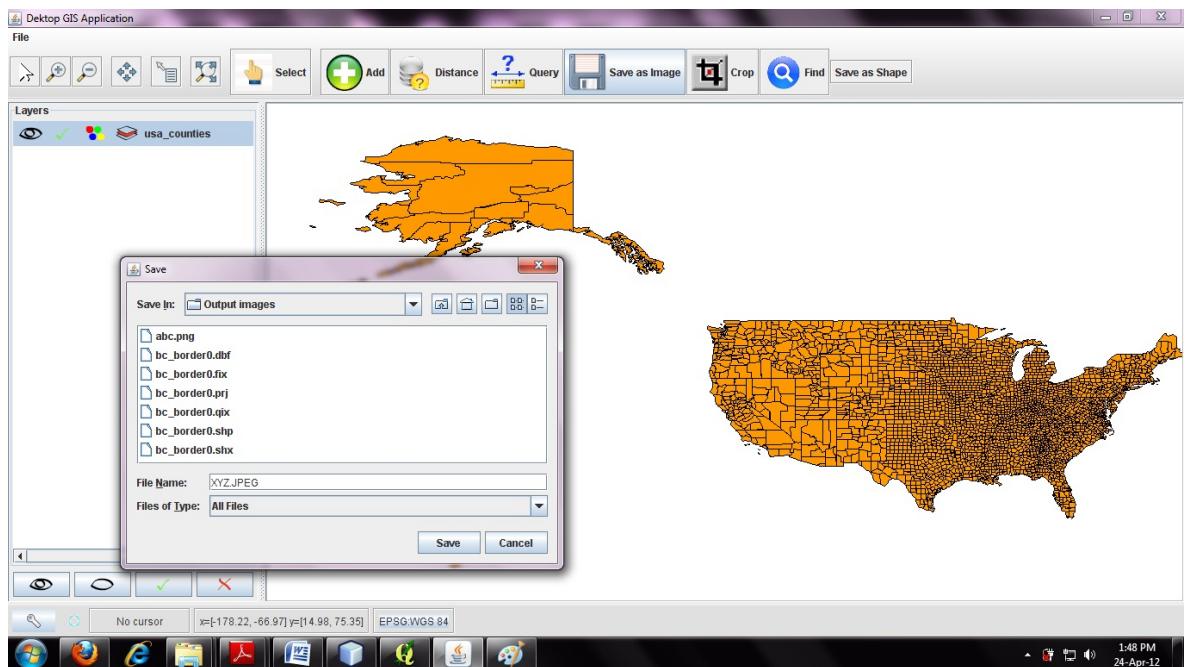


Figure 5.10: Save as Image

Description: Above it is seen that the user can save the file as Image.(Jpeg,Tiff,Bmp,Png) and Many other format.

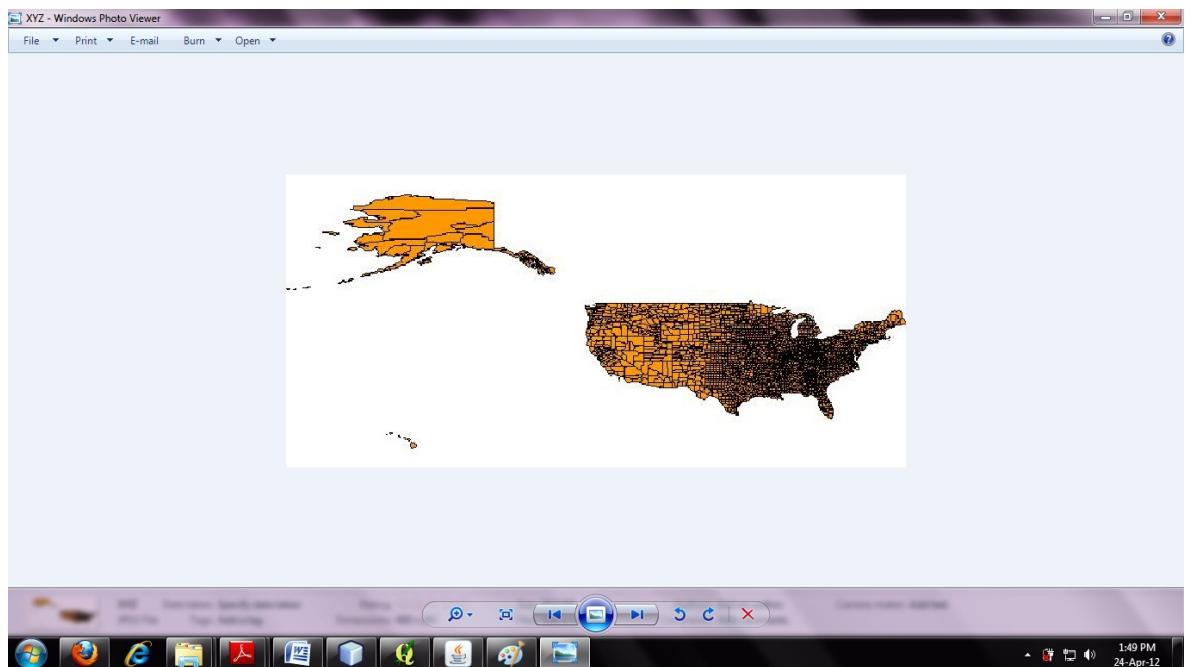


Figure 5.11: Output as Image

Description: Above is output of image file stored in previous case.

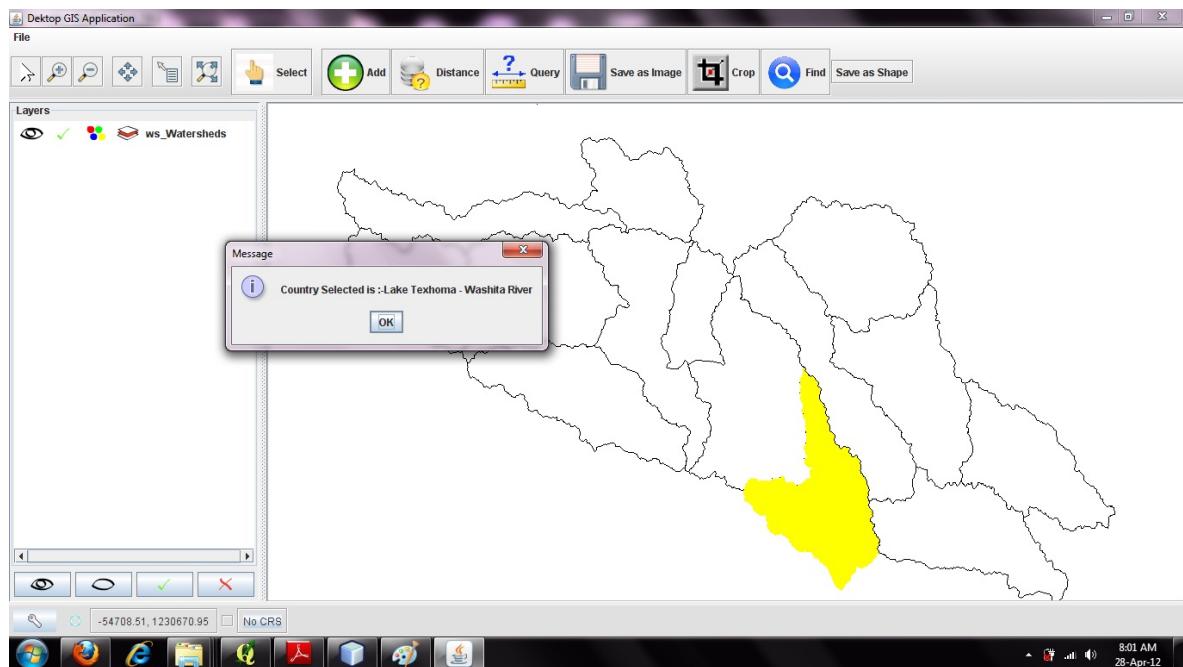


Figure 5.12: Selection feature

**Description:** User can select particular country from map and the name of that selected feature is prompted.

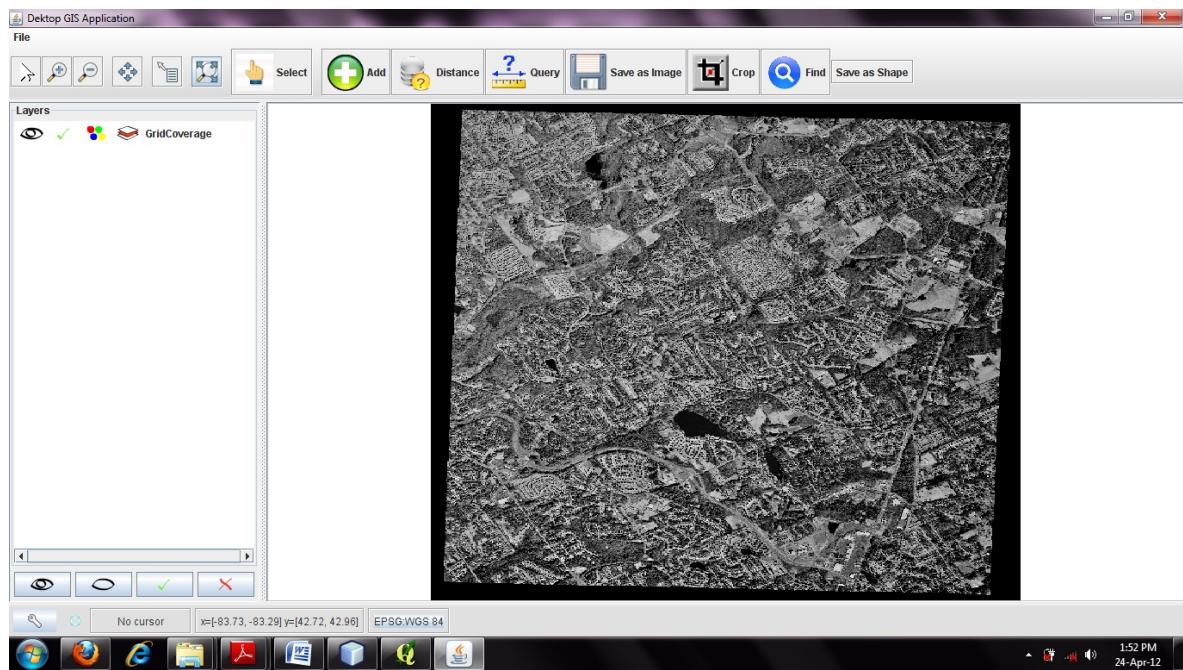


Figure 5.13: Open GeoTiff file

**Description:** User can open geo referenced TIFF file.

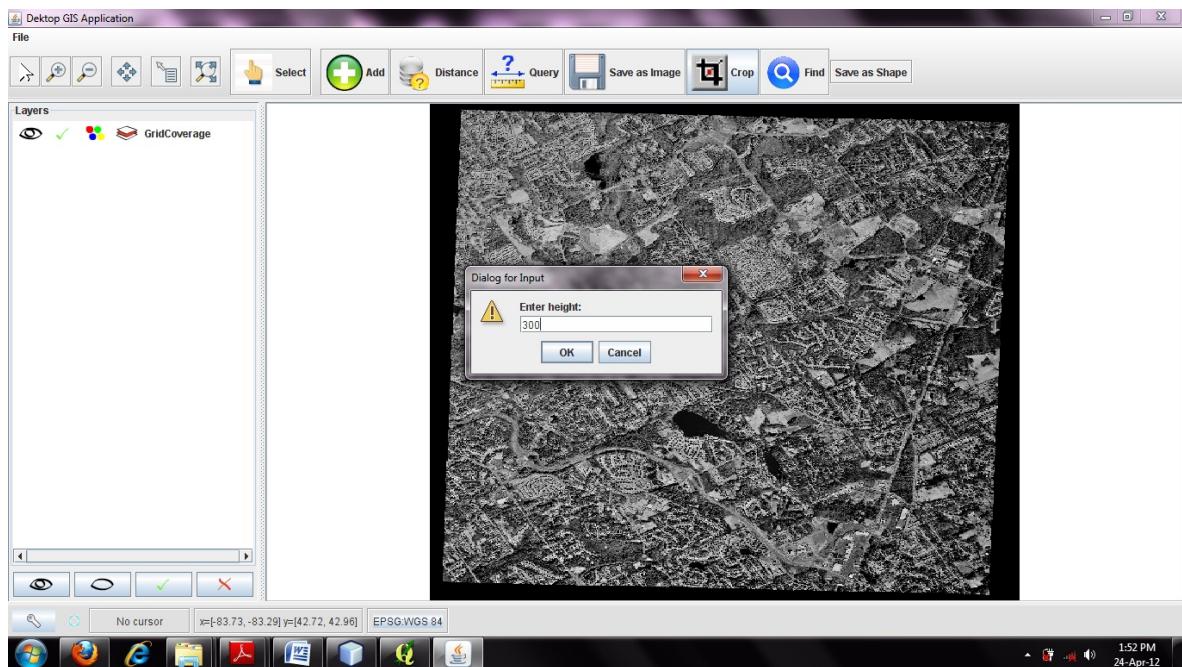


Figure 5.14: Crop the GEOTiff file

**Description:** User have to set parameter for cropping the image like width,height and the point from where to crop.

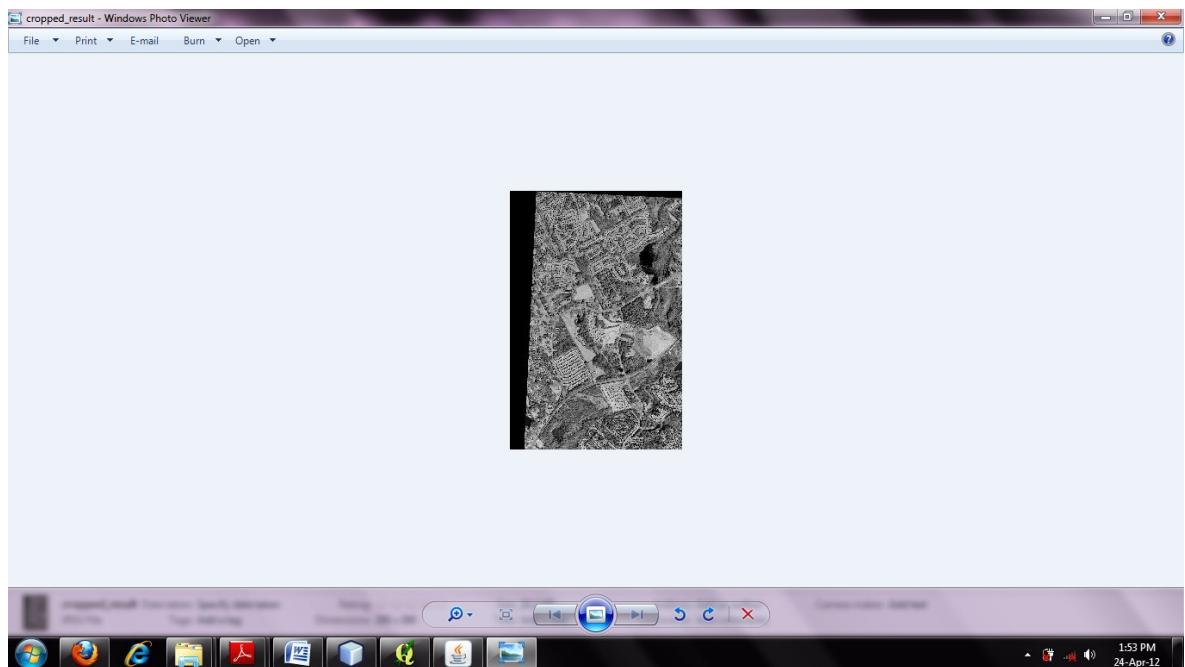


Figure 5.15: Cropped Result

Description: Here is the output of cropped TIFF file. That stores in Local directory of user.

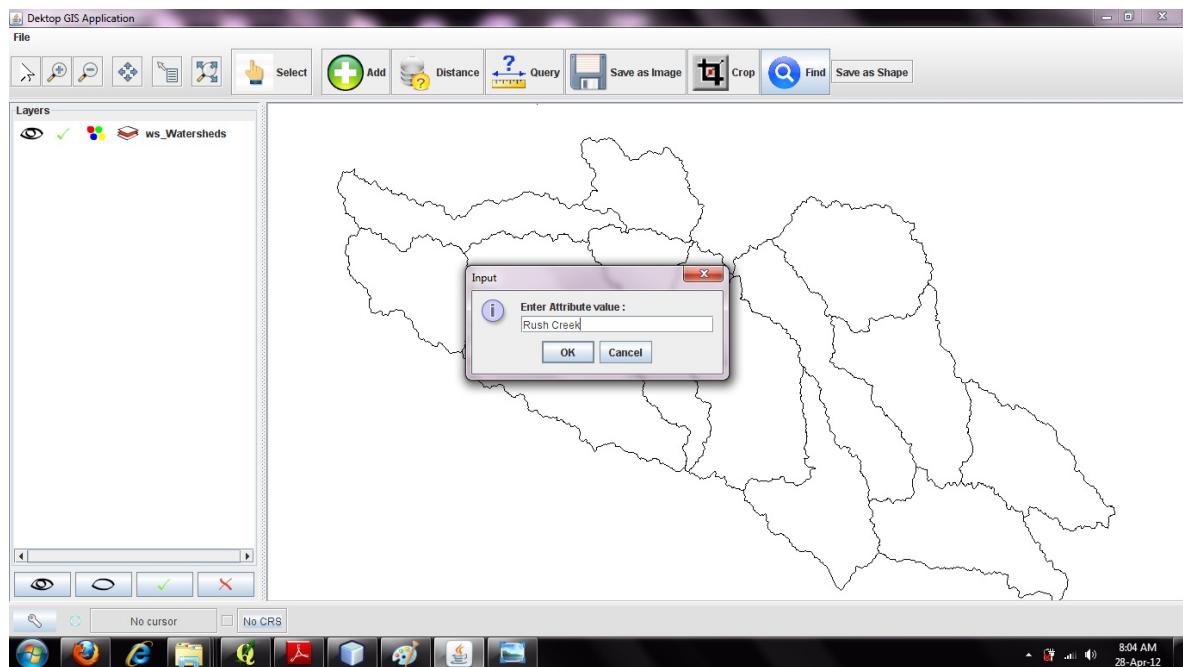


Figure 5.16: Find the feature

**Description:** User can find the country/state from the opened Map using field name stored in Attribute Table

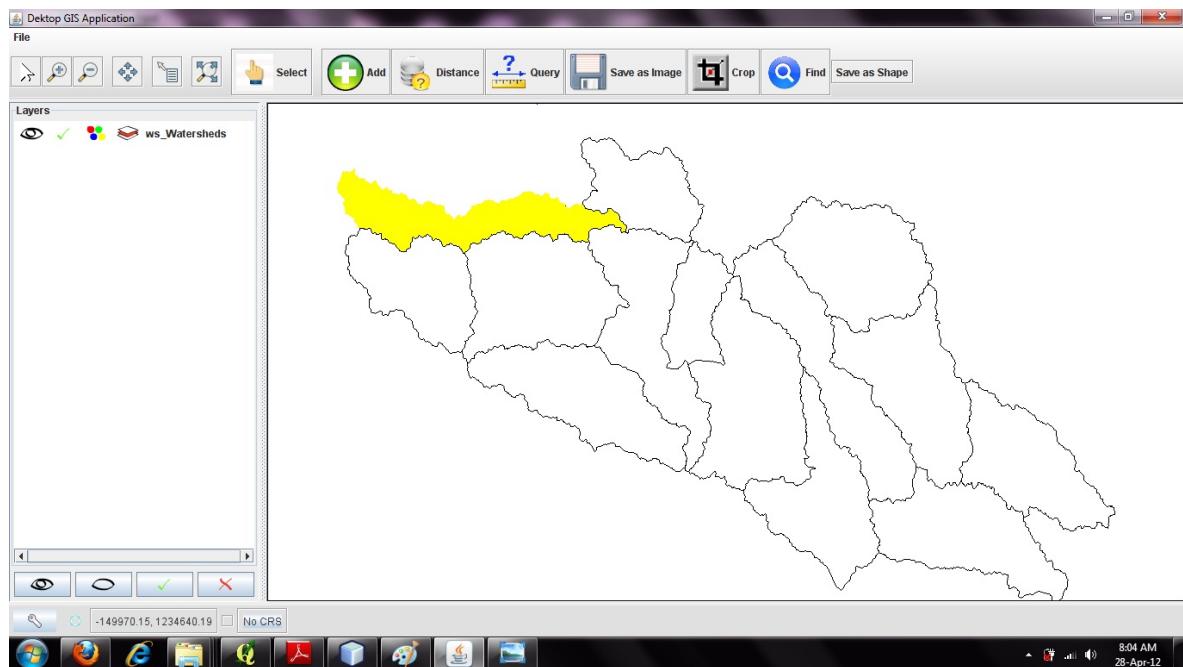


Figure 5.17: Result of finding

Description: Here is the outcome of finding the feature name Algeria. The part is highlighted in Map.

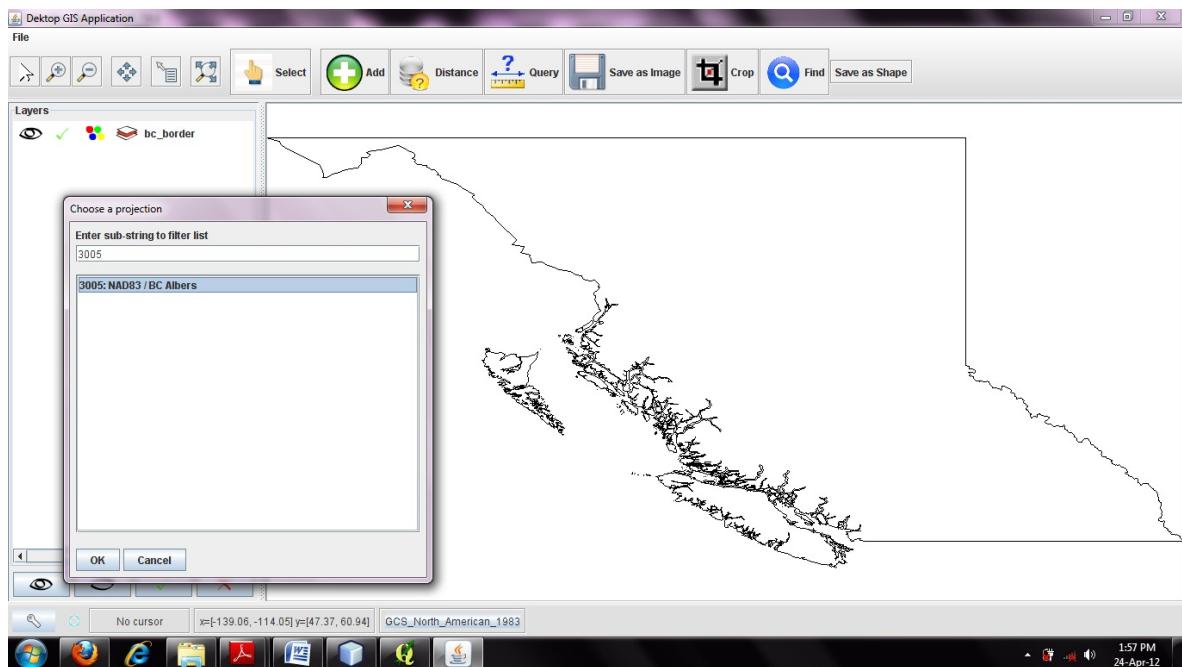


Figure 5.18: Changing the Coordinate Reference System

Description: Above user can change the CRS of shape file if its not proper so that the projection of the map can be properly displayed.

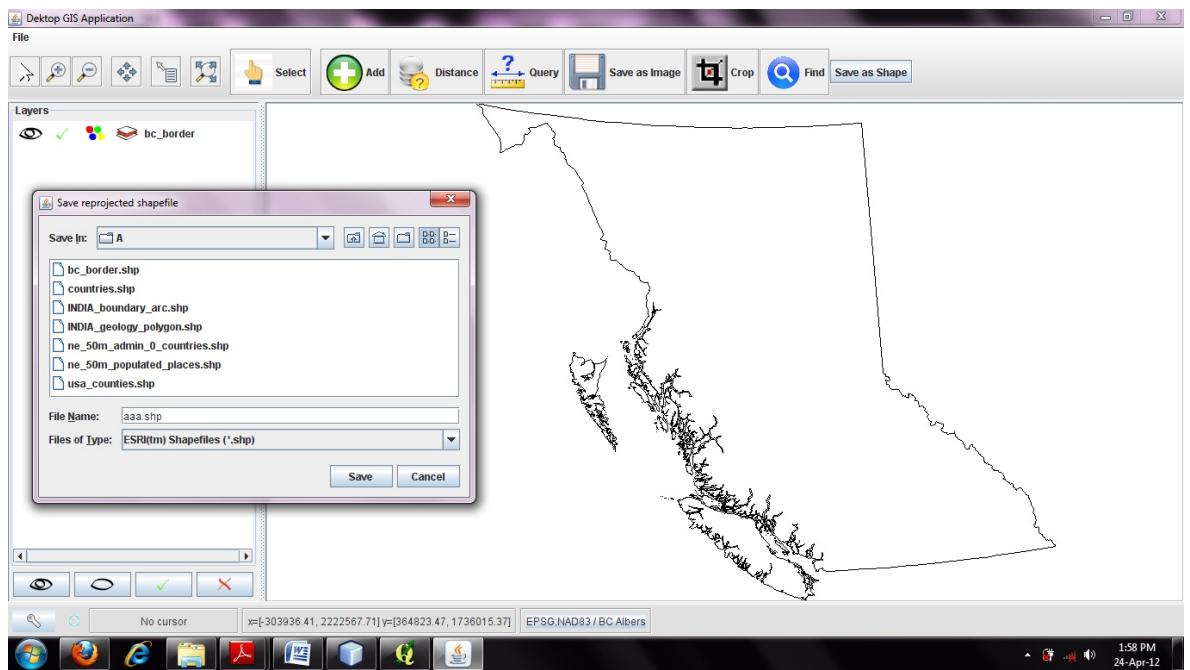


Figure 5.19: Save as Shape file

**Description:** User can save the reprojected file as shape file in local directory and use it for future purpose.

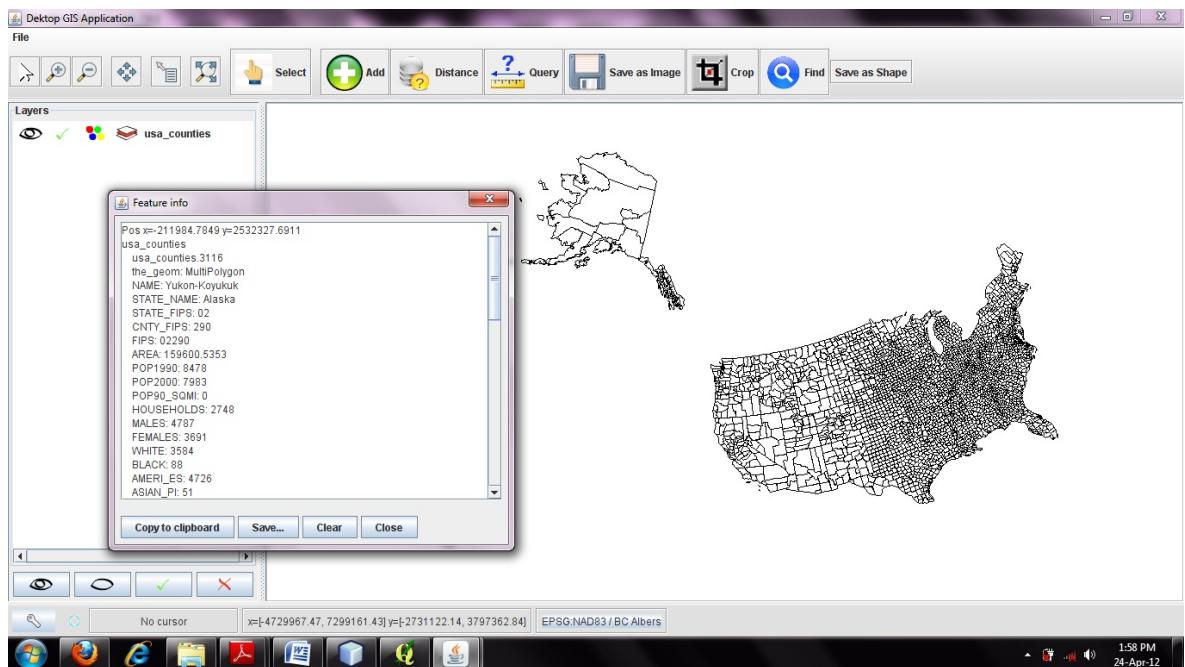


Figure 5.20: Features in selected Layers

Description: Above is outcome of the process when user click on some point in map using feature selection tool in Map. The all attributes entry related to that point is displayed in figure.

# Chapter 6

## Testing

Sr. No.	Scenario	Expected Result	Obtained Expected Results (True/False)
1	Successfully load the shape file.	The JMapFrame is rendering the Map Properly.	True
2	Successfully render Geo-referenced Raster data.	The JMapFrame is rendering the Image Properly.	True
3	Load non-georeferenced Data.	Nothing is displayed in MapFrame.	True
4	Selecting the feature.	The feature is colored in Map with different color and highlighted.	True
5	Calculate the distance.	The output in kilometers is prompted in screen.	True
6	Fetch the Attribute Table.	The attribute table is displayed on screen.	True
7	Query perform on Attribute.	The desired output according to query is displayed.	True

Sr. No.	Scenario	Expected Result	Obtained Expected Results (True/False)
8	Save the mapframe content as Image.	Prompt for option to save file in local directory and successfully save the file.	True
9	Crop the geotiff image.	Ask for input of cropping parameter and perform according to that.	True
10	Find the feature from Map.	Taking attribute name and its value and search it in table and highlight the area if desired result is got.	True
11	Save as Shape file.	Ability to change CRS of Map and option to save the reprojected shape file.	True

Table I: Test Cases

# Chapter 7

## Future Enhancement

The application is Desktop GIS application, which user shape file or geo referenced jpg or tiff file. As enhancement geoserver can be included with this project. In computing, GeoServer - an open-source server written in Java - allows users to share and edit geospatial data. Designed for interpretability, it publishes data from any major spatial data source using open standards. GeoServer has evolved to become an easy method of connecting existing information to Virtual Globes such as Google Earth and NASA World Wind as well as to web-based maps such as OpenLayers, Google Maps and Bing Maps. GeoServer functions as the reference implementation of the Open Geospatial Consortium Web Feature Service standard, and also implements the Web Map Service and Web Coverage Service specifications.

GeoServer is the reference implementation of the Open Geospatial Consortium (OGC) Web Feature Service (WFS) and Web Coverage Service (WCS) standards, as well as a high performance certified compliant Web Map Service (WMS). GeoServer forms a core component of the Geospatial Web.

Something like Disaster management system using GIS can be made using this. To do this one need sensor which gives continuous information

to us and when any big change in climate happens it notifies us. A natural hazard analyst might like to identify the high-risk areas of annual monsoon-related flooding by looking at rainfall patterns and terrain characteristics.

An urban planner might like to find out about the urban fringe growth in her/his city, and quantify the population growth that some suburbs are witnessing. He/she might also like to understand why it is these suburbs and not others biologist might be interested in the impact of slash-and-burn practices on the populations of amphibian species in the forests of a mountain range to obtain a better understanding of the involved long-term threats to those populations.

A geological engineer might want to identify the best localities for constructing buildings in an area with regular earthquakes by looking at rock formation characteristics

A mining engineer could be interested in determining which prospect copper mines are best fit for future exploration, taking into account parameters such as extent, depth and quality of the ore body, amongst others

A geoinformatics engineer hired by a telecommunication company may want to determine the best sites for the companys relay stations, taking into account various cost factors such as land prices, undulation of the terrain et cetera

A forest manager might want to optimize timber production using data on soil and current tree stand distributions, in the presence of a number of operational constraints, such as the requirement to preserve tree diversity

A hydrological engineer might want to study a number of water quality parameters of different sites in a freshwater lake to improve her/his understanding of the current distribution of Typha reed beds, and why it differs so much from that of a decade ago.

# Chapter 8

## Appendix

### 8.1 Technology Used

#### 8.1.1 GeoTools

##### Introduction

GeoTools is an open source (LGPL) Java code library which provides standards compliant methods for the manipulation of geospatial data, for example to implement Geographic Information Systems (GIS). The GeoTools library implements Open Geospatial Consortium (OGC) specifications as they are developed. For an overview of the capabilities of GeoTools please check the User Guide feature list. Current version information:

- 8.0: Development

- 2.7: Stable

GeoTools is used by a number of projects including Web Feature Servers, Web Map Servers, and desktop applications.

## Open Source

GeoTools is proud to be one of the original founding projects for the Open Source Geospatial Foundation. The foundation holds the copyright on the library and is a wonderful source of assistance and community spirit for our project. The GeoTools library is made available under the LGPL license. The source code is freely available in a public subversion repository.

## Open Development

If your organization is making use of GeoTools you are invited to help set the release schedule. Please contact us on the developers mailing list. GeoTools follows an open development process. Our policies and procedures are documented in the Developers Guide. Both our change proposals and issue tracker are open.

- Starts in 1996
- Lead by Jody Garnett.
- First Stable version 2.0.0
- Latest version 8.0.RC1
- About 343 packages.
- About 4247 Classes.

## Code Distribution

- Raster formats and data access
- Arcsde, arcgrid, geotiff, grassraster, gtopo30, image (JPEG, TIFF, GIF, PNG), imageio-ext-gdal, imagemoosaic, imagepyramid, JP2K, matlab

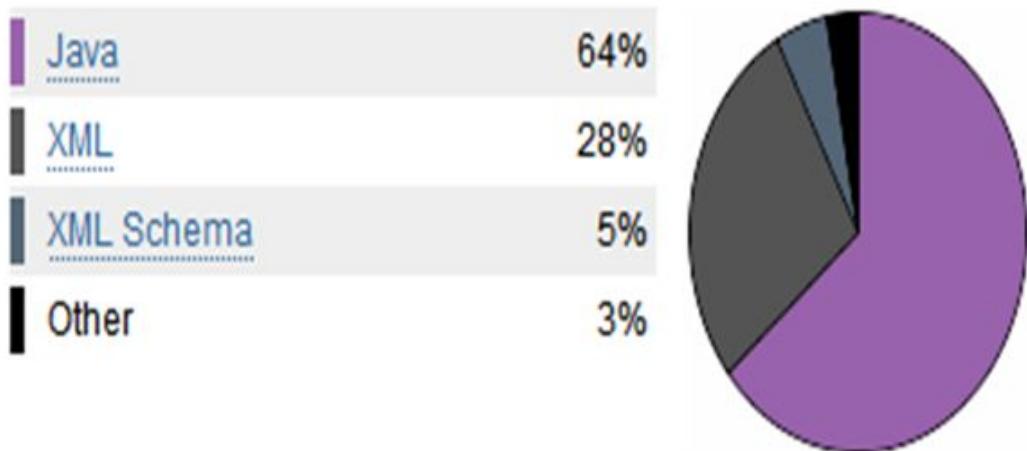


Figure 8.1: Code distribution in Geotools

- Database jdbc-ng support
- Db2, h2, mysql, oracle, postgis, spatialite, sqlserver
- Vector formats and data access
- App-schema, arcsde, csv, dxf, edigeo, excel, geojson, org, property, shapefile, wfs
- XML Bindings
- Java data structures and bindings provided for the following: xsd-core (xml simple types), fes, filter, gml2, gml3, kml, ows, sld, wcs, wfs, wms, wps, vpf.
- Additional Geometry, Filter and Style parser/encoders available for DOM and SAX applications.

## 8.2 Tools Used

### 8.2.1 Netbeans 7.0.1

NetBeans IDE 7.0.1 includes the following notable changes:

- Full JDK 7 support: Running NetBeans IDE on top of JDK 7 and support for the final version of the JDK 7 language features
- Integration of the recent patches
- Performance improvements

#### JDK 7

- Project Coin support
- Editor enhancements: Code completion, hints

#### WebLogic Server

- Streamlined and faster deployment to WebLogic
- New server runtime node displaying deployed applications and resources
- JSF integration with server libraries

#### Oracle Database

- Simplified connection wizard
- Guided installation to JDBC driver
- Editing and deployment of stored procedures

## GlassFish

- GlassFish 3.1 support
- Domain restart and log viewer for remote GlassFish
- Enable and disable deployed applications

## Java

- Maven 3 support
- JUnit 4.8.2 integration and various JUnit improvements
- Remote HTTP URLs supported for Javadoc in libraries and Java platforms
- New improved visual customizer for GridBagLayout

## Java EE

- Improved support for CDI, REST services and Java Persistence
- New support for Bean Validation
- Support for JSF component libraries, including bundled PrimeFaces library
- Improved editing for Expression Language in JSF, including code completion, refactoring and hints

## Web Languages

- HTML5 editing support
- JSON formatter

## PHP

- Generate PhpDoc
- Rename refactoring, Safe Delete Refactoring
- PHP 5.3 - Support for aliases

## C/C++

- Easy import of project from user's existing binary
- New Project type where user's source files are located on remote system

## NetBeans Platform

- Annotations for generating Action registrations in the layer
- Performance enhancements & tight integration with Profiler
- Additional NetBeans API changes

## General

- Word wrap in Editor
- Enhanced Profiler integration
- Less intrusive checking for external changes when switching between the IDE and other programs.

# **Chapter 9**

## **Summary and Conclusion**

### **9.1 Summary**

Summary of activities carried out during major project training at BISAG can be listed as below:

- Initial Learning about the technologies and the tools.
- Requirement Analysis of the project.
- Project Design including GUI related design.
- Project Development (Coding).
- Testing of the project.
- Quality Related Work
- Final Documentation.

### **9.2 Conclusion**

In "Desktop GIS Application" various functionalities of GIS are implemented. Various classes are given in Geotools which is used to make

this software. Many classes are already available in Geotools using which functionalities such as navigation, querying, finding, selection, saving and cropping like functionalities are developed in this project.

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- [2] [www.sourceforge.net/projects/geotools](http://www.sourceforge.net/projects/geotools)
- [3] [en.wikipedia.org/wiki/GeoTools](http://en.wikipedia.org/wiki/GeoTools)
- [4] [en.wikipedia.org/wiki/GIS](http://en.wikipedia.org/wiki/GIS)