JT Maps
User Manual

A step-by-step guide towards a Simplified GIS

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Overview

JT Maps User Manual is intended for those who want to know how JT Maps is used for GIS and Image Processing operations. It includes explanations and action procedures to work with JT Maps.

The JT Maps User Manual provides stepwise detail of how to use JT Maps. For those interested in further reading on GIS and Image Processing, can refer the *Additional Reading* section.

We recommend you to follow the JT Maps User Manual, as it describes the fundamentals of GIS with reference to the operations of JT Maps.

The JT Maps User Manual consists of 12 Chapters. They are:

- **Chapter 1 Introduction to GIS (6)**
  This chapter introduces you to the concepts of GIS, its functionalities and usage.

- **Chapter 2: JT Maps User Interface (8)**
  This chapter introduces you to various user interfaces of JT Maps.

- **Chapter 3: Maps and Layers (6)**
  This chapter provides an insight of what is a map layer and how to create a map layer.

- **Chapter 4: Map Viewing (16)**
  This chapter covers the ways to view a map and how to use the options associated with "Layer Control".

- **Chapter 5: Selecting Objects (5)**
  This chapter explains the various selection features with JT Maps and gives explanation on how one can perform these operations.

- **Chapter 6: Georeferencing (3)**
  Instructions on how the georeferencing module can be used for assign the coordinates to the digital image.

- **Chapter 7: Editing Spatial Objects (7)**
  This chapter explains the spatial data creation and editing of spatial objects using JT Maps.

- **Chapter 8: Image Processing (5)**
  This chapter describes the features supported by the Image Processing module of JT Maps

- **Chapter 9: Query and Data Manipulation (4)**

  This chapter explains the operations related to non-spatial/attribute data, including query analysis on spatial and non-spatial data.

- **Chapter 10: Thematic Mapping (5)**

  Functionality to create thematic maps through ranges, bar & pie charts have been explained here

- **Chapter 11: Buffer & Overlay (5)**

  Creation of buffer and options under overlay analysis, supported by JT Maps has been explained here in this chapter.

- **Chapter 12: Network Analysis (4)**

- **Chapter 13: Data Exchange**

- **Chapter 14: Map Composition**

- **Chapter 15: Projection Transformation**

What JT Maps has to offer

JT Maps is comprehensive and easy to use GIS software. An integrated system incorporating image processing, digitization and analysis, will help you work both quickly and efficiently. Built in accordance with industry standards it provides exceptional, yet intuitive capabilities.

Designed from ground up, JT Maps provides a level of functionality that has never been seen before in a GIS product. Key features include:

- Image processing which supports a range of satellite data formats
- Data Creation
- Analysis: Spatial Analysis, Network Analysis
- SQL support
- External Database connectivity
- Export-Import compatible with industry standard data formats.
- Projection Transformation

JT Maps - Prerequisites

Software

The desktop PC where you will be installing JT Maps should have:

- Windows 2000(with SP4)/Windows XP(with SP1) or above

Hardware

Minimum configuration required for running JT Maps is:

- PIII 933MHz with 128MB Ram

Recommended hardware

- PIV with 256MB Ram

Introduction to GIS

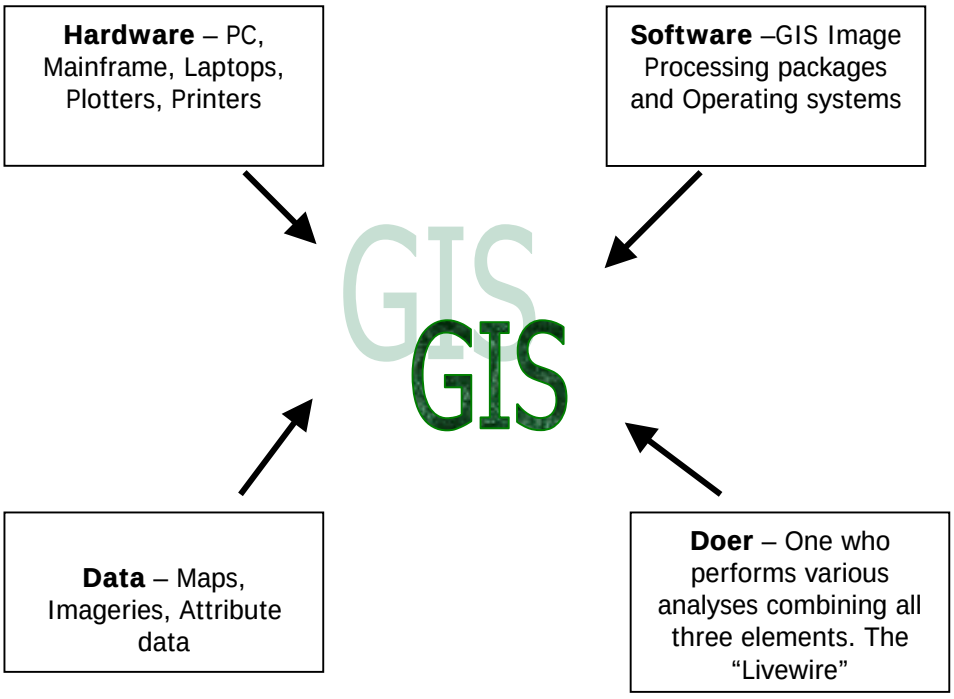
Definition

Geographic Information System (GIS) is a computer based integrated technology where geographic data along with it's attributes from various sources are fed into a system for storage, retrieval, manipulation and display. There are many definitions of GIS with each definition reflecting an individual perception of GIS and the type of problem statement he is addressing to.

These activities reflect the larger context in which people carry out their work.

Elements of GIS

GIS can be broadly segregated into four different classes as shown below



Functions of GIS

Data Input/Output

GIS accepts data from different sources in different forms. Some of the main sources of GIS data are digital / analog maps, aerial photographs, satellite imageries and field survey. Once the data is stored it can be manipulated and analyzed to reach a particular conclusion.

Data Management

Data management is a process in which the stored data is maintained systematically and allows proper retrieval of data.

Analysis

Analysis is an important function of GIS, which answers the queries, based the geographical feature, their location with respect to other features in association with attribute data.

Need for GIS

GIS integrates spatial and other kinds of information within a single system as it offers a consistent framework for analyzing geographical data by putting maps and other kinds of spatial information into digital form. GIS allows us to manipulate and display geographical data in new and exciting ways. The major advantages of GIS is that it allows you to identifies the spatial relationship with the map features .GIS gives a clear picture of what exists on earth in relation to non-spatial attribute. GIS stores the data, which can be utilized in different ways to serve the different purposes.

Organizing data

GIS software enables you to access, manage, analyze, and present the data with ease. It provides systematic organization of spatial database with corresponding map layers, to provide rapid access to data elements required for geographic analysis.

Data integration

GIS allows integration of different layers of data sets (both spatial & non-spatial) where each layer represents a particular type of geographic data. A typical example is shown in the figure below.

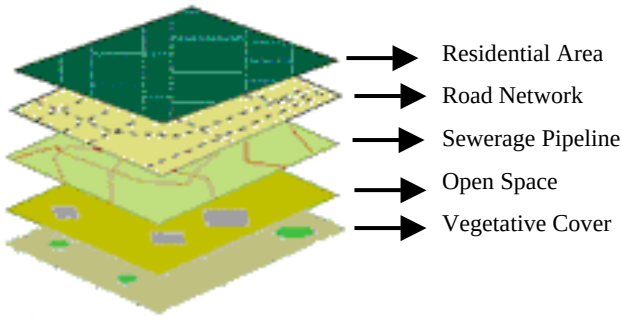


Fig: Different layers with specific data

Such a combination of data allows the user to identify areas of allocation for various purpose, besides helping them to carry overlay analysis, generate buffer zones and proximity analysis.

Making Data Presentable

GIS enables presentation of spatial data in different ways. For e.g. thematic map displays only selected kinds of information relating to specific themes, such as soil, land-use, population density and so on.

Type of Data in GIS

GIS mainly consists of two types of data spatial and attribute data. Spatial data consists of the geographical features and attribute data compromises of the numeric data.

Spatial data

Spatial data contains coordinates and identifies information for various map features. Spatial data means data pertaining to the location of geographical entities together with their spatial dimensions. Spatial data are classified as point, line, area or surface to describe particular features on maps like buildings, streets, or cities as points line or area.

Points

Points represents any features that can be described as an x, y location on the face of the earth, such as shopping centers, electricity poles, banks, and house.

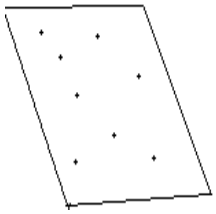


Fig: Houses as points

Lines

A line represents anything having length, such as streets, highways, and rivers.

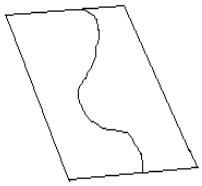


Fig: River or Road as line

Areas or Polygons

Areas or polygons are closed figures that represent the shape and location of homogeneous features such as states, countries, soil types or land use zones and cities.

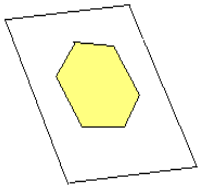
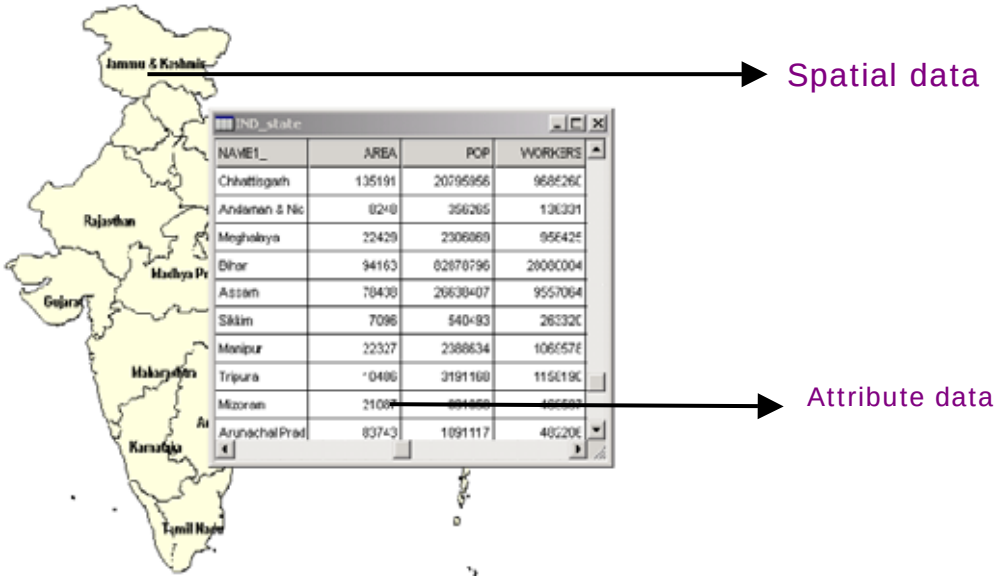


Fig: An Area as polygon

Attribute Data

The second type of data used in a GIS is attribute data. An attribute data represents a set of information, representative of spatial data. For instance, the spatial data might represent a country and contain information for city boundaries, streets, and attribute data giving information about the population, area in sq mts and so on.



Types of GIS

GIS can be divided into two main types, each having different methods of displaying and using maps and the data associating data with them.

Raster GIS

A raster is a grid of cells overlaid on a map or picture. On a computer display this is a matrix/grid of pixels. Each cell location has a value. Raster data comprises of satellite imagery, aerial photographs, scanned images etc. It is bulky and requires a large storage capacity. Data are stored in a grid or matrix like structure as a set of rows and column. Each cell within this grid contains a number representing a particular geographic feature, such as soil type, land use, etc.

A raster is a grid of cells overlaid on a map or picture. On a computer display this is a matrix/grid of pixels. Each cell's location is identified and has a value.

Vector GIS

Vector data records spatial information as (x, y) coordinates in a rectangular (planar) coordinate system. Point features are recorded as single (x, y) locations. Line features, including the outlines of polygons, are recorded as an ordered series of (x, y) coordinates.

Vector data is suitable for recording the location of discrete geographic features with precise locations like streets, boundaries, streams, telephone poles, etc. In the vector data model, features on the earth are represented as:

- Points
- Lines / route
- Polygons / regions

Co-ordinate System and Map Projection in GIS

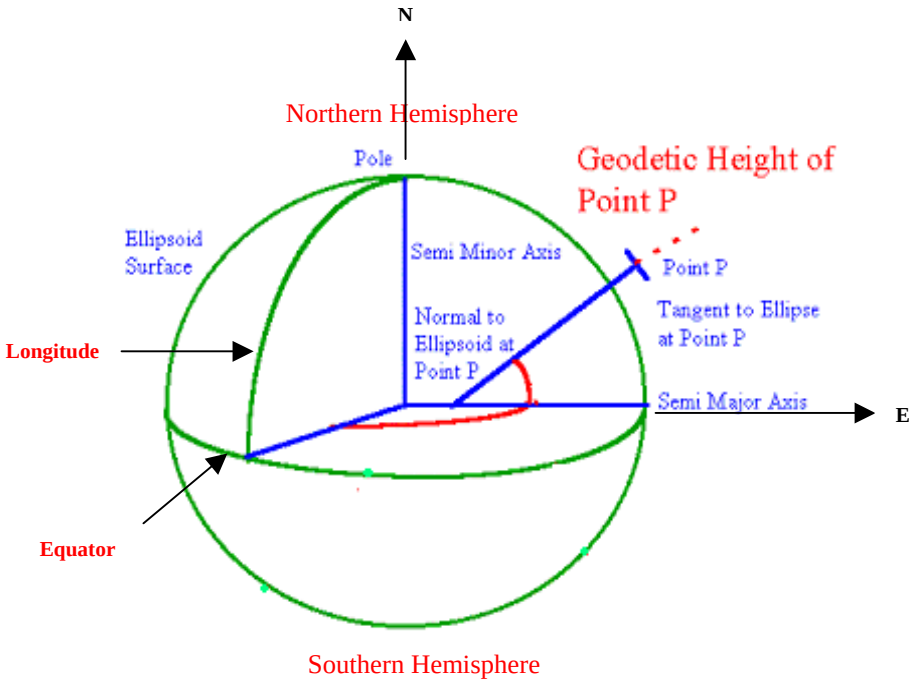
A coordinate system specifies the units used to locate features in two-dimensional space and the origin point of those units. The most common being latitude and longitude coordinate system often called the "geographic" coordinate system. An intersection of both these values (in degrees, minutes & seconds) gives the location of geographic feature on the earth surface. The **Prime Meridian** and the **Equator** are the reference planes used to define longitude and latitude respectively.

Prime Meridian is referred to the zero degree line that runs from North Pole to South Pole. Every country has its own prime meridian and when the sun shines overhead these prime meridians the country observes twelve o'clock in the noon.

Equator is the zero degree parallel that runs east to west dividing the earth into two similar hemispheres. **It is also called zero degree latitude.**

Latitude of a point is the angle from the equatorial plane to the vertical direction of a line normal to the reference ellipsoid. These are the lines running parallel to equator.

Longitude of a point is the angle between a reference plane and a plane passing through the point, both planes being perpendicular to the equatorial plane.



Maps and Projection Technique

Maps are representation of the surface of the earth or of some portion of it showing the relative position of the parts represented, usually on a flat surface. In general it represents earth features on a sheet of paper in context of its latitude and longitude value to validate its exact location on the earth.

A map projection is a process to translate features on the globe onto the flat surface of your map. In other words it's an attempt to portray the surface of the earth or a portion of the earth on maps. There are five methods of projections. They are Cylindrical, Conical, Mercator, Stereoscopic and Orthoscopic

All Earth's features are represented on the map in terms of the following: -

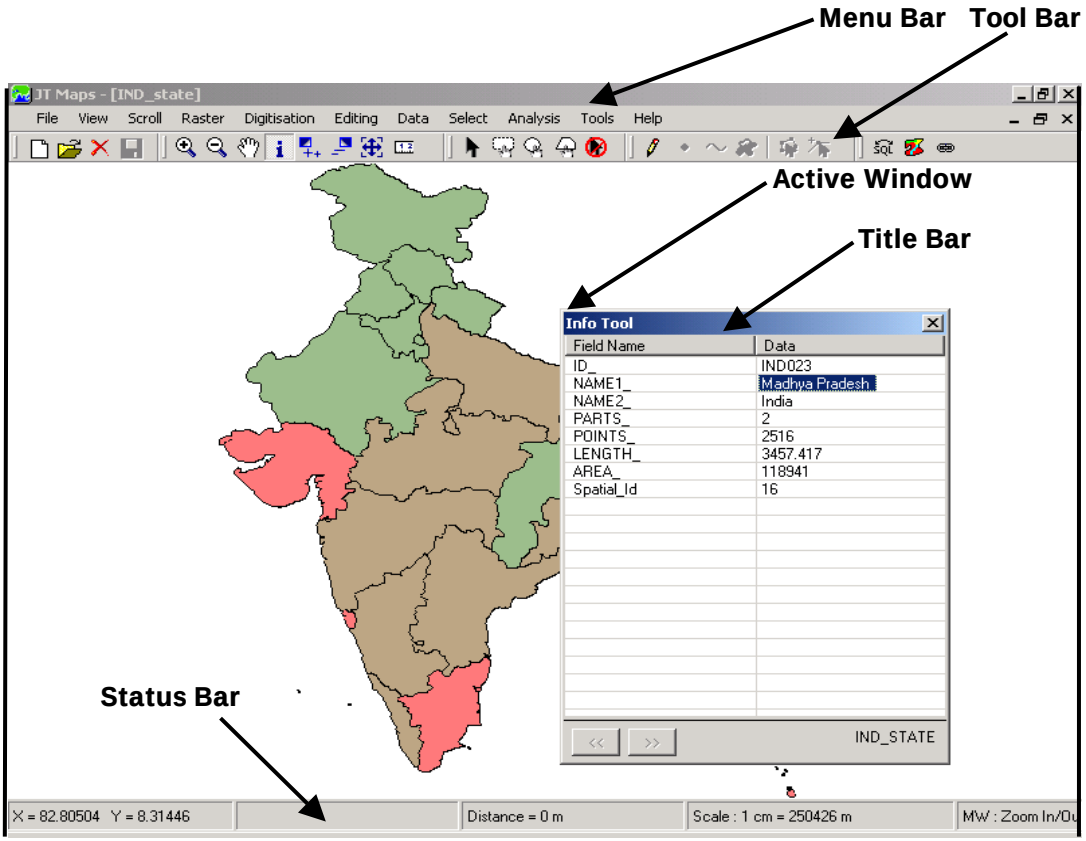
Point – features like post office, telephone poles etc
Line – representative of features like roads, streets, rivers etc
Polygon - representative of features like an open area, forests, agricultural districts etc

Note: depending on the scale of the map a polygon feature can become a point feature. E.g. A post office can be a polygon if depicted on a scale of 1:500, but is reduced to a point in a scale of 1:250,000.

Benefits of GIS

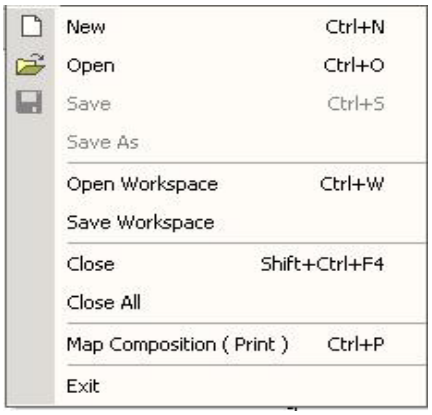
GIS as a technology can be applied to discipline like watershed management, network analysis of roads and waterways, public health care monitoring, vehicle routing and many more. Analysis of spatial and non-spatial data becomes easy and supports querying, overlay and buffer analysis. One can combine data in new ways to analyze patterns and trends not evident in separate databases. Such an analysis can lead to predictive tools for hazards management, better decision support system and optimizing sales and services for different sectors. Thus the use of GIS technologies helps empower people to make better decisions by increasing access to different dataset in its spatial context.

JT Maps User Interface



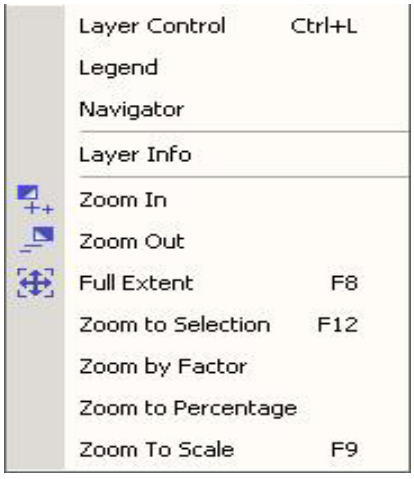
Interface Element	Description
Toolbar	All major functionalities of JT Maps are logically grouped together into Button Pads
Menu Bar	All Functions provided by JT Maps are grouped together in appropriate menus
Title Bar	Operation title in progress
Status Bar	Miscellaneous information associated with the active and main window
Active Window	The window the user is currently working on.

JT Maps > File



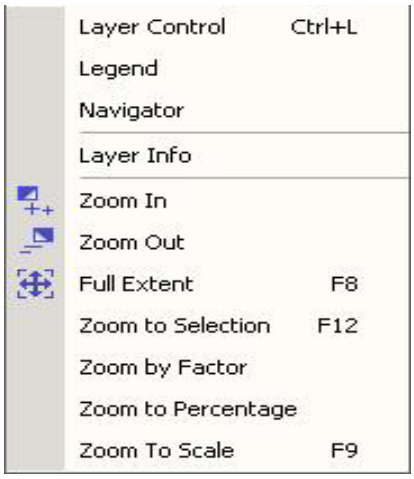
Creates a new layer
Opens an existing layer
Saves a layer
Saves the current layer with a different name
Opens the workspace
Saves the map layer order, scale and other information as a project workspace
Closes the active layer
Closes all the opened Layer
Opens print layout window
Quits the application

JT Maps > View



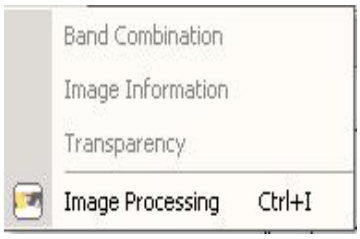
Shows Layer Control Dialog
Shows Legend Window
Shows the Navigator Window
Opens Info Dialog Box of the Active Layer
Zooms in on an area of map window
Zooms out of an Area of Map Window
Fits all layers into the map window
Zooms the selected area on a map
Zooms in by a factor
Zooms in by a percentage
Zooms in or out to a given scale

JT Maps > View



Shows Layer Control Dialog
Shows Legend Window
Shows the Navigator Window
Opens Info Dialog Box of the Active Layer
Zooms in on an Area of Map Window
Zooms out of an Area of Map Window
Fits the Map to Window
Zooms the Selected Area on a Map
Zooms in by a Chosen Factor
Zooms in by a Chosen Percentage
Zooms in or out to a Chosen Scale

JT Maps > Raster

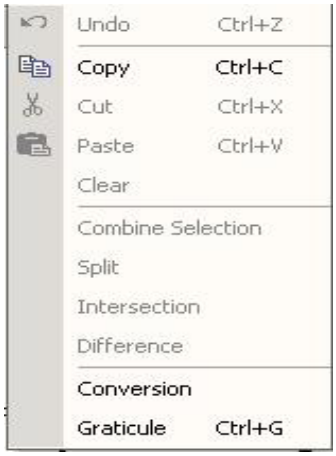


Provides the option to alter the band combination of a multispectral image
Displays the information for the image
Creates transparency of an image
Opens JT Spectral module for Image Processing

JT Maps > Digitization

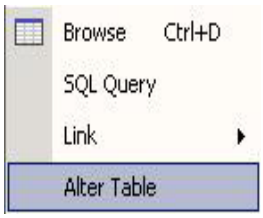
To set the pen/brush setting of a point, line or polygon feature
Opens the dialog box where you can select the layer to be edited
Stops editing
Shows nodes of the object in an editable layer
Option to add nodes to an object
Snaps a node to the nearest existing node.
Completes the object creation in the given layer

JT Maps > Editing



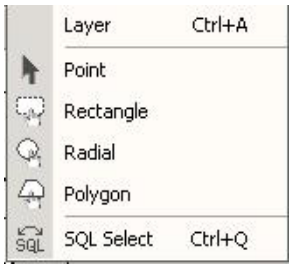
Rollback the last change on the editable layer
Copies selected object to an editable layer
Cuts the selected object
Pastes the object to an editable layer
Clears the selected object
Combine selected Objects
Splits second object with respect to the first selected object
Creates a common area object between two selected objects
Erases the common area from the second selected object with respect to the first selected object
Conversion from Line to Polygon & vice versa
Create a grid on a map

JT Maps > Data



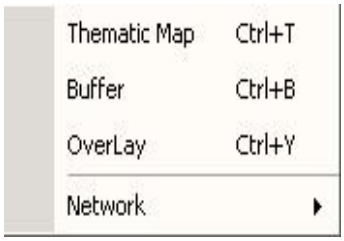
Opens non-spatial data window of one of the opened layer
Open query dialog
External database link
Opens the interface for changing the non-spatial table structure of one of the layer opened

JT Maps > Select



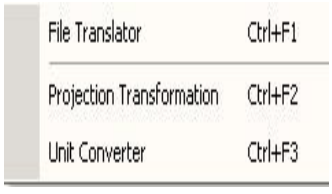
Selects all the objects of one of the opened layer
Activates point select tool to select an object
Rectangle select tool
Radial select tool
Polygon select tool
Opens query dialog box

JT Maps > Analysis



Create a thematic map over the current layer
Create a buffer from a selection
Polygon overlay
To perform network analysis on layer

JT Maps > Tool



Opens JT Maps File Translator
Opens Projection Transformation Dialog Box
Opens Unit Converter Dialog Box

JT Maps > Help

Opens JT Maps User Manual
Opens keyboard instruction for operation
Connects to JT Maps web site
Display information about JT Maps

JT Maps Toolbars Reference

Main Toolbar

- ✓  Creates a New Layer
- ✓  Opens an Existing Layer
- ✓  Closes a Layer
- ✓  Saves the Layer

Map Toolbar

- ✓  Zoom-In
- ✓  Zoom-Out
- ✓  Grabber to pan on Map Window
- ✓  Information Tool
- ✓  Fixed Zoom in
- ✓  Fixed Zoom out
- ✓  Full Extent button to view complete map
-  Distance measuring tool

Select Toolbar

- ✓  Select Tool
- ✓  Line Select
- ✓  Rectangle Select

Drawing Toolbar

- ✓  Editing button to start editing
- ✓  Create point data
- ✓  Create polylines
- ✓  Create polygon
- ✓  Node select
- ✓  Add node to a an object

Miscellaneous Toolbar

- ✓  Opens SQL Query dialog box
- ✓  Theme Creation
- ✓  Opens “Create Link” dialog

2.3 JT Maps Shortcut-Keys Reference

Keyboard Action	Key
File Options	
New File	Ctrl + N
Open File	Ctrl + O
Save File	Ctrl + S
Close File	Shift + Ctrl + F4
Open Workspace	Ctrl + W
Print	Ctrl + N
View Options	
View Layer Control	Ctrl + L
View Full Extent of Map	F8
Zoom to Selection	F12
Zoom to Scale	F9
Mouse Wheel Options	
Change Wheel Behaviour	F7
Wheel Up	F5
Wheel Down	F6
Digitization & Editing	
Start Editing	Ctrl + E
Finish Object	Ctrl + F
Undo	Ctrl + Z
Cut	Ctrl + X
Copy	Ctrl + C
Paste	Ctrl + V
Graticule	Ctrl + G
Data Options	
Browse Data	Ctrl + D
Selection Options	
Select Layer	Ctrl + A
SQL Select	Ctrl + Q
Analysis Options	
Thematic Map	Ctrl + T
Buffer	Ctrl + B
Overlay	Ctrl + Y
External Applications	
Image Processing	Ctrl + I
File Translator	Ctrl + F1
Projection Tranformation	Ctrl + F2
Unit Converter	Ctrl + F3
Help Option	
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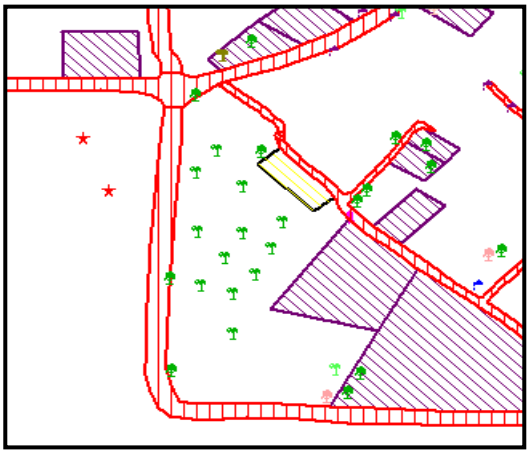
Maps and Layers

Features present on the earth surface like rivers, forests, trees, houses etc are represented on a map through the combination of points, lines and polygons. GIS enables the user to store data in different set of layers for specific needs

By using different colors, widths, patterns, and symbols, the features can be distinguished from each other and information can be conveyed about what each point, line, or area represents. Geographic features shown on a map are composed of two types of data:

- **Geographical features or Spatial data**
- **Attributes of these geographical features or non-spatial data**



Opening and Closing Layers

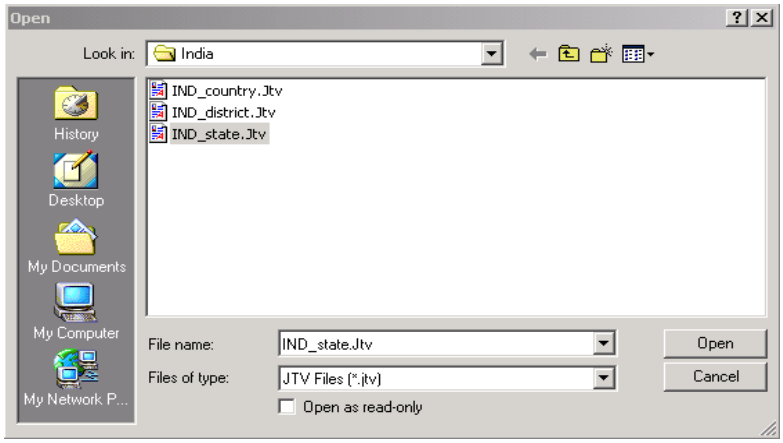
JT Maps stores all its data as .jtv files. Data in other formats needs to be converted into JT Maps file format before using with JT Maps software. JT Maps provides tools for importing data from different format as well as export data to other formats. *See Data Exchange Chapter with JT Maps* for more information.

To Open a Map:

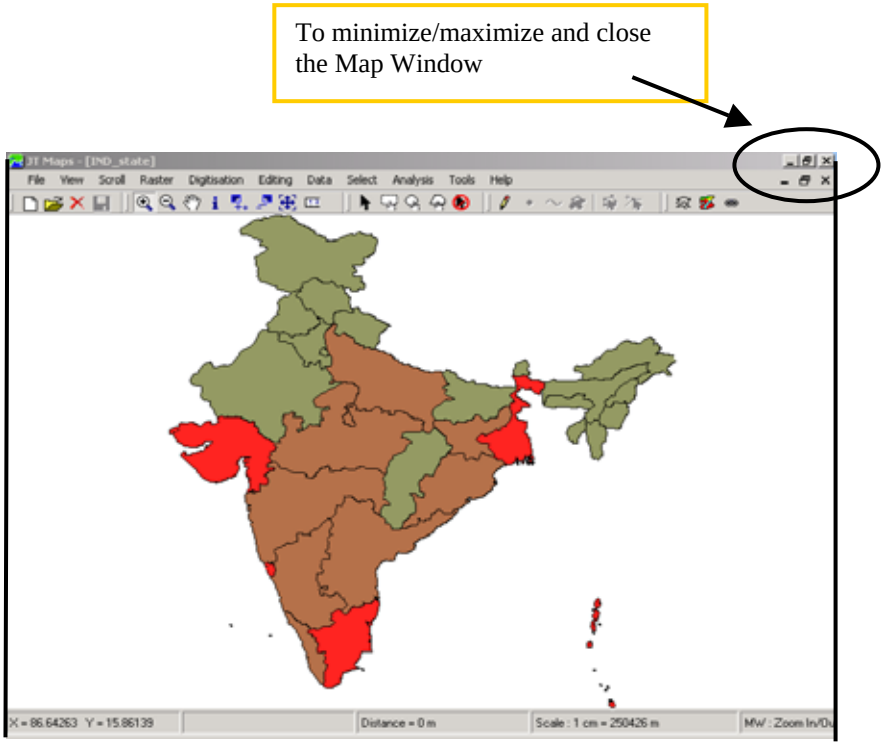
Click on the File menu, and select the Open Layer command

It can be also accessed be clicking the open button on the Main Toolbar 

In the open layer dialog, go to the directory where the map is stored, (In this case IND_state.jtv) select it and click the Open button.



The above shown step opens the map window with the layer selected.



To Close a Map:

Close the map window by clicking the  button
OR
Click go to the File menu, and select Close Layer command

OR
File > **Close**. Highlight the layer to be closed, in this case IND_state and click OK button.

If you want to close multiple layers simultaneously use the menu option File > Close All Layer.

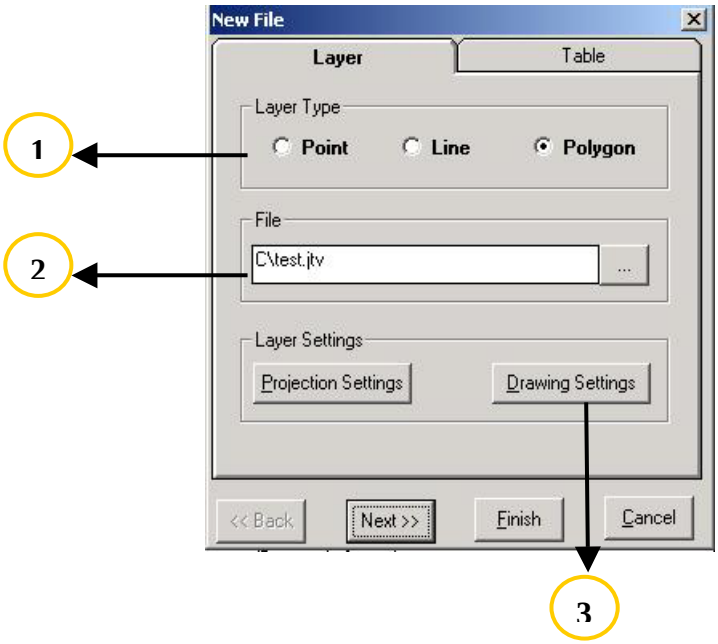
Creating New Layers

Click on the File menu, and select the New or simply press Ctrl+N

OR clicking the new button on the Main Toolbar 

The New File dialog box open, which has two tab windows.

Layer Tab: The Layer Tab is for specifying the type of the layer to be created. The choice is between Point, Line and Polygon. It also provides options to specify the drawing settings of the layer.

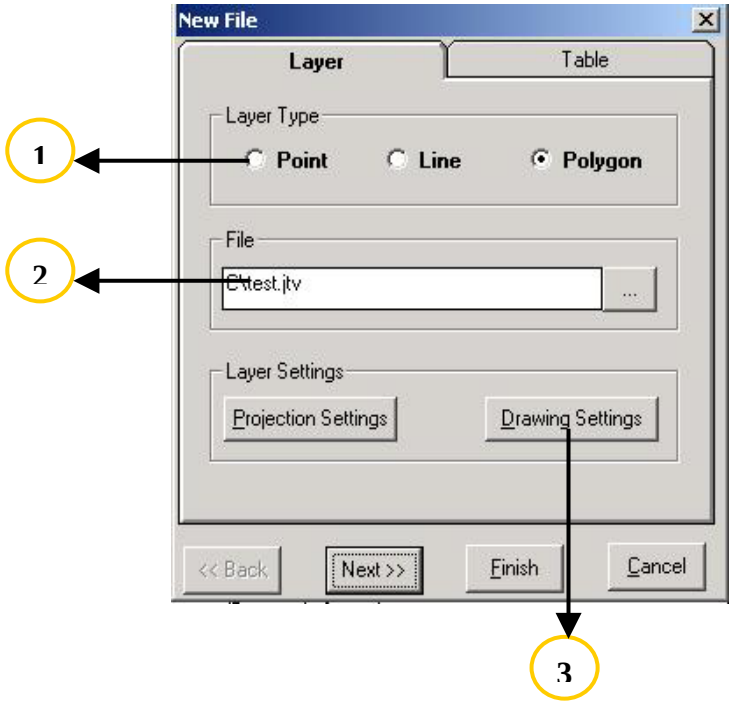


1	Specify the type of layer. Only one type can be chosen at a time.
2	Specify the location of the new file.
3	Specify the setting for drawing the object.

Settings

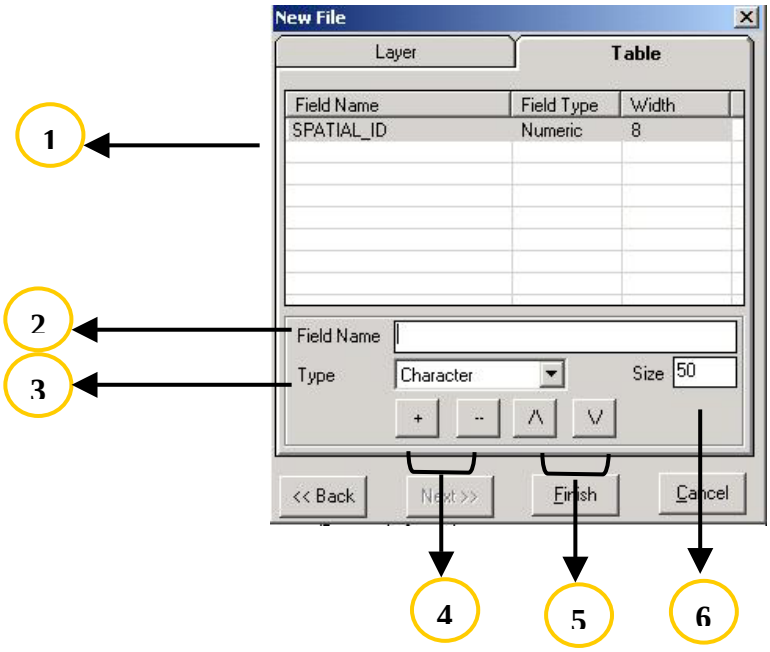
You can change the drawing settings for each layer type. This corresponds to the way the objects of the type will be drawn on the layer.

Layer Tab: The Layer Tab is for specifying the type of layer. The choice is between Line, Polygon and Point. It also provides options to specify the settings for drawing that corresponding object.



1	Specify the type of layer. Only one type can be chosen at a time.
2	Specify the location of the new file.
3	Specify the setting for drawing the object.

Table Tab: The table tab provides facility to create the fields for the non-spatial record-set to be associated with the new layer.



1	Displays the field names in the non-spatial record-set. Default field is Spatial_id.
2	Enter the name of new field.
3	Enter data type for new field
4	Buttons to add or delete fields from the record set.
5	Buttons to alter the position of fields.
6	Enter size for new field. This is applicable only if the data type is character.

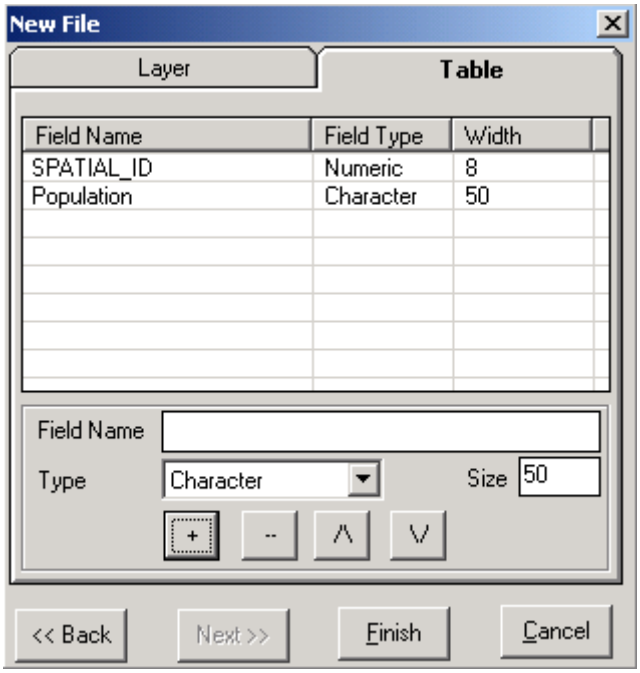
Example. Suppose you want to add a new field by the name of Population, follow the following steps:

Click on the Field text box. When you see a blinking cursor type in the name of the field

Click the 

button to add the field. **Type of the field can be defined from the drop down menu bar.**

The final screen looks like:



Saving Changes on Layer

Saving New or Modified Layer

To save changes made on a layer, click on the File menu, and select Save Layer command or simply press Ctrl+S

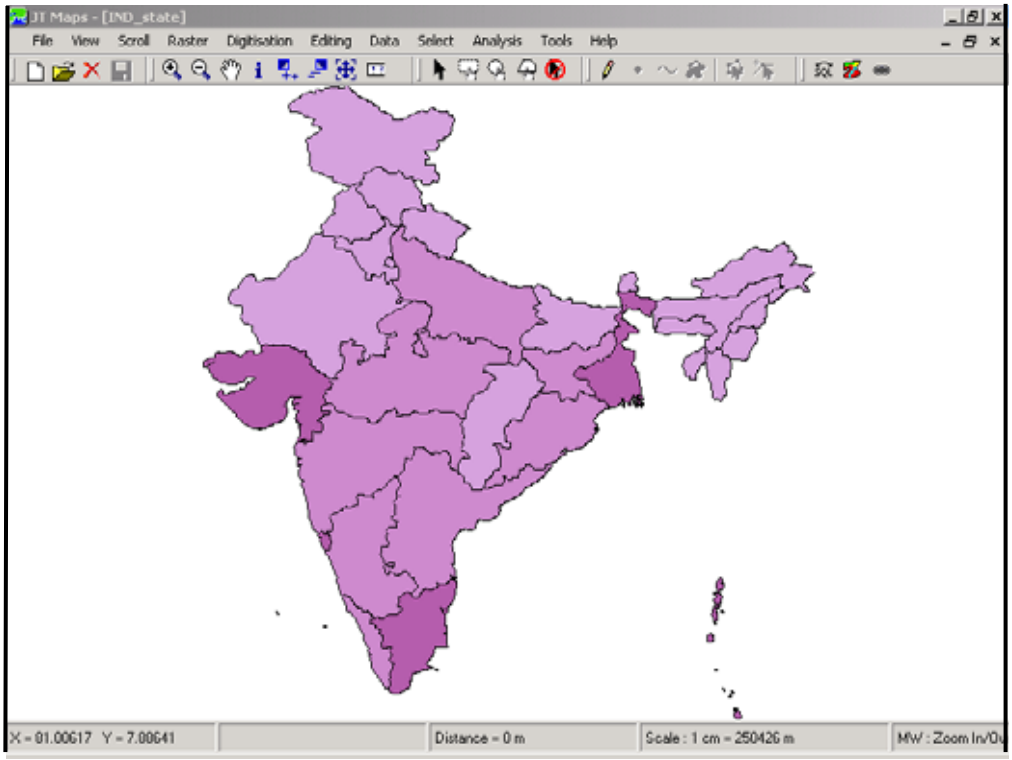
Note: This options is enabled only when you make changes on a open layer and incase multiple layers are open, this command saves changes to only the editable layer.

Concept of Editable Layer

JT Maps allows the user to open more than one layer at a time. But it allows editing or modification of only one layer at a time. To modify an existing layer, make the layer editable.

Map Viewing

JT Maps provides easy access to various commands from toolbar. This chapter provides the instructions on viewing maps and moving around a map in JT Maps.



The map shown in the figure is in **Full Extent mode** i.e. the size of the map is best fit in the given window. It provides visibility to all the objects of the layer.

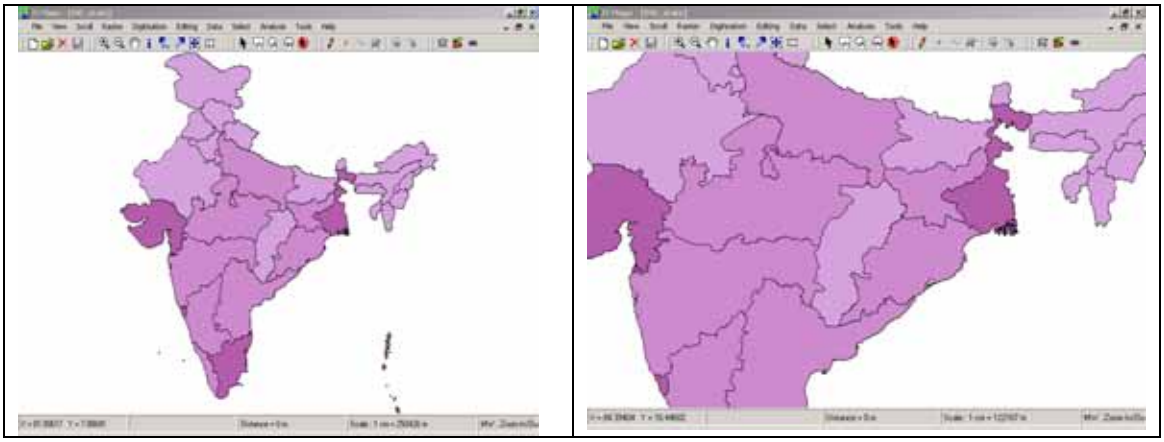
If required to enlarge a portion of the map for better viewing, JT Maps provides various options to zoom-in the map.

Zoom In: Some of the ways to zoom-in on a map are:

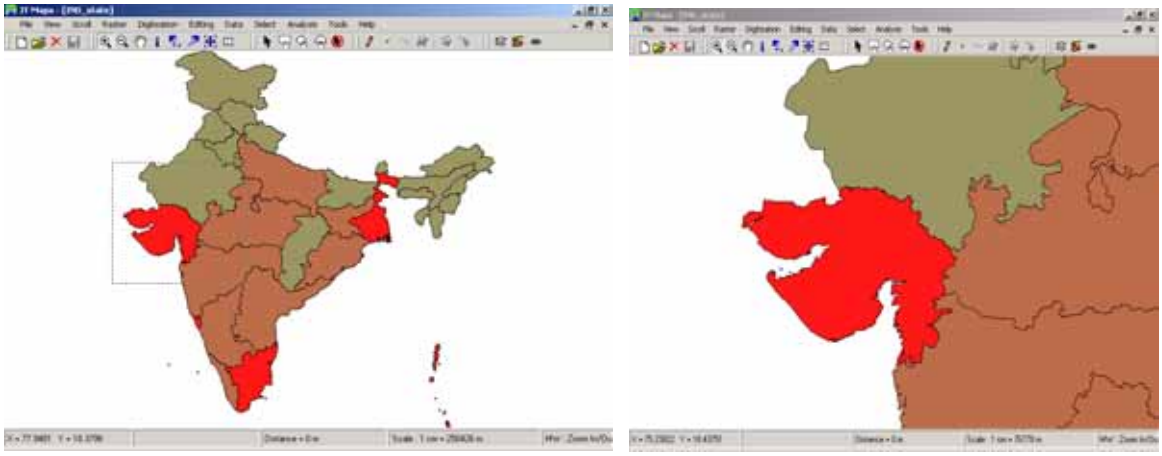
Zoom-in by a factor
Zoom in percentage
Elastic Zoom. Here you provide your own variable area for zooming.
Fixed zoom in

For fixed zoom-in click on View menu, and select the  icon.

It can be also accessed be clicking the icons on the View Toolbar



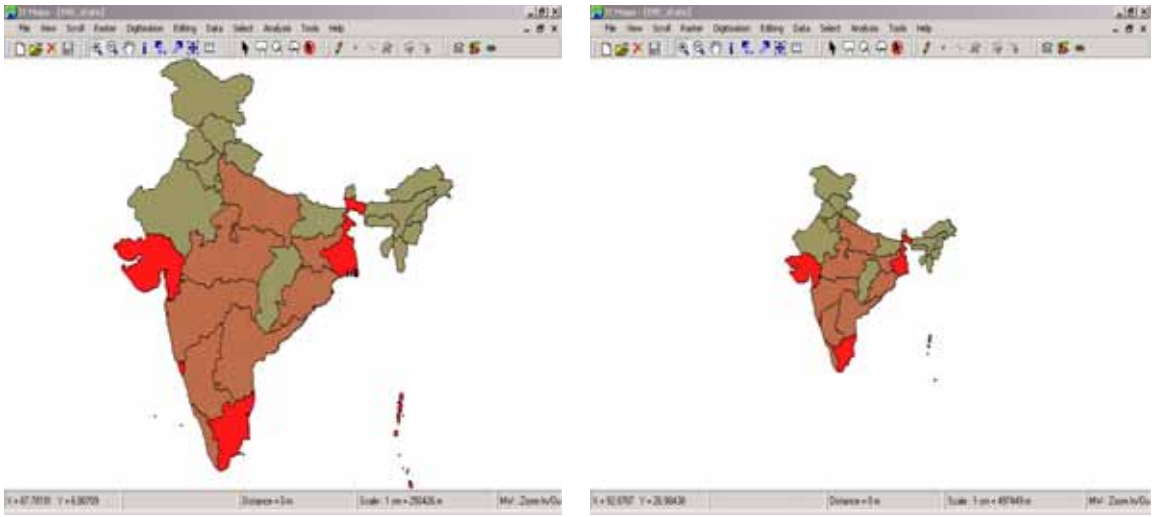
To zoom-in by specifying your own area, select the  button on the View Toolbar. Keeping your finger pressed on the mouse button, “drag” a box over an area on the **Map Window** then release the mouse button to finish off.



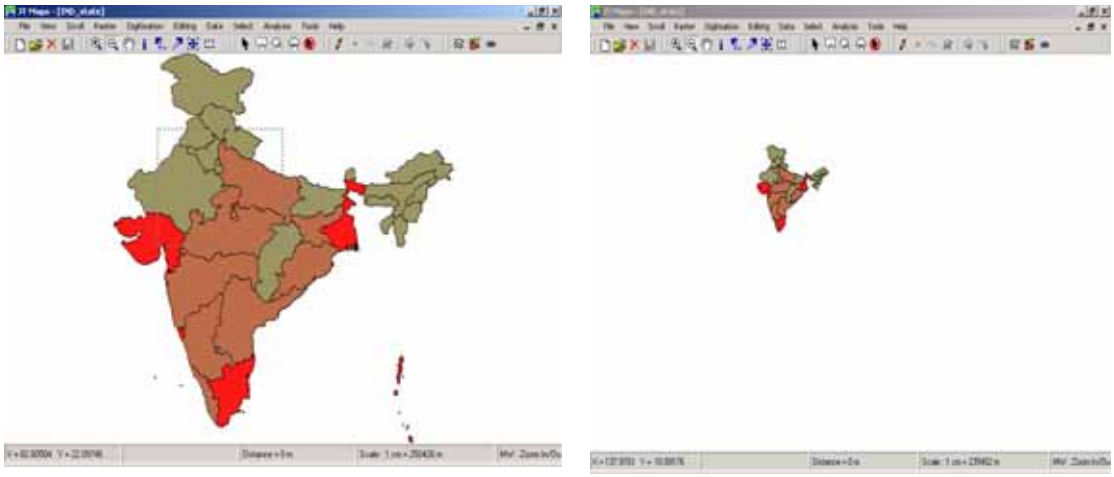
Zoom Out: It is opposite of zoom in. Ways to zoom-out on a map are to either zoom-out by a factor or provide your own variable area for zooming out.

To fix zoom-out click on View menu, and select the  icon.

It can be also accessed be clicking the Zoom-out button on the View Toolbar

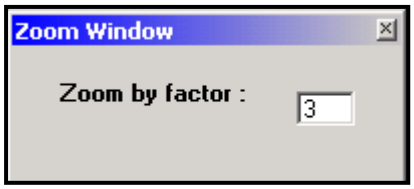


To zoom-out by specifying your own area, select the  button on the View Toolbar. Keeping your finger pressed “drag” a box over an area on the **Map Window.** Release the mouse button to finish off the operation.

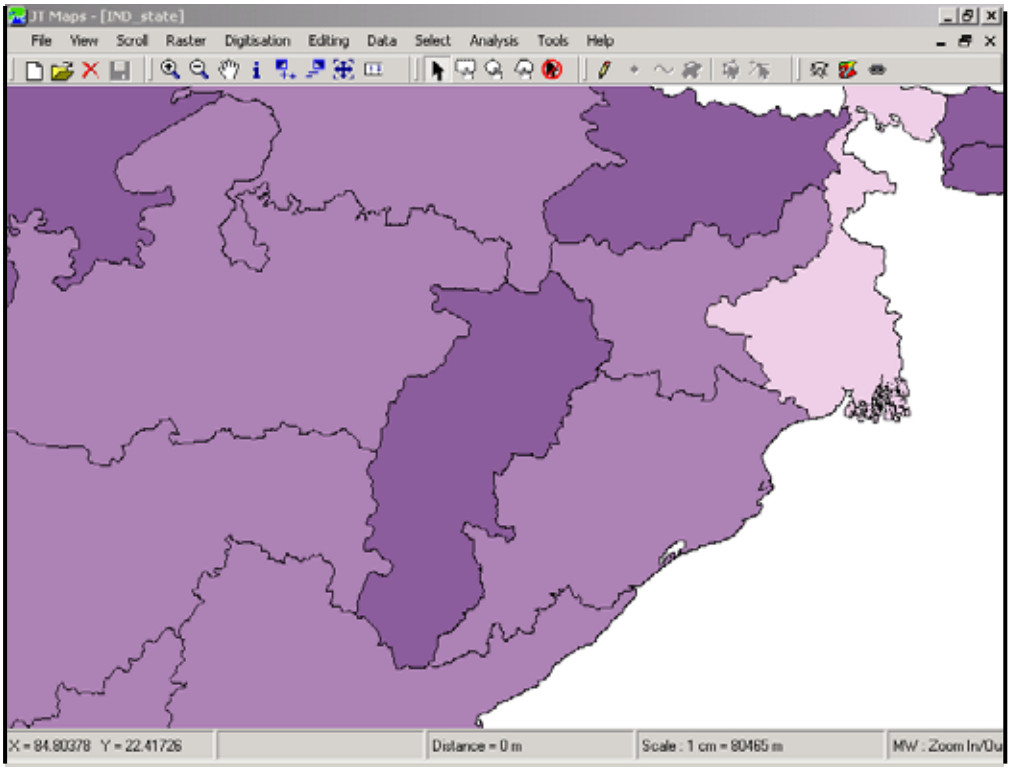


Zoom by Factor: This feature allows to zoom-in or zoom-out on the map by factor of your choice. Its useful when you know to what extent you want to view the map.

To zoom in on the layer by a factor, select View->Zoom By Factor or use the shortcut key Ctrl + R



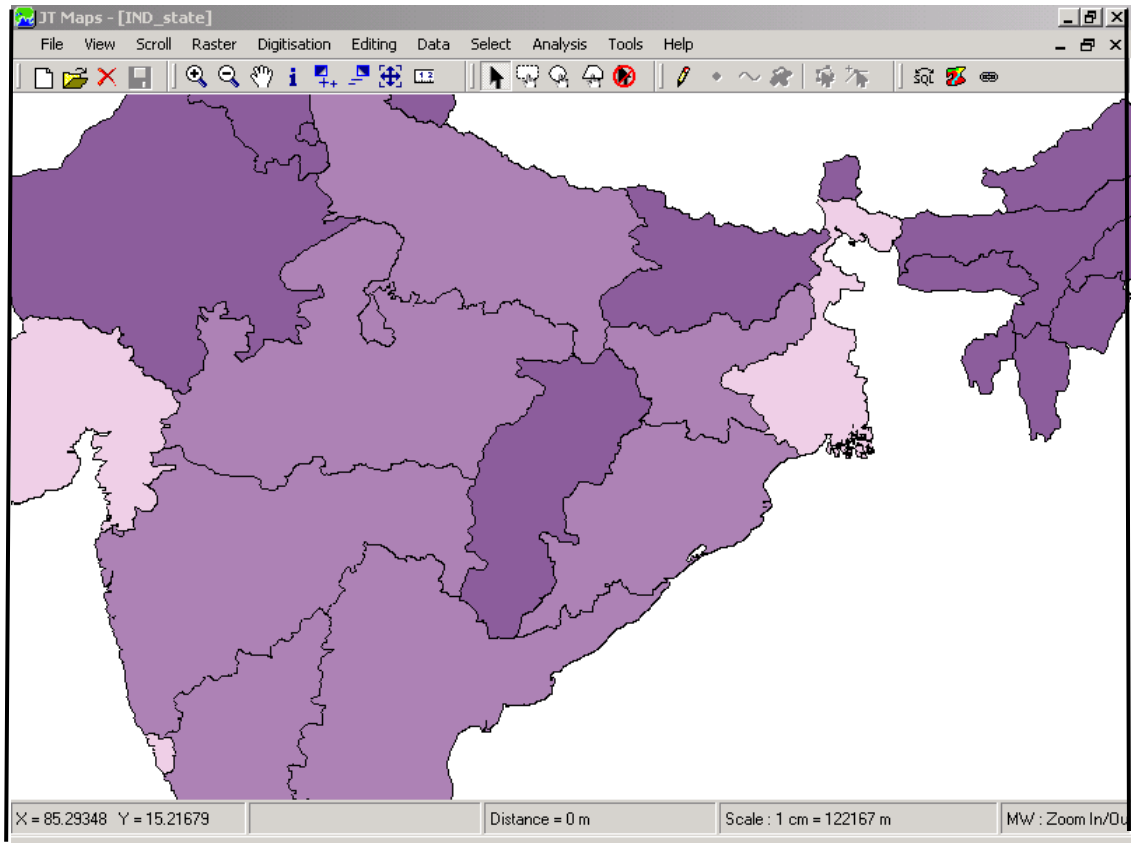
The screenshot below shows the extent of map when we zoom by a factor of 3



Zoom by Percentage: This feature allows zooming on the map by a percentage.

To zoom in on the layer by percentage value. Select View Menu > Zoom to Percentage.

The screenshot below shows the extent of map when zoomed by 200%

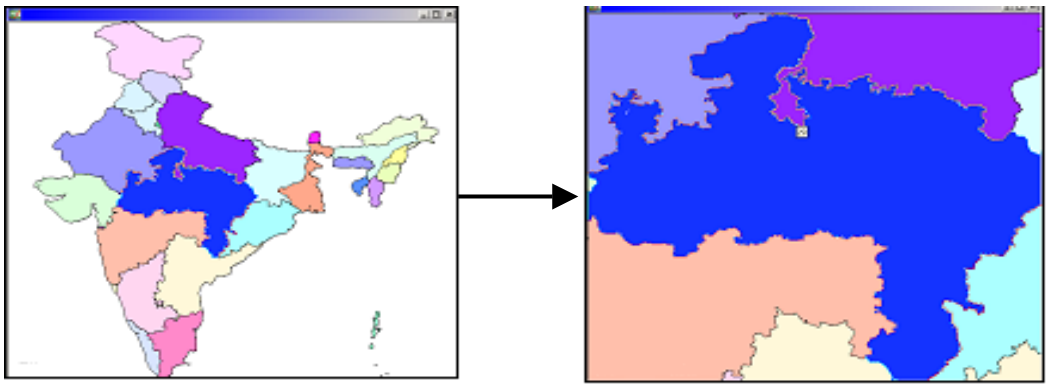


Zoom to Select: This feature allows to zoom to the selected region on the map.

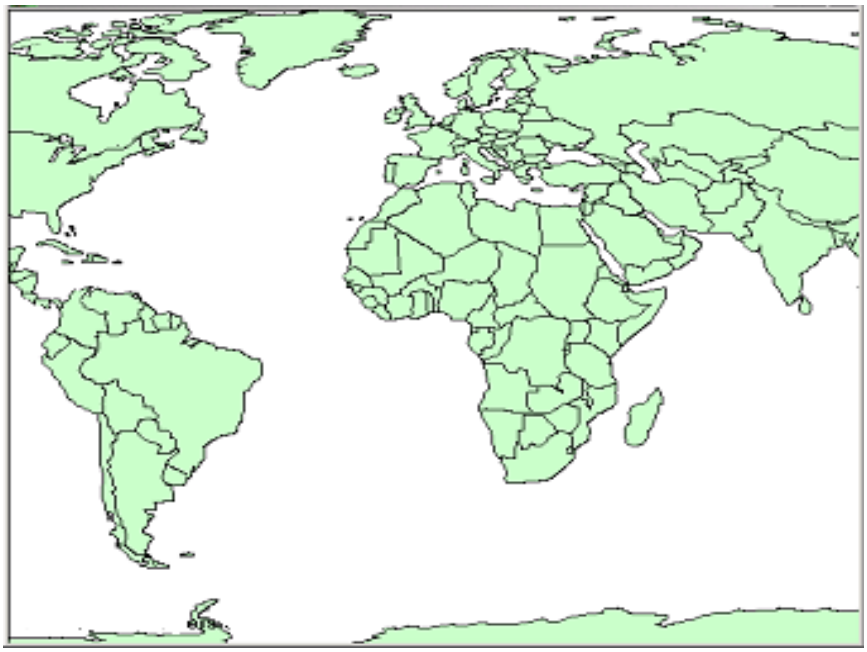
Click the select  on the drawing toolbar 

Select an object

To zoom in on the object, select View->Zoom to select

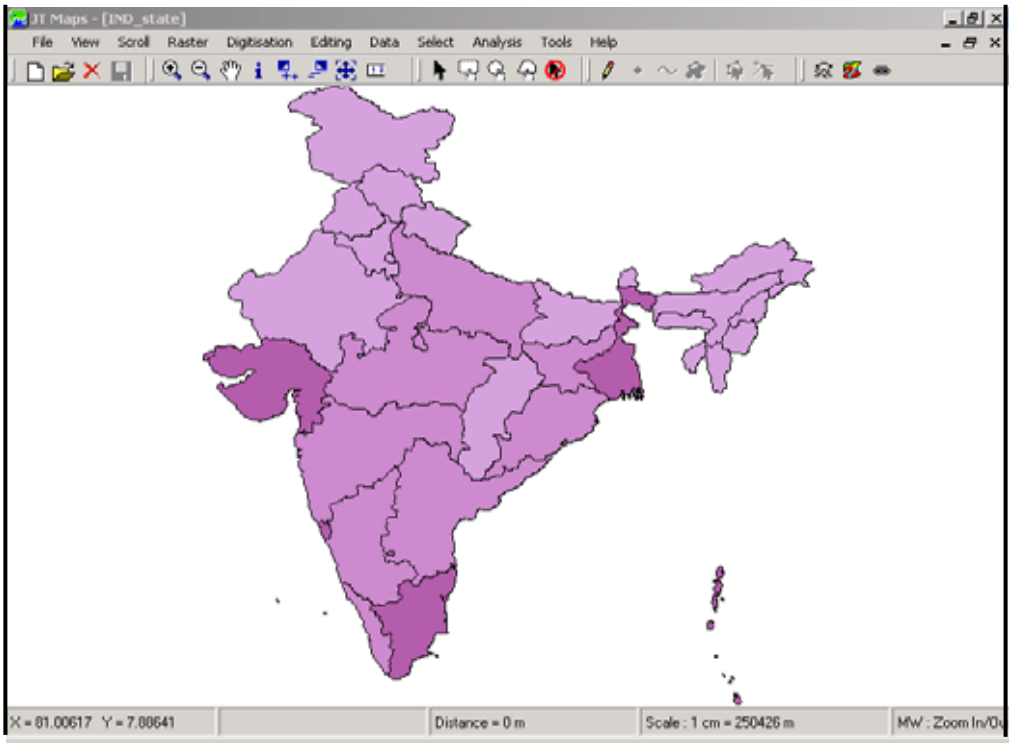


Zoom to Layer: Whenever more than one layer is open, select the layer on which to operate zoom function. The example below has two layers (World Map & India Map). To zoom to a specific layer select the layer as shown in “Select Layer” dialog box below.



To zoom to a specific layer, select View->Zoom to Layer

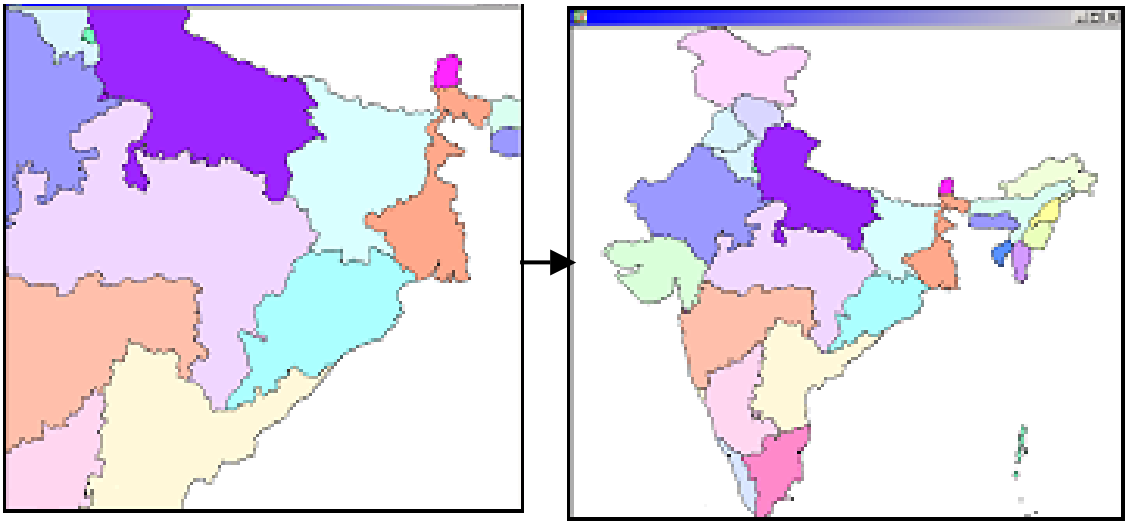
Select INDSTATE and click “Ok”. The INDSTATE map is now displayed on the map window as shown.



Full Extent: This feature scales the map to an extent where it is possible to view all objects in the layer.

To zoom to a level where it is possible to view all objects in the Layer that is active, select View->Full Extent
OR

Click the full extent button  from the toolbar.



Pan: This feature refers to moving around the map. Its useful when you have zoomed-in on the map and want move around at the same extent.

To move the viewing window up, down or sideways to display areas that lie outside the window, select the Grabber  from the view toolbar 

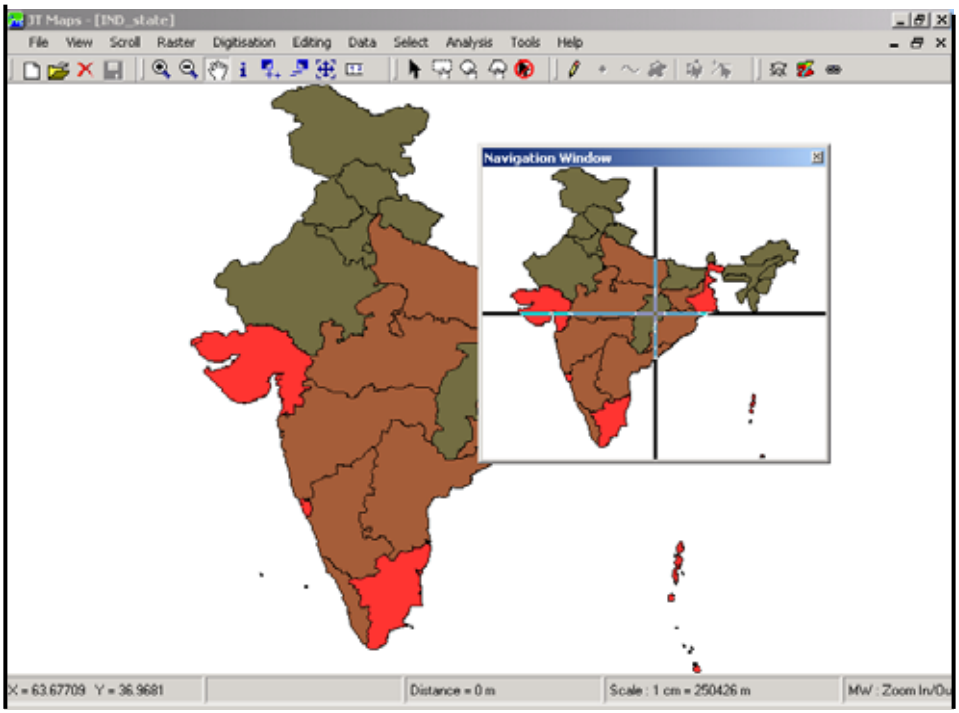
OR

Select View > Pan

Hold the mouse button down and click and drag the map around.

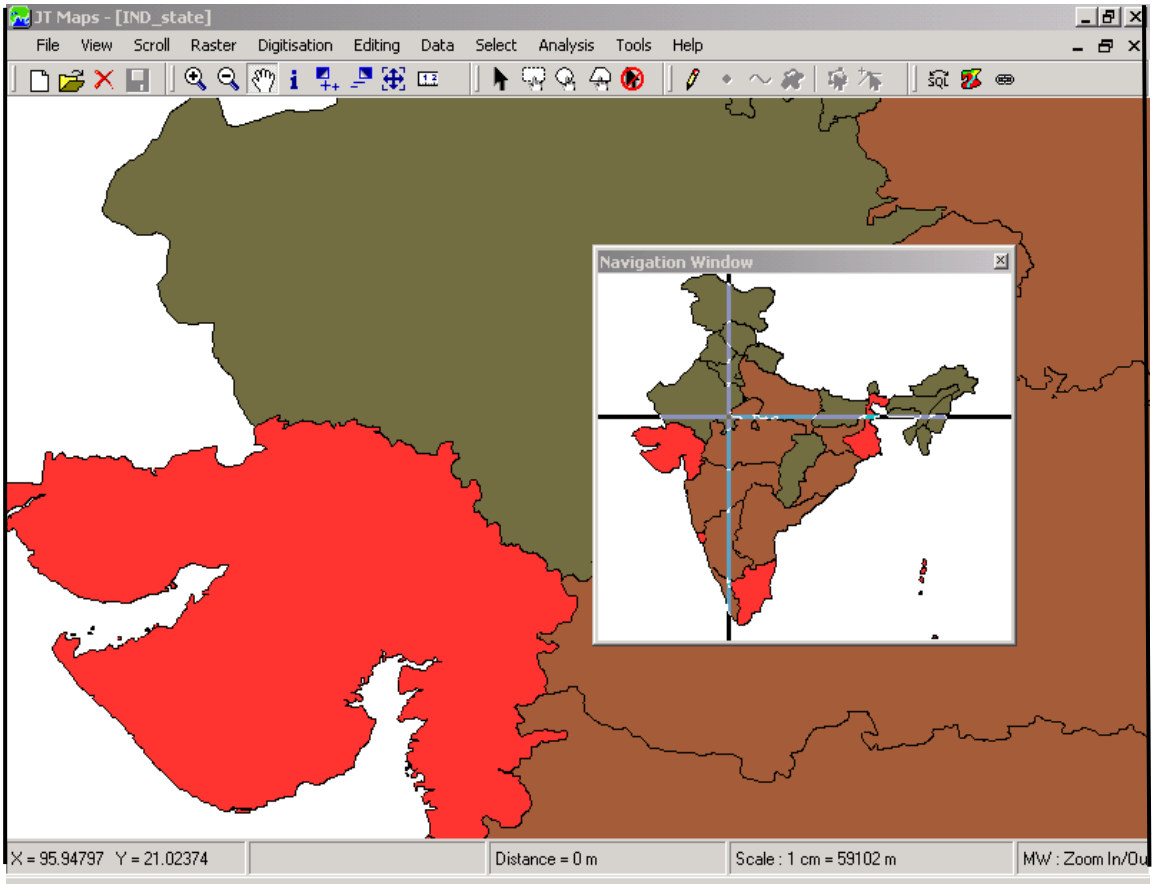
Navigator

This feature includes a small navigator window, which constantly provides a visual representation of where you are on a map via a **Black Cross Bar**. It consists of a small window showing the map currently displayed on the map window in full extent. The size of the rectangle depends on the current zoom extent of the map and encloses whatever is displayed on the map. Thus in full extent, it encloses the whole map as shown below.
Select View->Navigator



Moving on the Map Using Navigator: Take the cursor over cross hair on the navigator window. Click and Drag the cross hair to any location on the map. The map also moves in the same direction.

Zoom on Map and Navigate: When zoom in operation is active, the navigator window display the map in full extent to locate the position. For navigation to an area of interest on the map shift the cross bar to that position.



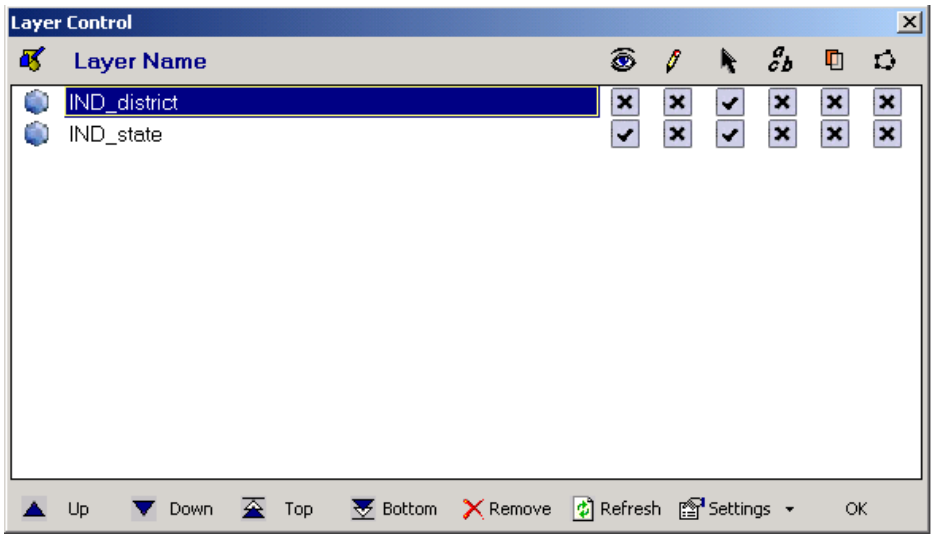
Layer Control And Layer Options

A Map Window may have one or more layers open to represent the spatial data appropriately. With this concept of layering, the **Layer Control** provides a way for the user to specify how the various layers are ordered and various options of controlling the behavior of a layer.

The Layer Control gets active only when there is at least one layer open. It gives the user a collection of layers currently open and all options available to control a layer's behavior.

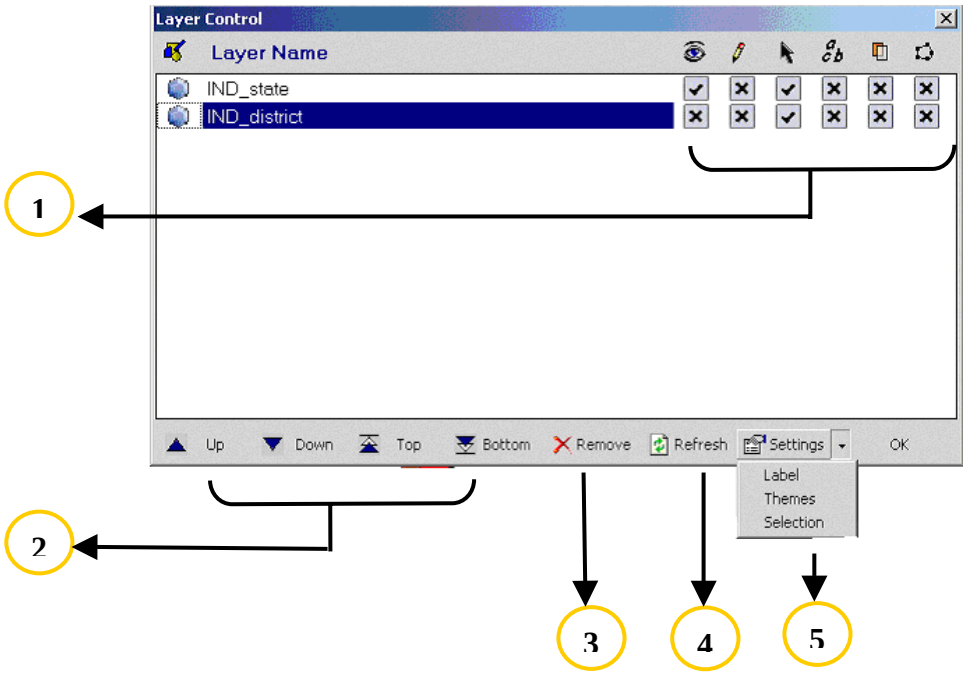
Select View->Layer Control or simply **right click** on the map View > Layer Control

Layer Control Dialog Box opens as shown below



In the above screenshot, you see a list of layers open at a time. There are 2 layers opened simultaneously.

Layer Control Interface



The various control options for a layer.

1	The various options available for a layer.
2	Buttons to toggle the position of a layer.
3	Deletes the highlighted Layer
4	Refreshes all Layers.
5	Provides options to Label, Control Theme & define Selection Setting options.

Layer Control Option

 Visible: Indicates visibility of a layer. All layers are visible by default.

 Editable: Indicates whether a layer is editable. Only one layer is editable at a time.

 Selectable: Selects a Particular Layer

 Show Label: Displays Label information on for the layer. By default labels are off for all layers.

 Transparent: Indicates whether a layer is transparent. By default all layers are transparent.

 Show Node: Makes visible the Nodes of the active layer

 Remove Layer: This will remove the layer.

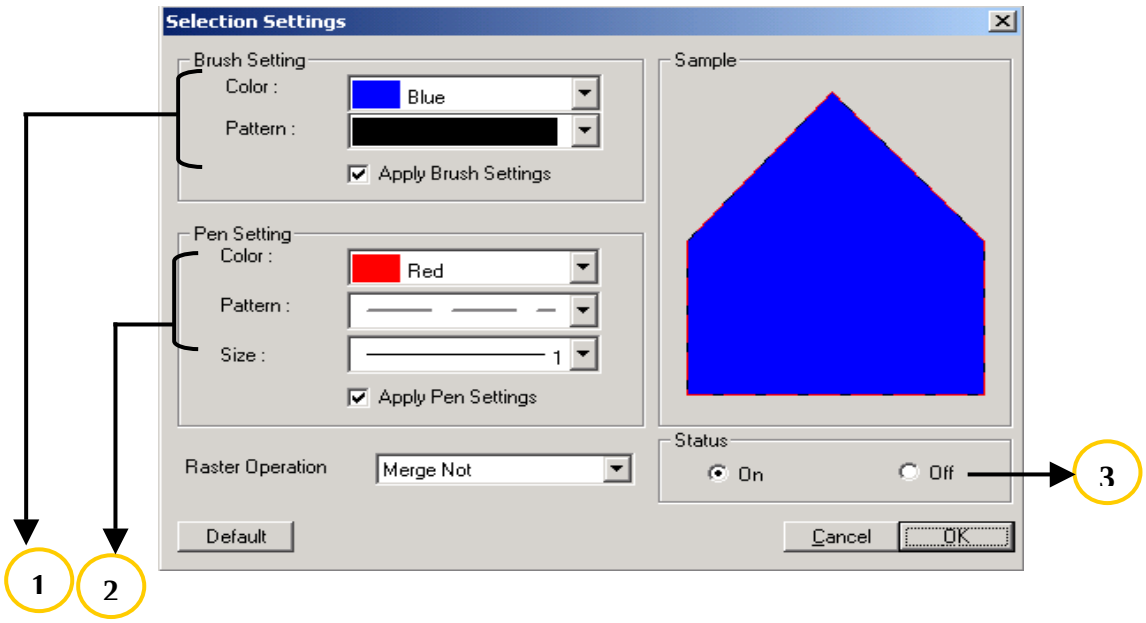
 Indicates that the options is open (on)

 Indicates that the options is locked (off)

Settings for Layer Options

Selection Settings: To change the way objects are selected on the layer.

Select the layer in the layer control and click the selection button. The following dialog opens.

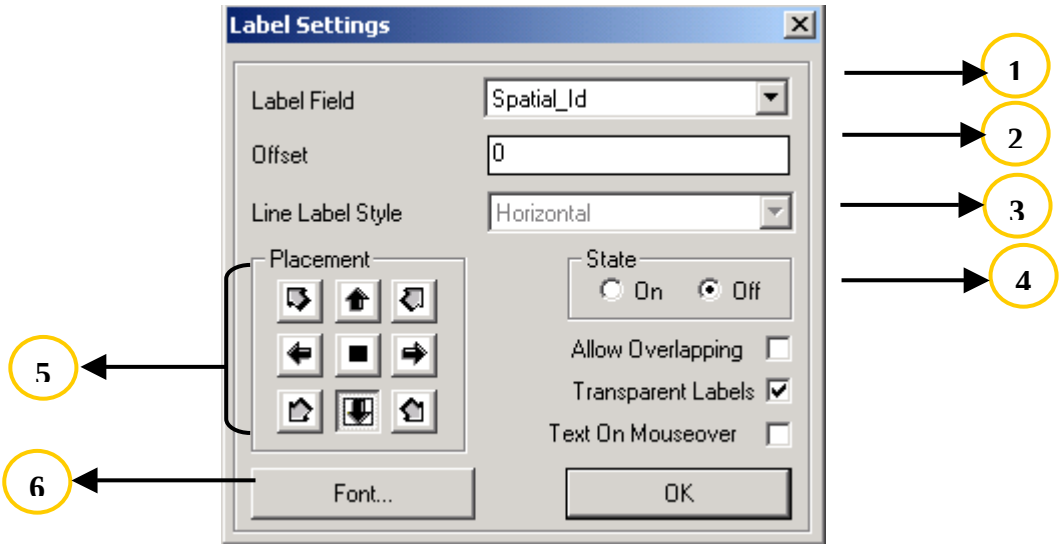


1 This is for Brush Settings. Color drop down box allows you to select the colour. Patter indicates whether the object to be opaque, transparent, striped etc.

2 Provides Pen Setting Options – Set the colour, Pattern allows to choose the type of line and Size indicates the thickness of line.

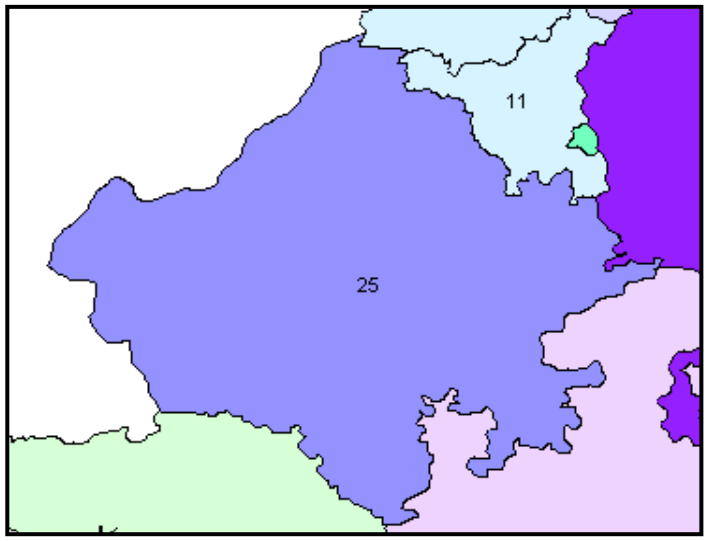
3 This toggles the status of preview of the objects in then layer. If off, the preview cannot be seen and vice-versa. Default state is on.

Label Settings: This specifies where the labels will be placed with respect to every object. Select the layer in the layer control and click the Label button. The following dialog opens.



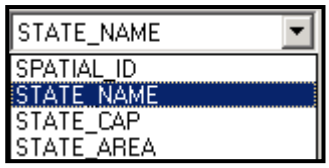
1	It's a combo box to specify the field in the record-set to be used as a label for each object. The default field is Spatial_id
2	The offset specifies how far the label will further move from the current position
3	Will specify the orientation of the Line Label
4	It toggles the display of labels. Default state is off.
5	Specifies the orientation of label within an object. Default is Center
6	To set Font Parameters – Type, Style and Size

By Default the labels are displayed in the center and are based on the spatial_id. As shown below.

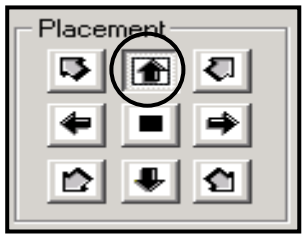


Changing the Settings:

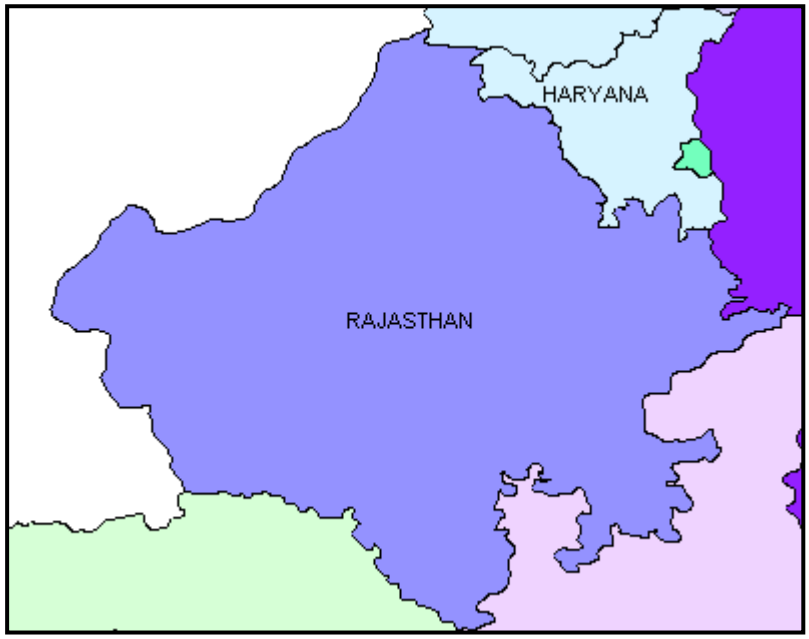
1. Click the drop down menu and select a different field name.



2. Change the orientation for the label to **top**



3. Change the offset to 2. This will further move the label above by 4. The new label display is as follows:

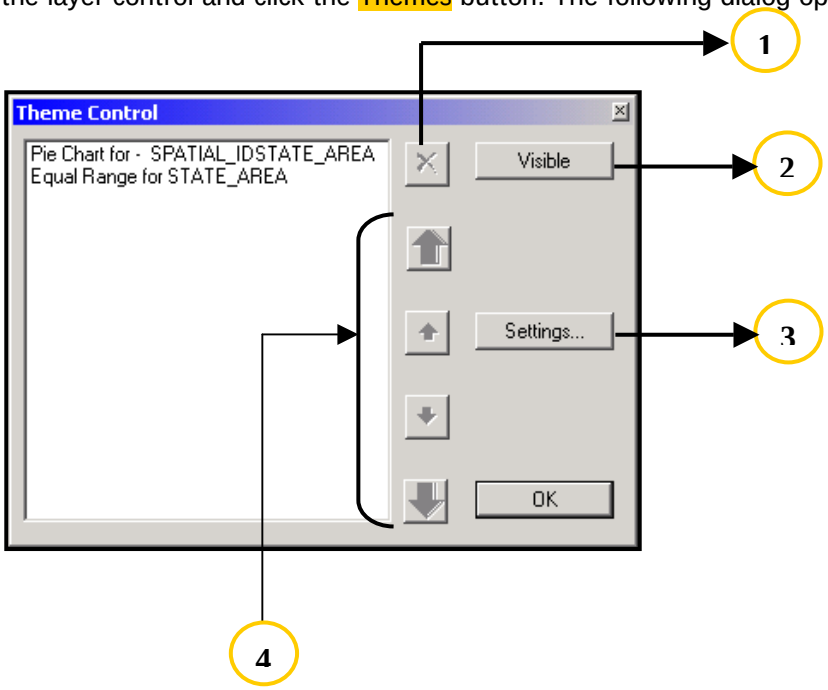


Points to be noted:

- Always select the layer before changing the settings for any option.
- Make sure the option is switched on to view the changes on the layer.
- Whenever you toggle the status of an option in its dialog, notice the corresponding visibility icon turns to ☑ as it opens that layer.

Theme Settings: This specifies which Themes are visible on the map. It is applicable only when you have applied 1 or more thematic analysis on a map. It then provides options of viewing all, one or none of the themes on the map. It also provides options to changes settings for each individual theme.

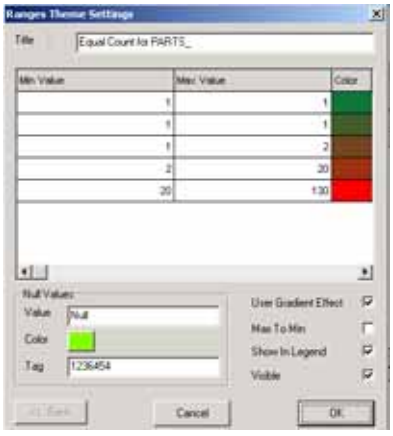
Select the layer in the layer control and click the Themes button. The following dialog opens.



1	To remove the theme
2	To make the theme visible
3	To change Theme Settings
4	To toggle the position of selected theme

Changing Settings for a Theme: You can change the settings for a particular theme. The dialog provides options to changes the color for the various theme fields. It also provides options to show the legend of the theme in the legend Window.

Select the layer in the layer control and click the Settings button on the Theme Dialog. The following dialog opens. It allows the user to change minimum/maximum value of colour and select options like displaying the “Label” etc.



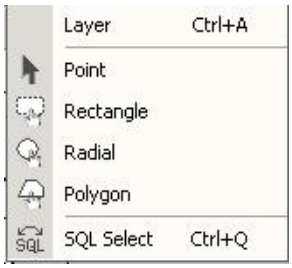
Selecting Objects

Selection is an important tool, which provides information to the software as to what the user wants to act upon. It is one of the fundamental tools that the user must know.

Concept of Selectable Layer: A user can perform operations on an object in the layer only if it is highlighted. To do this, open the Layer Control, select the layer and toggle the selectable option for the layer. Only one layer can be selected at a given time.

JT Maps provides various selection options. One can access the different select options from the Select Menu

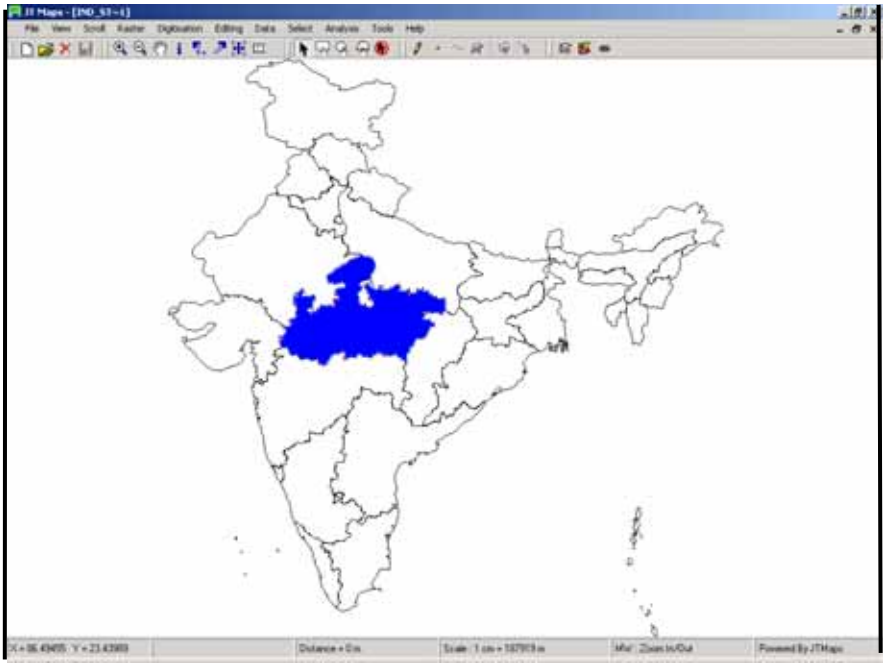
Opens Dialog Box to Select a Layer to Open
Activates Select Tool to Select a Feature
Rectangle Select Tool
Radial Select Tool
Polygon Select Tool
Opens Query Dialog Box



These options are also available on the Select toolbar 

Single Select

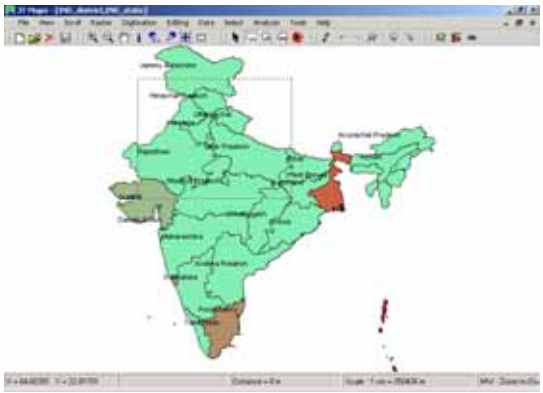
The Single Select icon highlights one object at a time. Click the  on the select toolbar, and click on the corresponding map to select the area of interest. The map below shows the selected state of Madhya Pradesh.

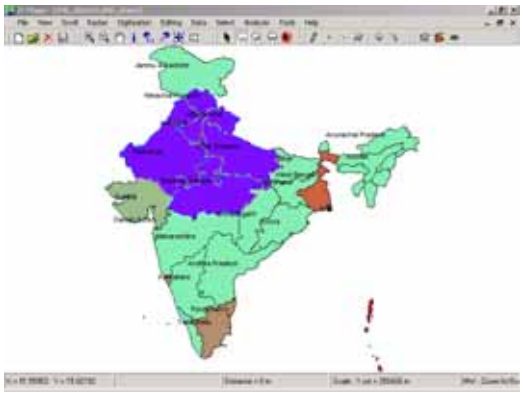


✓ To Deselect all click  from  toolbar.

Rectangle Select

This type draws a selection box and selects all within the box. Click  on the toolbar or Select->Rectangle. Click and Drag to select objects.

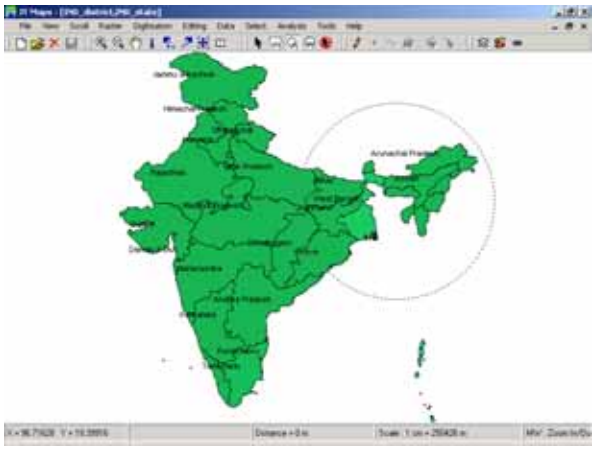


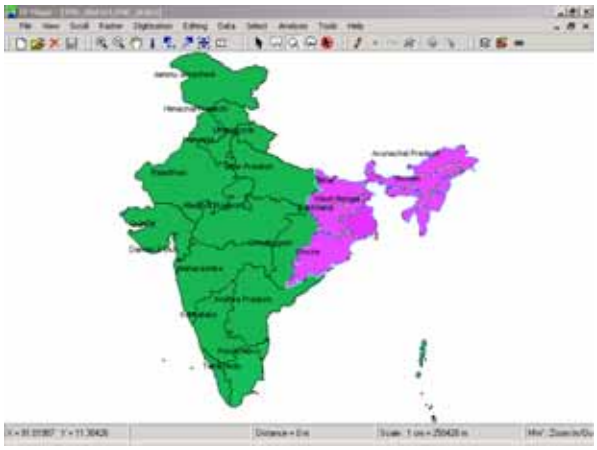


Note. The selected portions are highlighted by blue colour

Radial Select

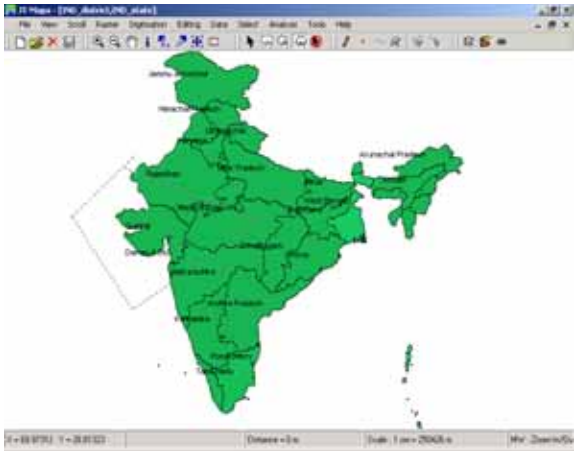
This type draws a circle and selects all within the box. Just click  on the toolbar or Select->Radial. Click and Drag to select objects.

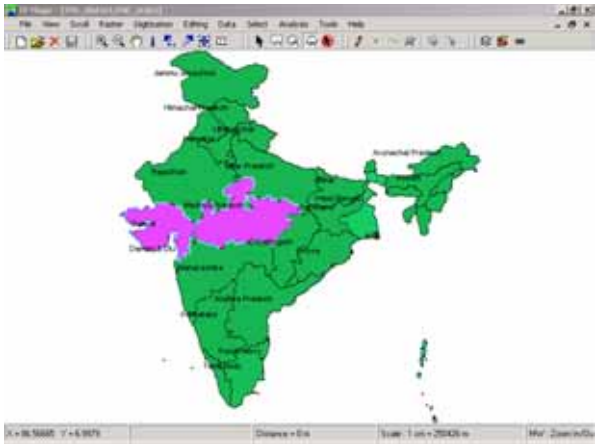




Polygon Select

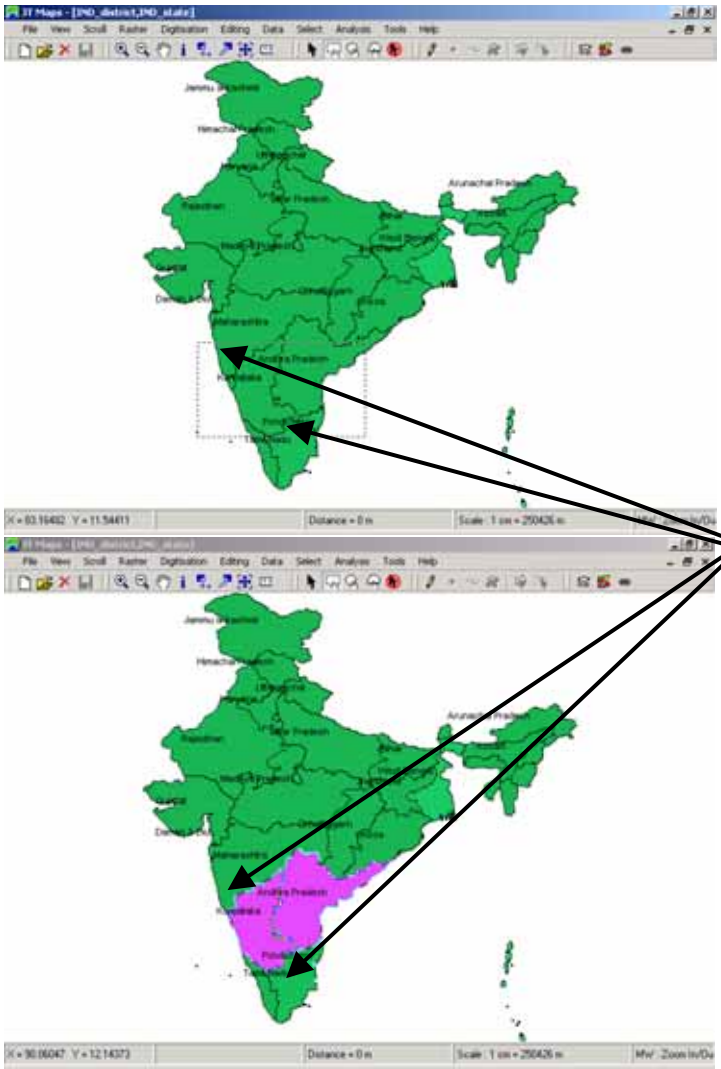
This type draws a region and selects all within the box. Just click  on the toolbar or Select > Polygon. Click to mark the region and double-click to finish.





Note. The selected portions are highlighted by Pink colour

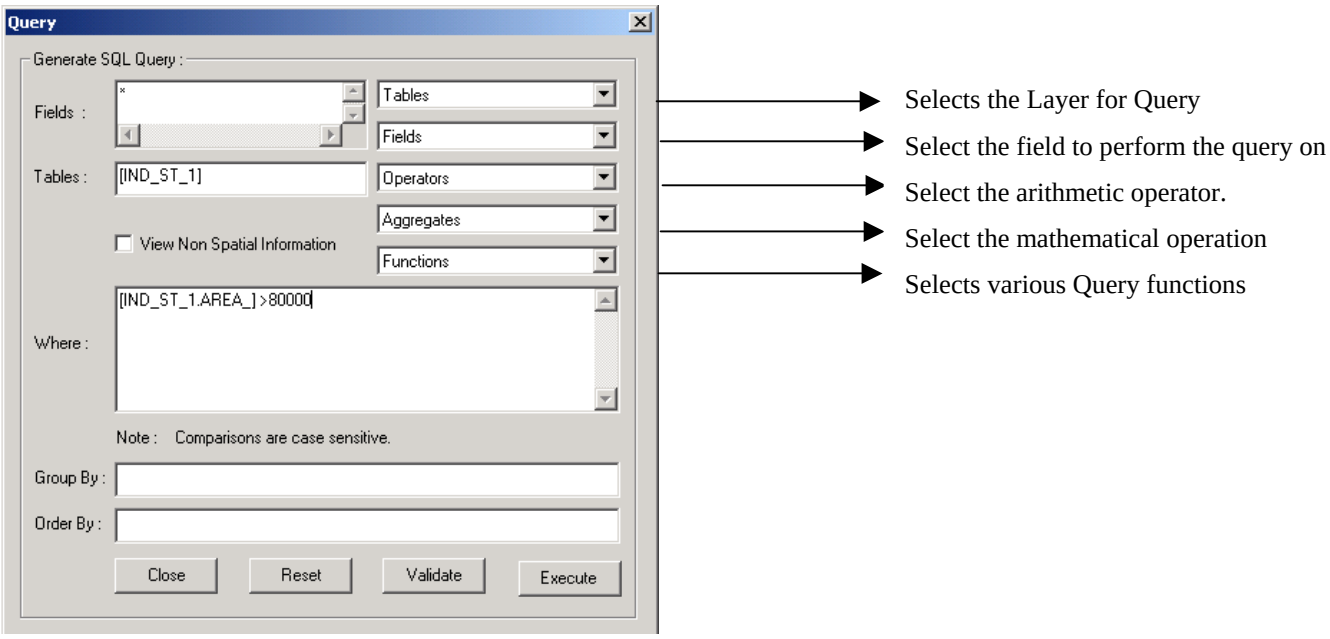
Selection of objects based on Centroid: In JT Maps, objects are selected only when their centroids lie within the selected region in the case of Rectangle, Polygon and Radial Select. Thus even if the rectangle includes a part of an object but as its centroid is outside the box, it will not be selected. For e.g. observe the following case of a Rectangle Select.



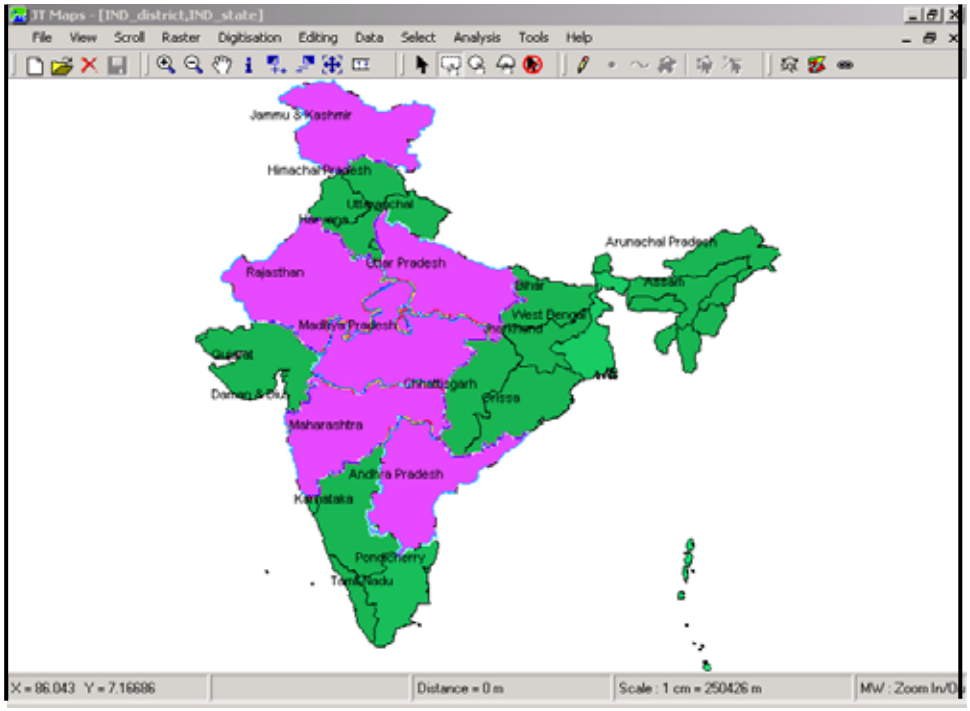
Notice these regions though within the rectangle are not selected as shown in the map.

SQL Select

This type selects objects based on a SQL query on the non-spatial attributes of the layer.
Select->SQL Select



Once the query criteria is fulfilled click “Execute” button. The State with an area greater than 80,000 Sq.kms gets highlighted as depicted on the map below.



Geo Referencing.

To register or to georeference an image, open the image, which is to be geo- referenced.

Spectral > Raster > Georeferencing

Fig.1

Click on raster in the tool bar and select the option of Geo-referencing (Fig.1).

A dialogue window will appear which has the details about the projection types, datum types, units of projection etc. (Fig.2)

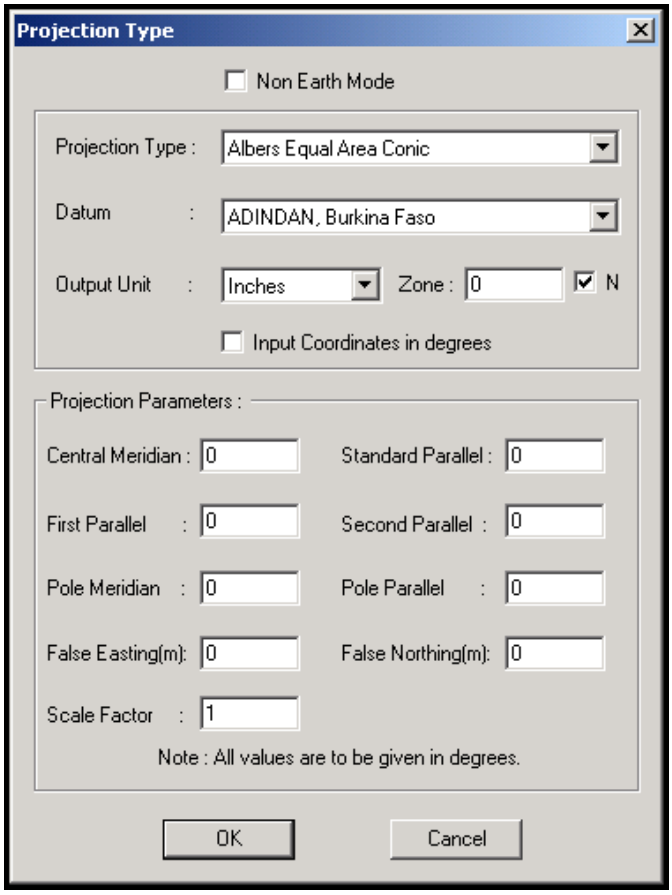


Fig.2

The user can select the type of projection to be used from the list of projections in the drop-down menu (Fig.3)

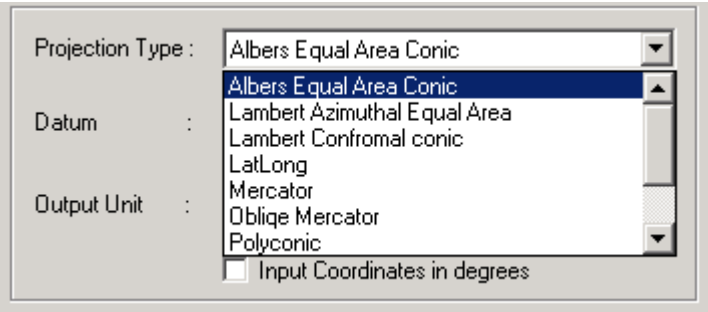


Fig.3

User can also select the Datum you want to apply in the Image that is to be Geo-referenced from the list of datums supported by the software (Fig.4)

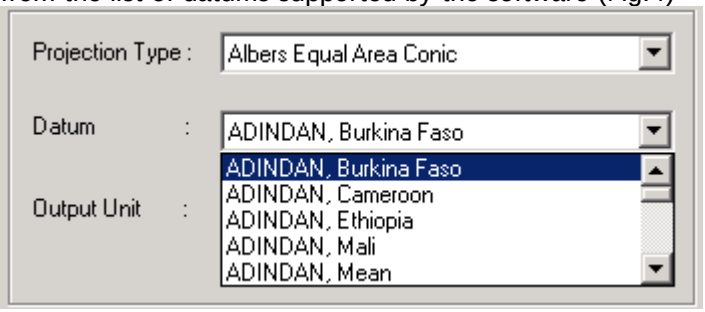


Fig. 4

The desired unit in which the user wants the output image can be selected from the various options available in the drop-down menu. (Fig.5).

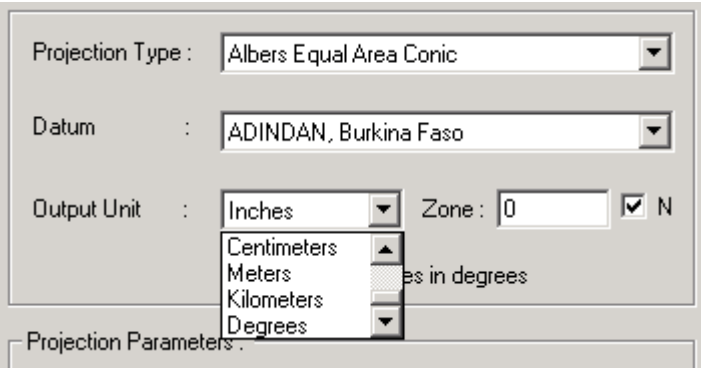


Fig.5

Once all the relevant information has been filled in the dialogue box, the user can proceed on to registering the image by marking the co-ordinates or points on the image. To register a point on the image, the user has to click on the tab-New on the dialogue window, the shape of the cursor will change and thus you can mark the relevant point on the image by taking the cursor to that point and clicking there. (Fig.6). another dialogue window will appear in which the user has to feed the coordinate values. after feeding the coordinate values click O.K. and the point will be registered and can be seen in the table.

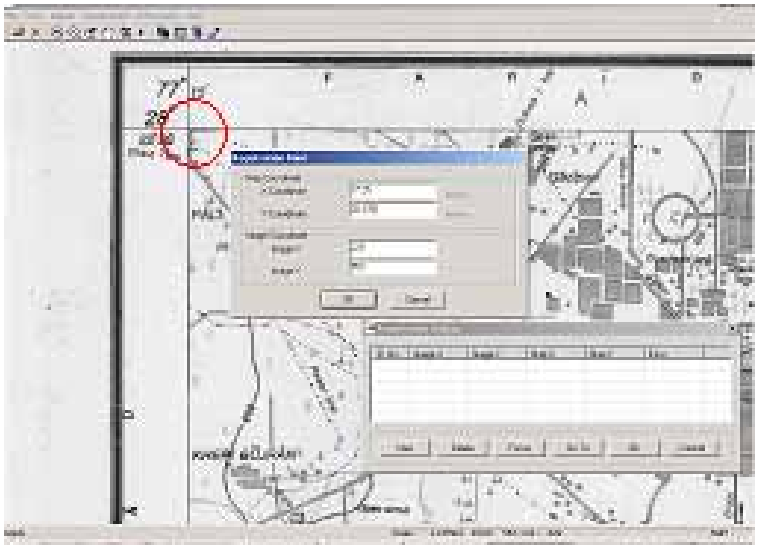


Fig.6

Similarly the user can select the next point, which is to be registered and feed its relevant values in the table. (Fig.7). Once all the values have been fed and all the points have been registered, the user can make corrections, if any, in the location of the registered points by selecting that point in the table and clicking on –FOCUS.

The selected point will automatically be zoomed into the center of the screen. (Fig.8)

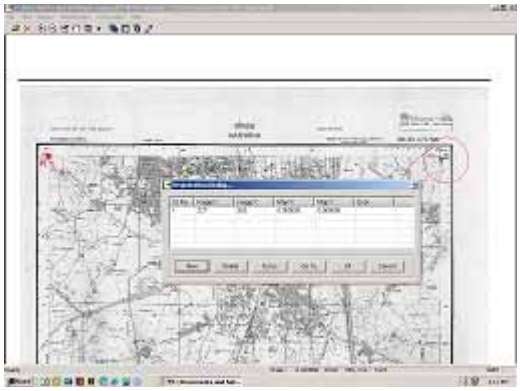


Fig.7

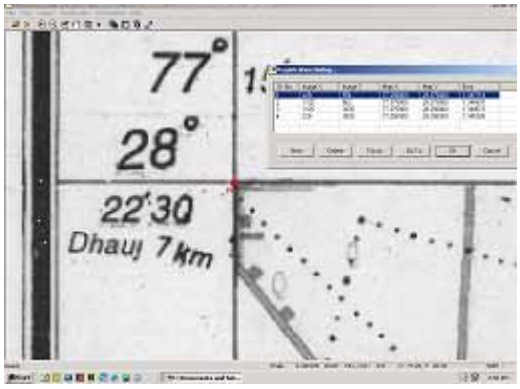
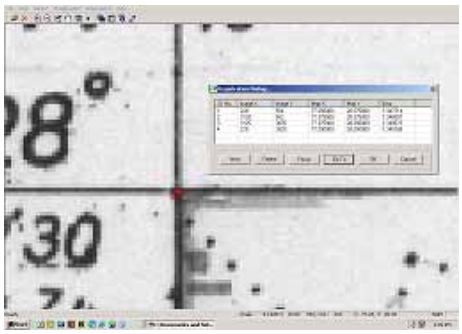


Fig.8

When the selected point is zoomed into the center of the screen, the user can make the correction in the location of the point by clicking on GO TO and specifying the correct location where the user wants to shift that point. The point will automatically shift from its current position to the new specified position. (Fig.9).

Once all the corrections have been made the user can proceed on to next step by clicking O.K. on the table menu bar(Fig.10). When the user clicks on the O.K. button, the registered image will be saved automatically in the same folder and with the same name in .JTV file format. Now the user can proceed on to the process of data creation using the registered image in JT Maps.



Editing Spatial Objects

When working with spatial objects, we need to edit the existing object or create new objects in a given layer.

JT Maps provides techniques for data creation and editing, which involves conversion of data in analog form, such as maps and satellite images, into vector form and doing data manipulation.

Concept of Editable Layer: Only one layer can be edited at a time. To make a layer editable, turn on the editable option for the layer on the layer control dialog box. To do this

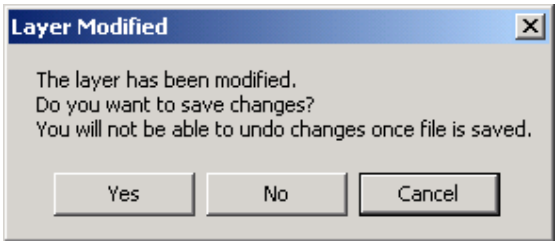
Right Click > View > Layer Control. Open the Layer Control, select the layer and toggle the selectable option for the layer. Only one layer can be made editable at a given time.

OR go to Digitization Menu > Start Editing option and select the layer.

This option is also available by clicking the  in the drawing toolbar 
Click the select button and choose the feature you want to edit.

Stop Editing

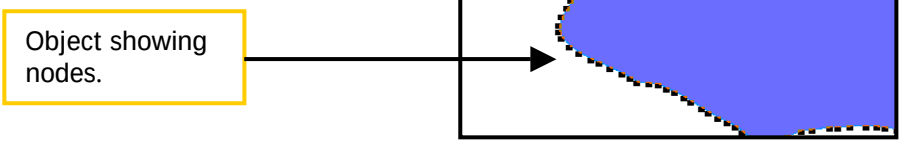
To stop editing, choose Digitization > Stop Editing option. Dialog box will prompt whether to save the changes made to the layer.



Editing Objects on Layer

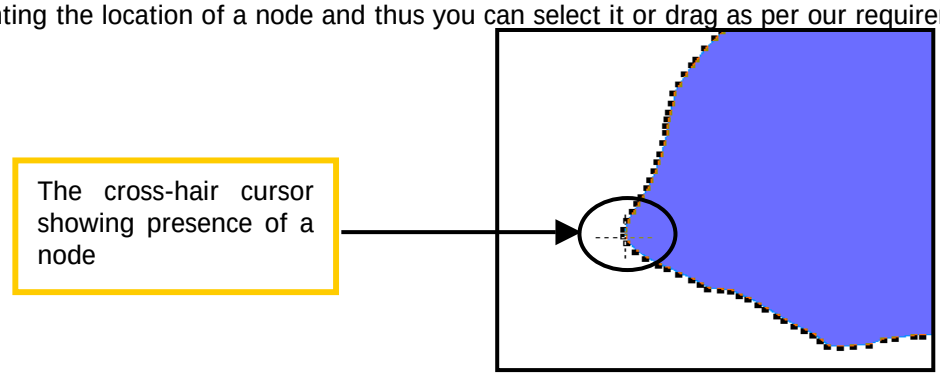
Showing Nodes on an Object

To show nodes on an object, Select the object and click  button in the drawing toolbar.



Snap Tool

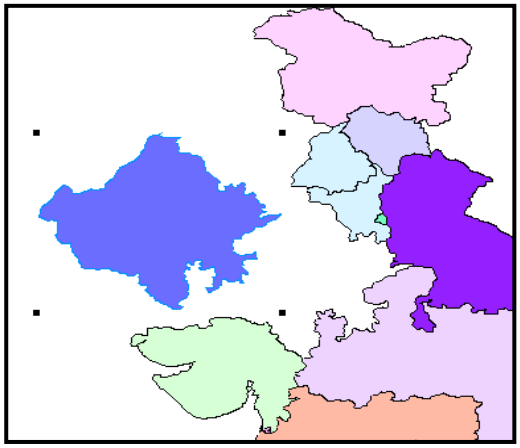
The Snap tool indicates the presence of a node on an object. It does this by changing the mouse cursor to a crosshair whenever the mouse cursor hovers over a node. This helps in pinpointing the location of a node and thus you can select it or drag as per our requirement.



You can activate the snap tool by checking the Snap option in the Digitization menu or by simply pressing the Shortcut key

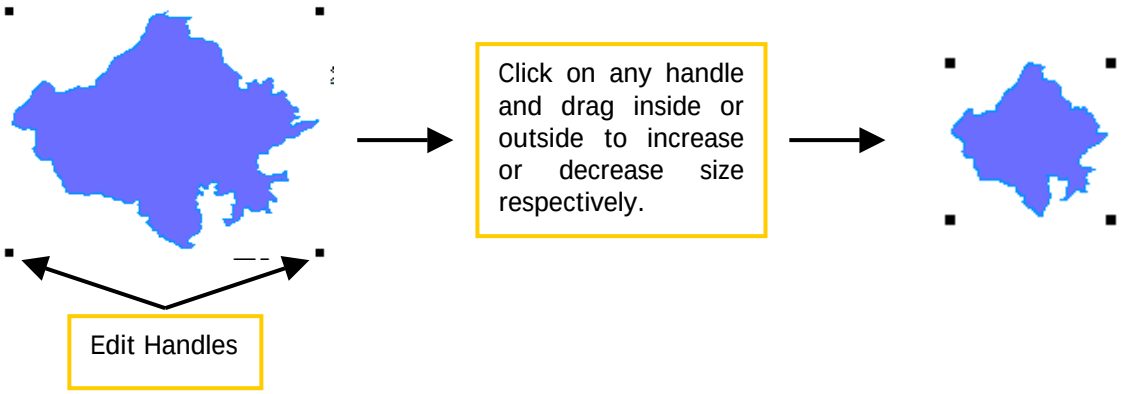
Moving an Object

To move an object, select the object using select tool. Keeping the mouse button pressed drag the object to the new location and release the button.



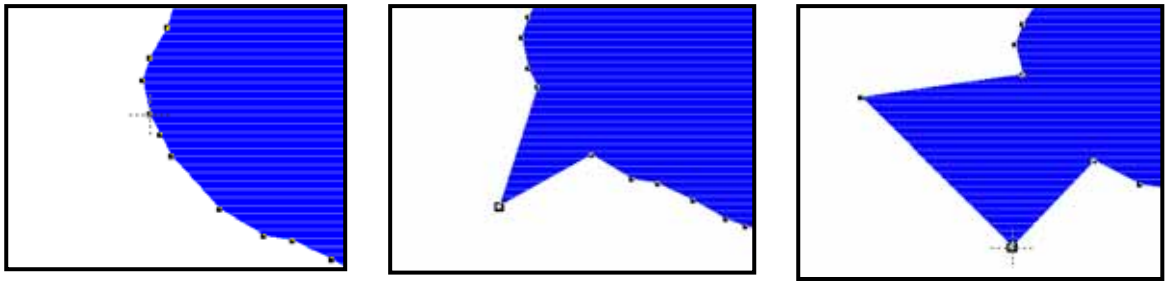
Resizing an Object

Select the object to be resized, note the four edit handles, click and drag on any of the four-edit handles to increase/decrease the size of the object.

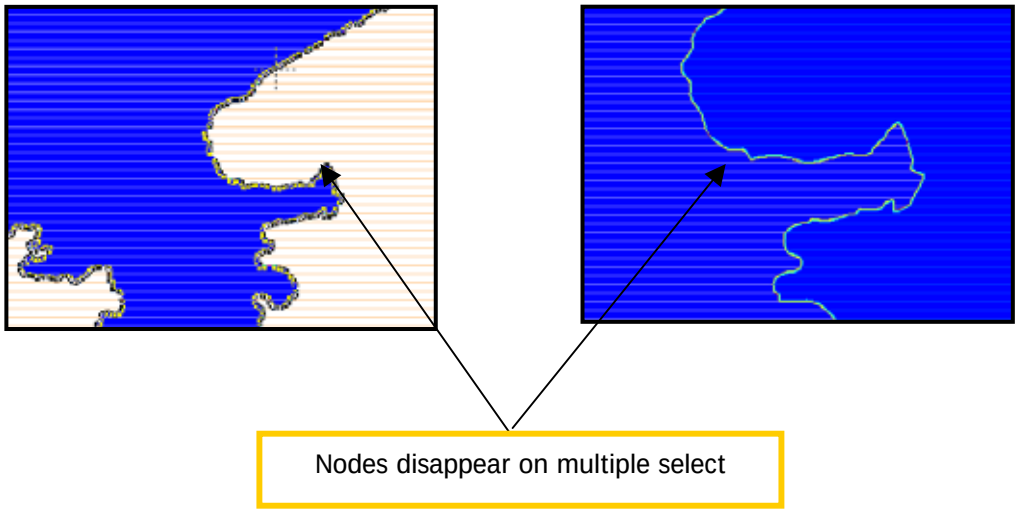


Reshaping an object

To reshape an object, select the object. Then click the Show Nodes icon from the Drawing Toolbar to allow display of nodes. Click and drag on the nodes to reshape the object



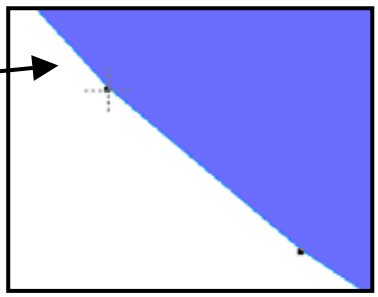
Note: Show Nodes will display nodes only if a single object is selected. However if more than one object is selected, the nodes will disappear automatically as shown below.



Adding a Node to an Object

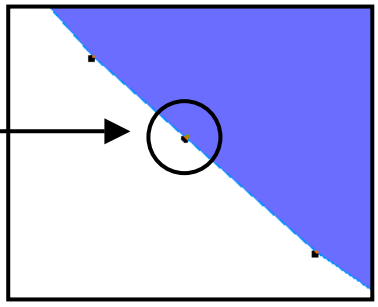
Select the object. Click the Add node  icon from the drawing tool bar 
And click on the location for the new node.

Snap Tool Showing location of a node. This gives an idea of where you could want your new node to be.



When you click the add node button, the cursor changes to  . Click on the new location to add the new node.

New Node Added between the two existing nodes.

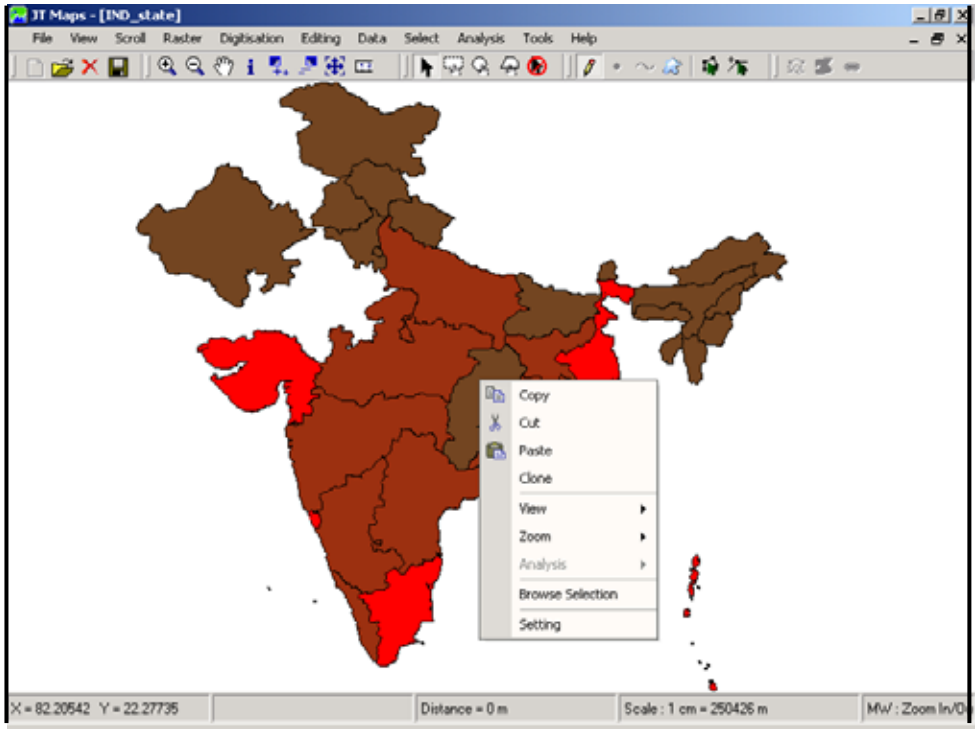


Cut, Copy And Paste Operations

Cut, Copy and Paste commands are available with the Editing Menu. It is important to make the layer editable prior to execution of these functions.

These options are also available on Right Click pop-up menu. Select the object and perform the operation as shown in the figure below.

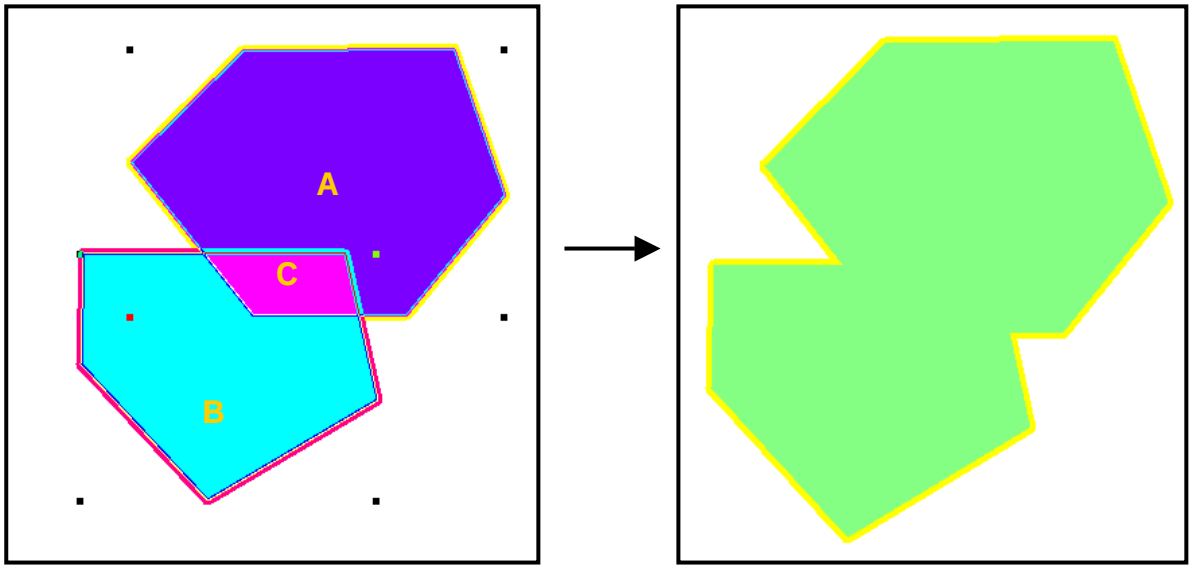
To Undo or Redo the changes made on a layer, use the Undo and Redo options from Editing Menu



Combining two polygons

This feature provides facility to combine two overlapping polygons into a single polygon. Select the polygons to be combines (using shift and click). Choose Editing->Combine.

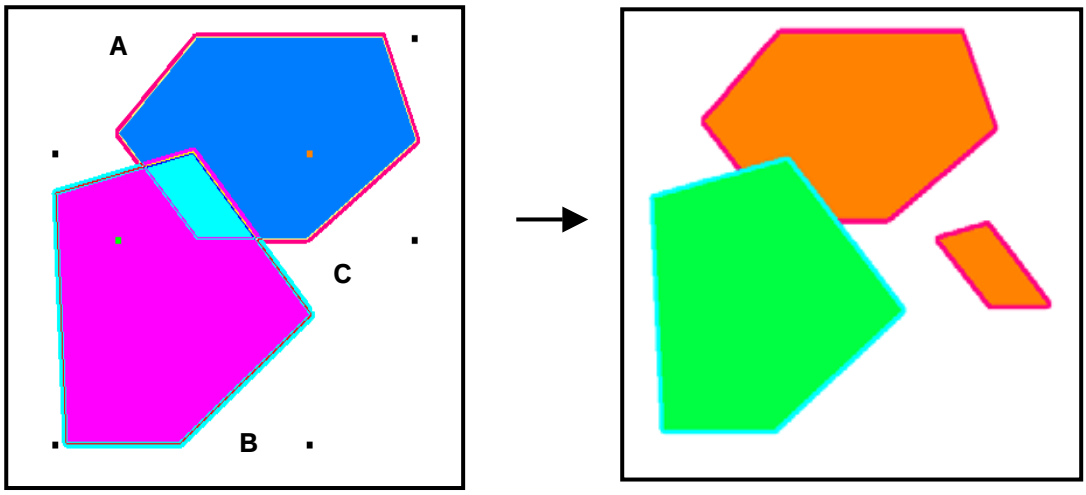
In the example below, there are two polygons A and B. The intersection is marked as C. When combining the polygons the result is a single polygon with no intersection region.



Polygon Intersection

This feature provides facility to extract the intersection region between any two polygons without modifying the two polygons. Select the polygons to be combined Choose Editing > Intersection

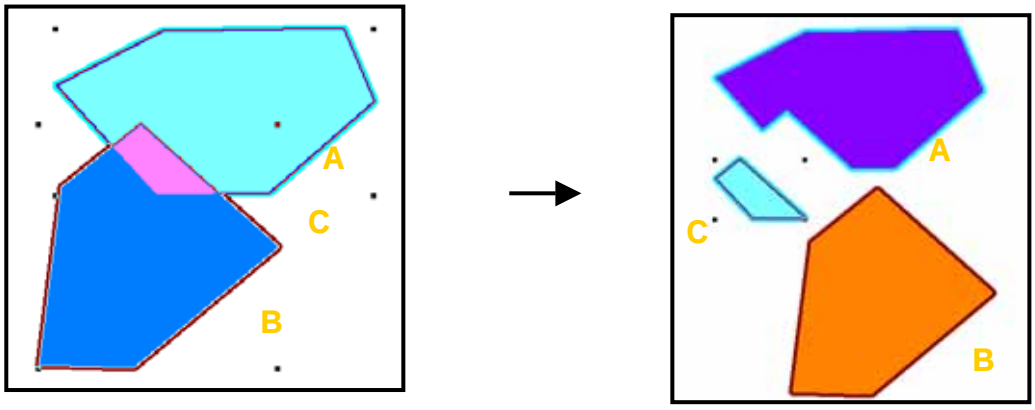
In the example below the intersection is marked as C. When the operation is executed, the polygon C can be obtained as a separate object.



Splitting Polygons

This feature provides the facility to split overlapping polygons i.e. it separates the intersection region between two polygons but cut this region from the polygon at the bottom. Select the polygons to be combined (using shift and click). Choose Editing->Split

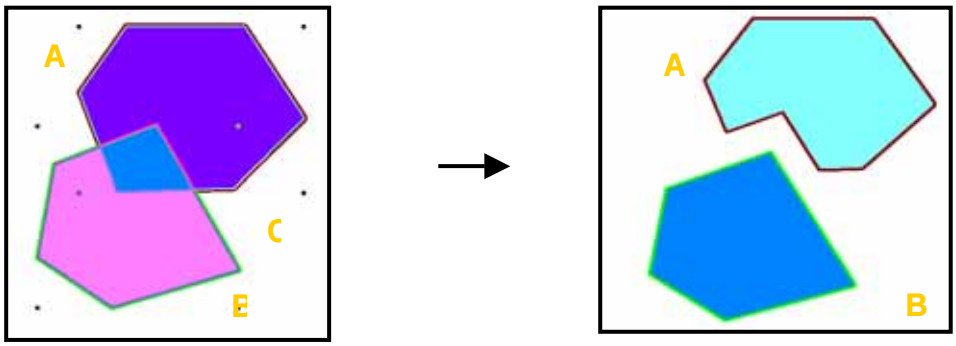
In the example below, we have 2 polygons A and B (as seen, B is on top and A at the bottom). The intersection is marked as C. When we run the operation, we get the polygon C as separate but observe that this region is removed from polygon A, which was the bottom one.



Difference in Polygons

This feature is slightly different from splitting the polygons. In Place of creating a new polygon from the common region, it removes this region from the bottom polygon and separates the one on the top. Select the polygons to be combined (using shift and click). Choose Editing->Difference

In the example below, we have 2 polygons A and B (as seen, B is on top and A at the bottom). The intersection is marked as C. When we run the operation, we get the polygon B as separate but observe, that region C is removed from polygon A, which was the bottom one as is now only a part of B



Transparency

Concept of Transparent Layer: To do this, Right Click > Layer Control, select the layer and enable the transparent option for the layer by clicking. . More than one layer can be made Transparent at a given time. The “tick mark” indicates that the layer transparency is enabled.

The Streets layer becomes transparent

Image Processing

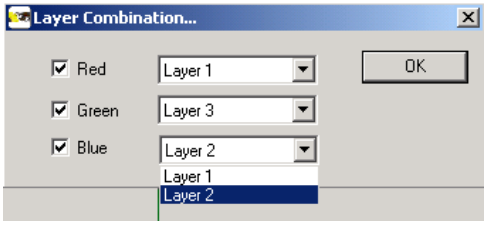
Image Processing is used for data processing to analyze, enhance, interpret or display satellite images or aerial photographs. It has the feature of processing high-resolution imagery into quality raster data products. The enhancement techniques are employed to increase the contrast/brightness of an image. Therefore, the distinction of features in the scene can easily be performed by visualization. This augments the efficiency of image for interpretation.

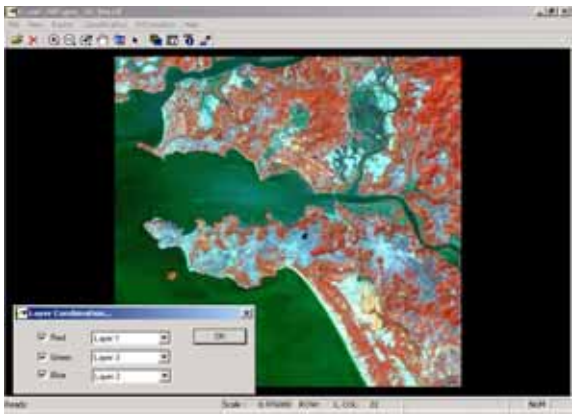
JT Maps permit Image Processing through its in-built module called **"JT Spectral"**. Run the JT Maps software and once JT Maps window opens Go To Raster > Image Processing **OR** press Ctrl + I. JT Spectral window opens. File Menu > Open or Click  icon from tool bar and select the image to open. JT Spectral supports various formats like *.tiff, *.img, *.bmp, *.Jpeg, IRS-1C/1D, Spot and LISS image.

Image Enhancement

JT Spectral allows user to apply Layer Combination (Red, Green , Blue), change brightness and contrast property of the image for better clarity. Example below depicts the same.

To applying layer combination, go to View menu > Layer Combination or click  icon from toolbar. The following dialog box appears.





Notice the difference in image quality with different Layer Combination. Above left image has Red color as Layer 1, Green as Layer 3, and Blue as Layer 2. The one on the right has Red, Green and Blue as Layer 1,2,and 3 respectively.

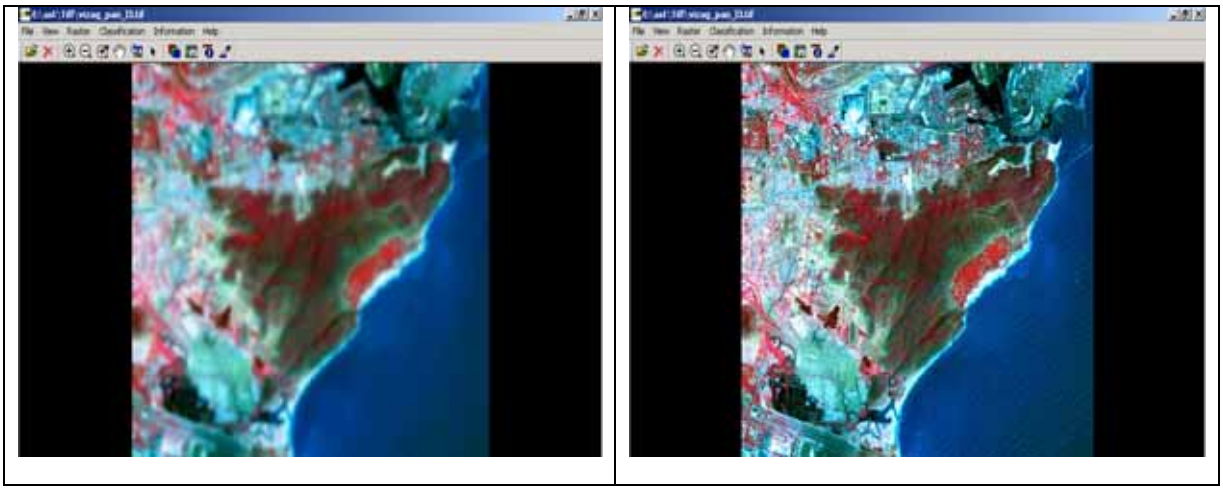
Effecting Brightness and Contrast property

Raster Menu > Brightness/Contrast. Apply settings for best image. The image on the right has the best brightness and contrast combination.

The dialog box shows two screens. The one on the left depicts the original and the one on the right previews the change in both these properties to the user before he can apply the new settings. Notice the blur ness.

The figure above has the best combination of brightness and contrast. Relish the quality of the image.

JT Spectral extends the feature of applying various Filters to the image. To apply filters go to **Raster** Menu > **Filters**. You get various filter choices like Linear, Statistical and Custom. Images can also be sharpened to remove blur ness as shown in the image below.

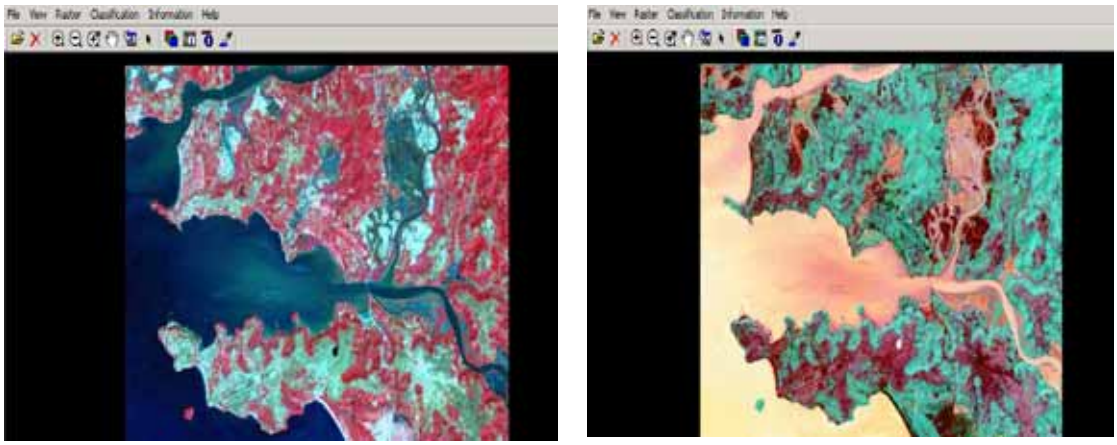


Blurred Image.

Sharpened Image. ***Notice the clarity. Ripple marks on water clearly visible.***

The software also facilitates generation of negative image of any given imagery as and when the user needs it.

Go to **Raster Menu** > **Negative**



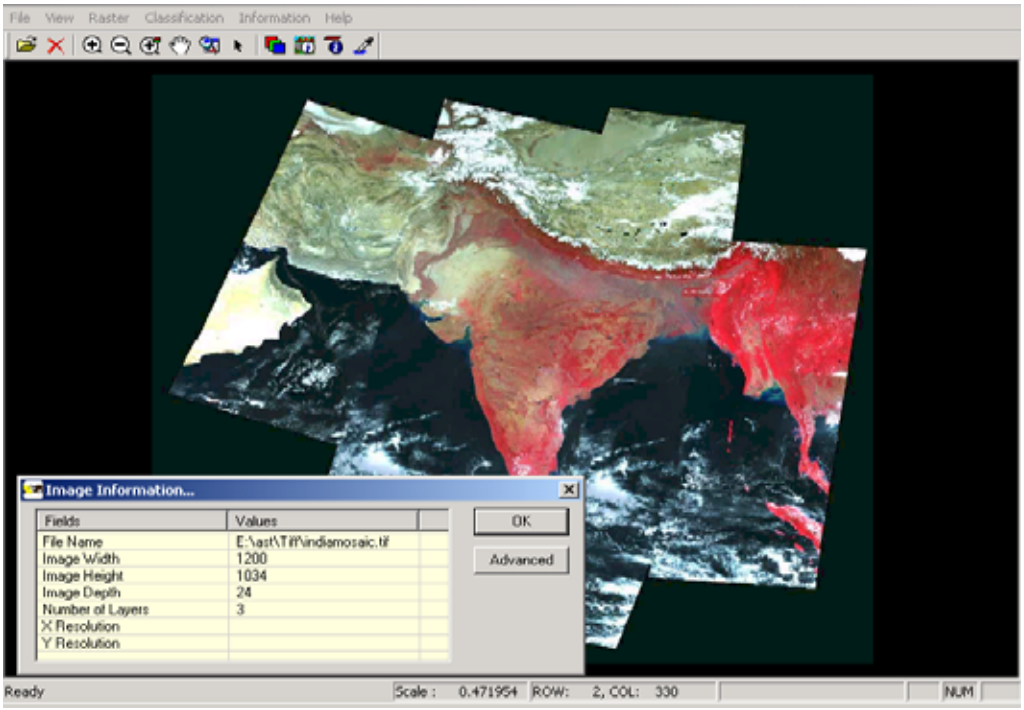
Original Image

Generated Negative

Information Display of Raster Data

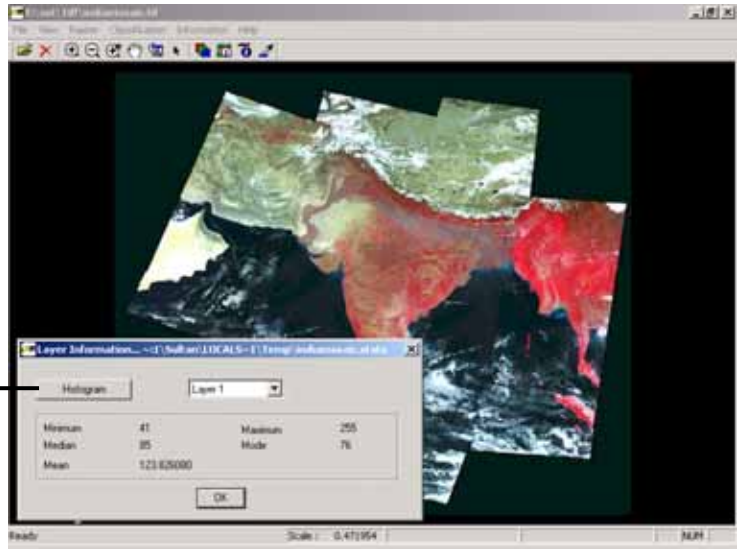
A raster data (satellite imagery, aerial photographs, etc) contains various types of information. To retrieve information of the opened image Click on Information Menu and select between any three option. The following example shows the same.

For image Information. **Information Menu** > **Image Info** or click  icon on the toolbar

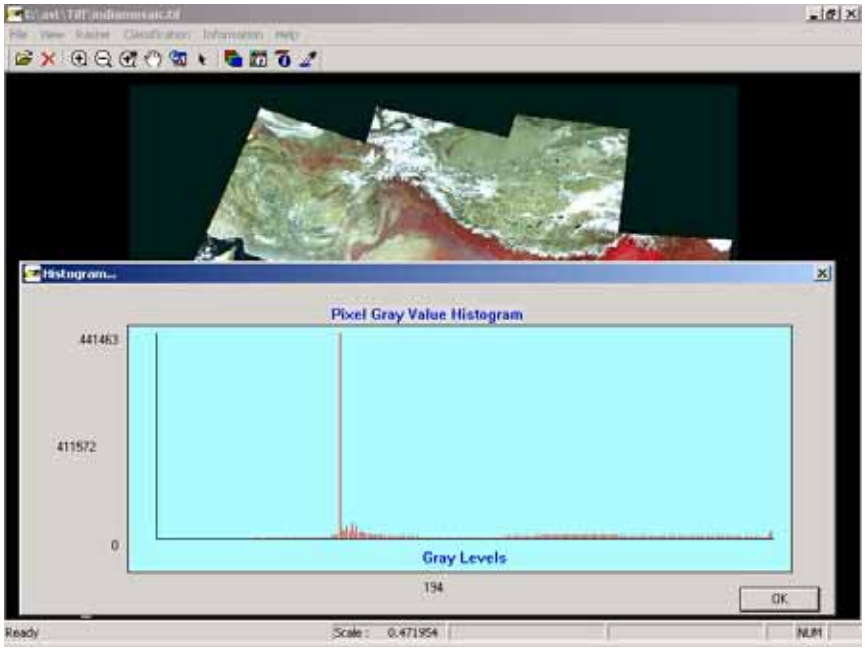


For Layer Information. go to **Information** menu > **Layer Info** or click  icon on the toolbar

The Histogram button generates histogram of the said image.



To generate histogram click on the "**Histogram**" button as shown above. The resulting histogram is shown below.



For Pixel Information, go to **Information** menu > **Pixel Info** or click  icon from the toolbar

The cursor changes to  . Choose a point on the image and click. Pixel information of the selected pixel is displayed in tabular form as shown below.

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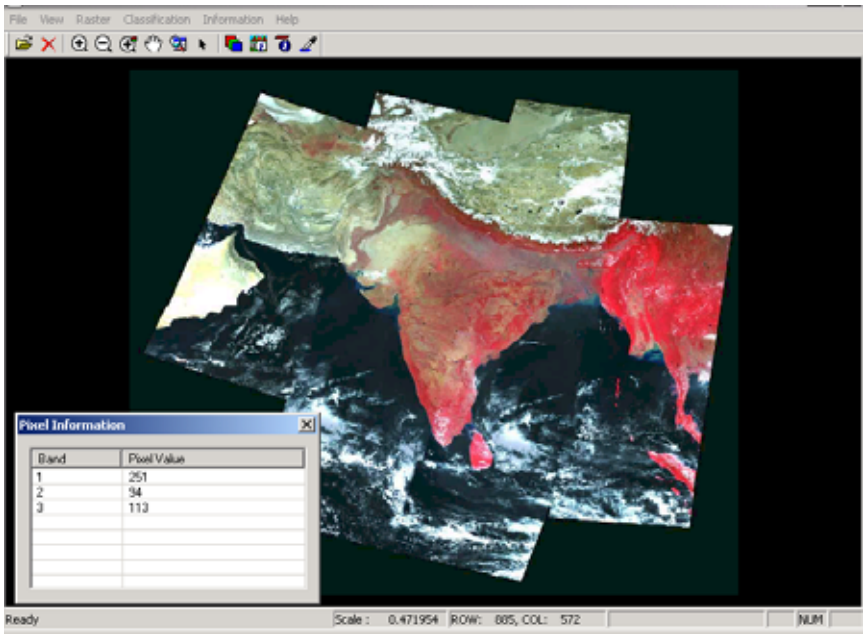
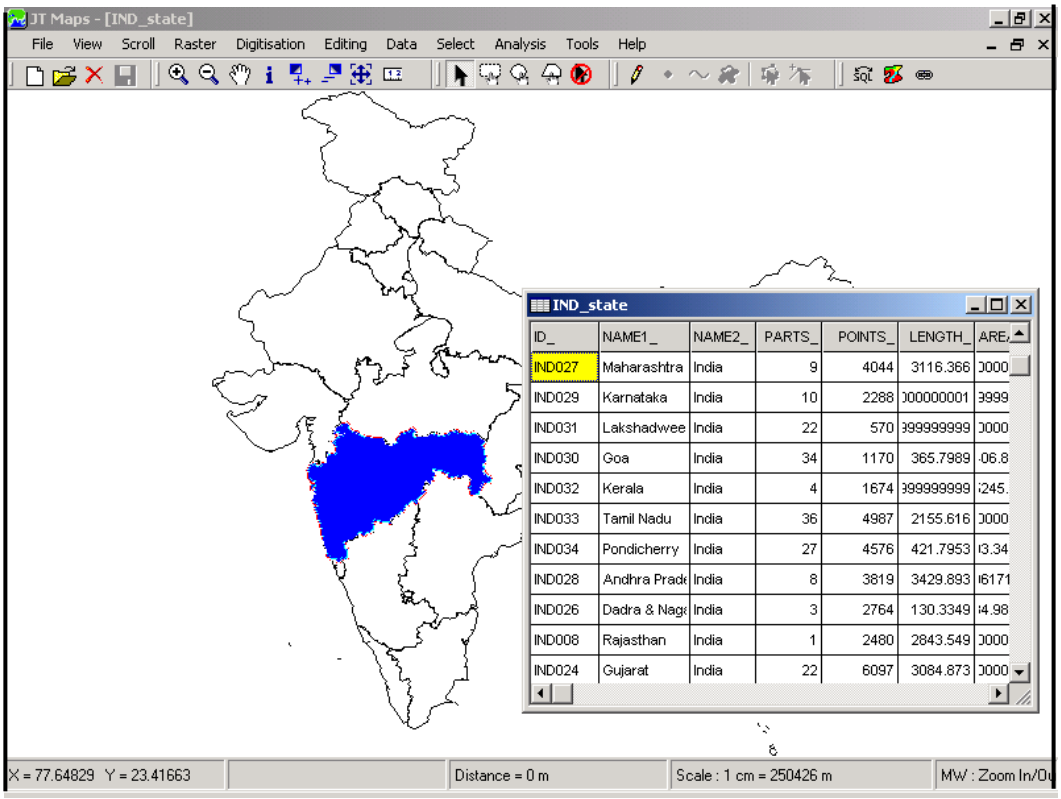


Query and Data Manipulation

JT Maps provides functionalities for the user to analyze, view, manipulate attribute data and maintain a database. The software provides query tool for viewing and manipulating data on a dataset by applying conditions as provided by Structured Query Language.

Browsing the non-spatial data

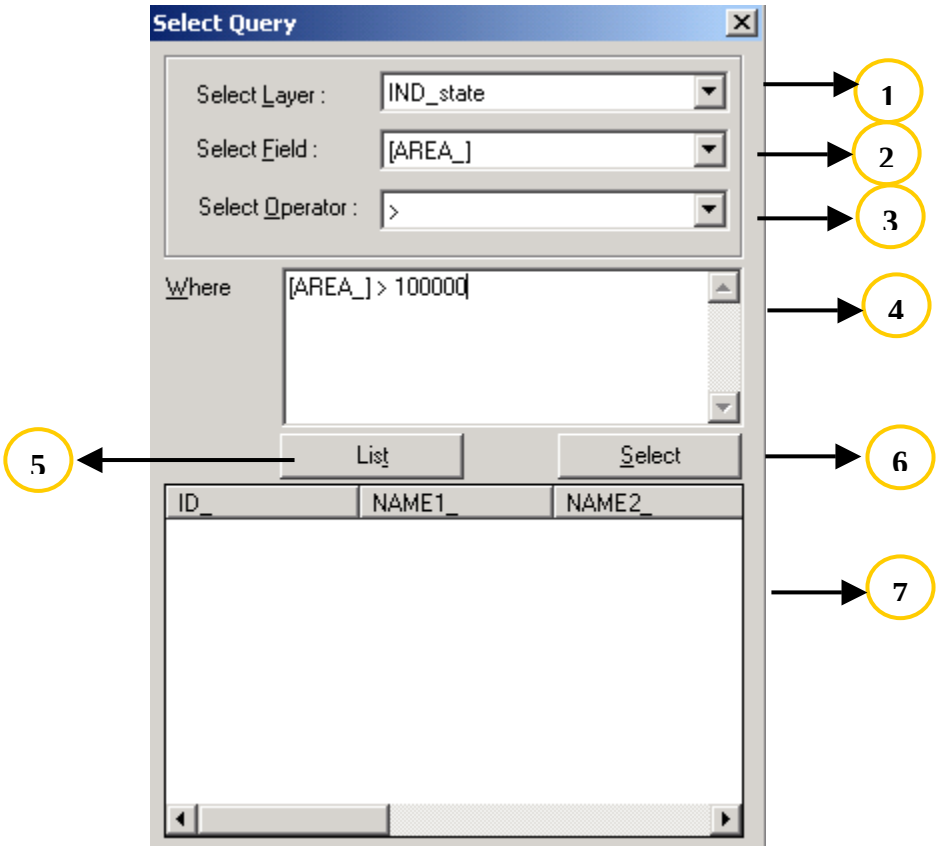
To browse the data, choose Data->Browse or press Ctrl+D. Select the layer for which data is to be displayed and Press OK



Note. *A browser window appears detailing non-spatial data for all the state. The selected state is highlighted on the India map (blue color) with corresponding non-spatial data shown in tabular form and highlighted with Yellow color.*

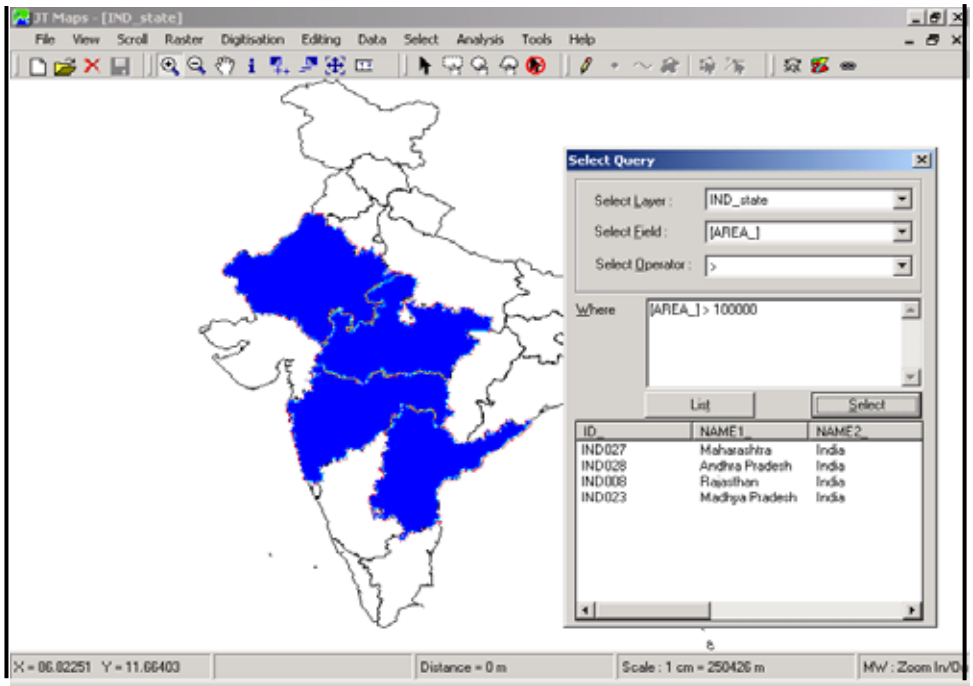
SQL Query

JT Maps permits the user to make Structured Query on any layer of data and display the same in both spatial and non spatial context. Follow the simple step mentioned below to attain that. It provides stepwise guideline to the user making query analysis. Go to Data Menu > SQL Query. The “Select Query” dialog box pops up.

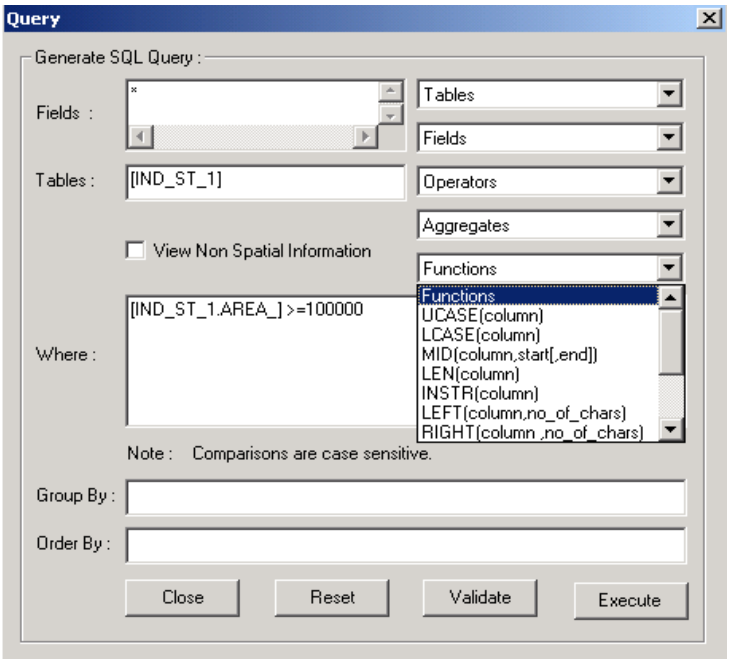


1	Select the layer to perform the select query on.
2	Select the field to perform the query on.
3	Select the arithmetic operator.
4	Specify the condition
5	Details the query result
6	Display the result on the map.
7	Displays the computed result

Result of the above query where the states have an area greater than 100,000 sq. mts is displayed in a tabular form and highlighted (blue color) on the map.



Advanced Query using SQL query like SQL ORDER BY, SQL BETWEEN...AND, SQL DROP etc. can be made to furthermore filter the desired result within huge database. Select Menu > SQL Query or simply click  icon from the toolbar. The dialog box contains advanced options with drop down menu as shown below.



Altering a Table

JT Maps also provides the facility of altering the structure of the non-spatial records. Thus, if required, you can delete fields from the record set that are no longer needed.

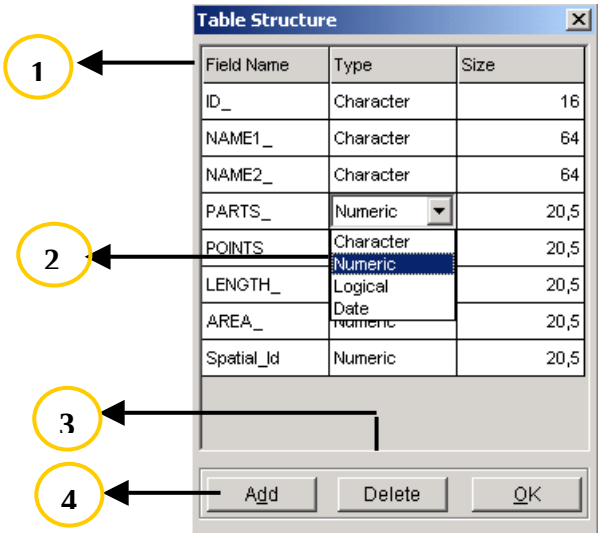
Choose Data->Alter Tabel

1. Fields in the table structure.

2. Type of field. Double click to go through the drop down menu to select the type.

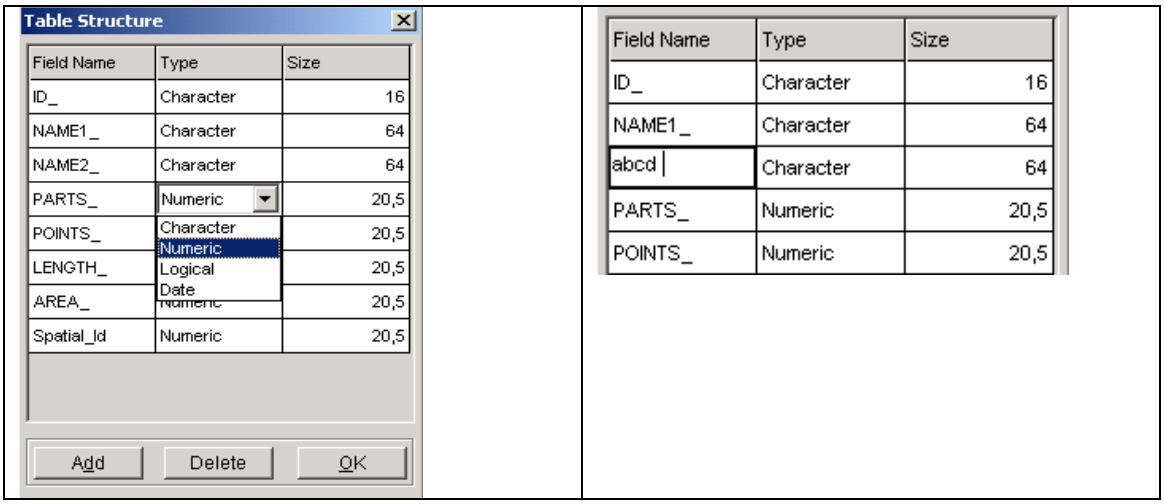
3. Delete a particular field.

4. Add a new field



Changing a field

To change a field, Double-Click on the field . The field turns to text mode. When an insertion cursor appears type in the new field. Look the example below. The new field added as “abcd”. To add a field click the “Add” button. To delete a field, select the field to be deleted and then click the “Delete” button



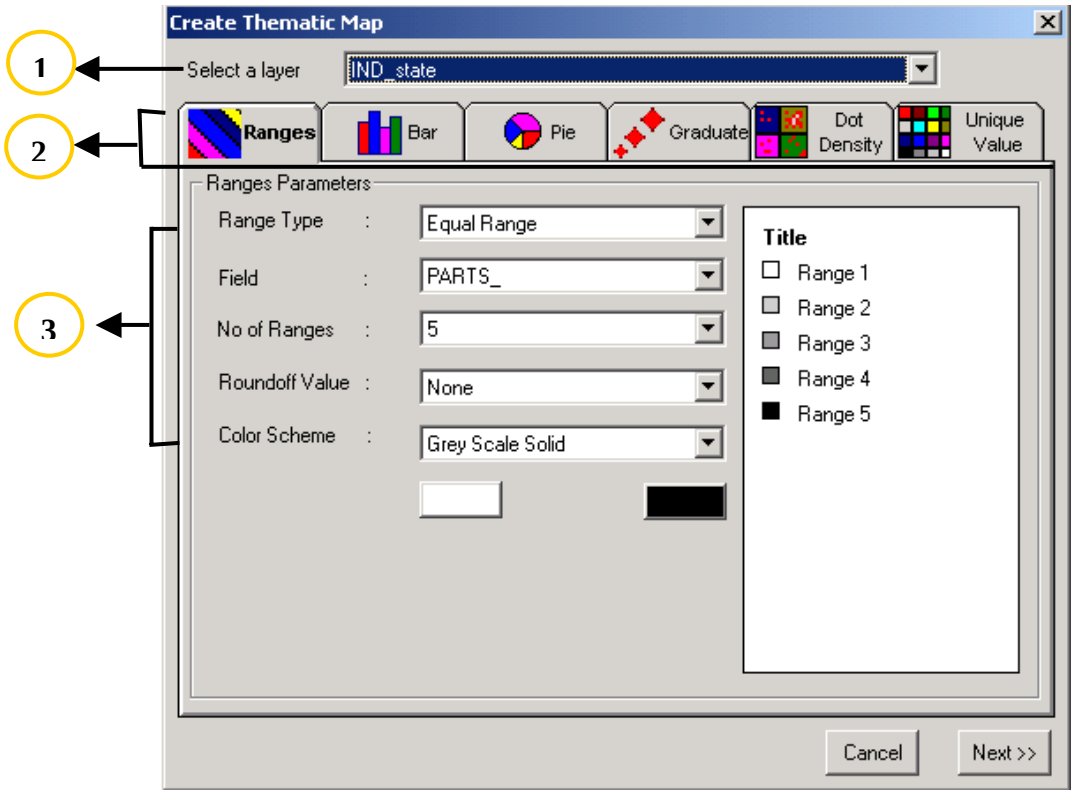
Thematic Maps

Thematic maps are those maps that show the distribution of a single attribute (characteristic) or the relationship between several attributes. Thematic maps can cover a variety of characteristics from soil types to climate to population density. GIS helps display the correct distribution or the relationship between the various attributes either on map, in tabular form or both. Normally the creation of a thematic map involves a process of compilation, which includes the collection, and manipulation of data from a variety of sources to produce a new product.

Scaling of thematic maps depends on the data types and accuracy. With better availability of data thematic maps can be made with a larger scale to show more accurate spatial information. What makes a good thematic map is its accomplishment mainly with the marks and symbols that one uses to represent the data.

Creating Thematic Maps

To initiate theme, choose Analysis > Thematic Map or select  icon from toolbar. The following dialog box opens



1	Select the layer on which to create the thematic map.
2	Select the type of theme to be generated.
3	Select the theme options. These are specific for the various theme types.

Themes provided by JT Maps

Ranges Displays your data according to ranges you set. The ranges theme divides the data on the basis of number of ranges defined. The user can specify the colors to be used with each particular range unit.
Equal Ranges: The entire range is divided into equal spaced sections and the theme is created on the basis of it.
Equal Count: the total numbers of units, which are being considered for creating the theme, are divided into equal sized groups and the theme is generated on the basis of that.
Quantile: The entire data set is divided into quantile groups and the ranging is done on the basis of it.

Bar Charts Bar Chart theme generator creates bars corresponding to each specified field of theme creation. This type of theme can be used to analyze multiple variables per record on the map. An instant comparison can be made between the sizes of the bars in each chart to obtain information about records in the data set.

Pie Charts On specifying the chart theme type to pie chart the theme generator creates a pie with each specified field forming a part of the pie. This kind of theme is generally used when comparing values and observing the amount of share each field has in the entire group.

Graduated Graduated Theme generates a symbol for each record in your table, the size of which is directly proportional to your data values. Thus, size of the symbol is a clear indication of the data value in the record.

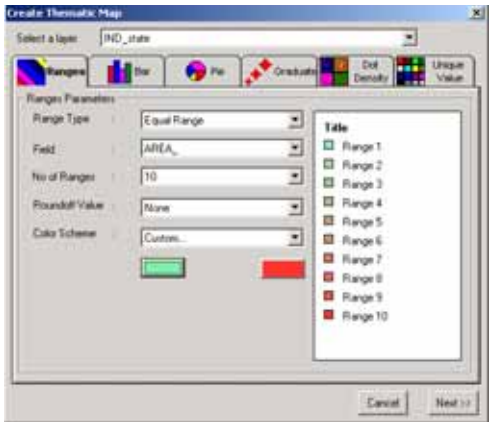
Dot Density Dot Density gives a raw account of the field values. In this theme every dot represents a value and the total number of dots are equal to the total data value of the field.

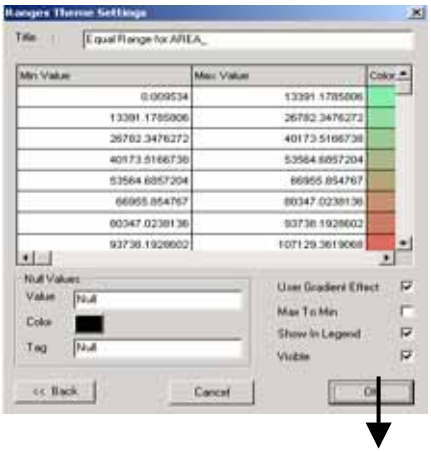
Unique Value The unique value theme is used to create themes where each unique value is given to color. This kind of thematic maps are used when mapping a large dataset and trying to find out similar values. For e.g. you can generate this theme if you want to find out which Districts in India have a Hospital.

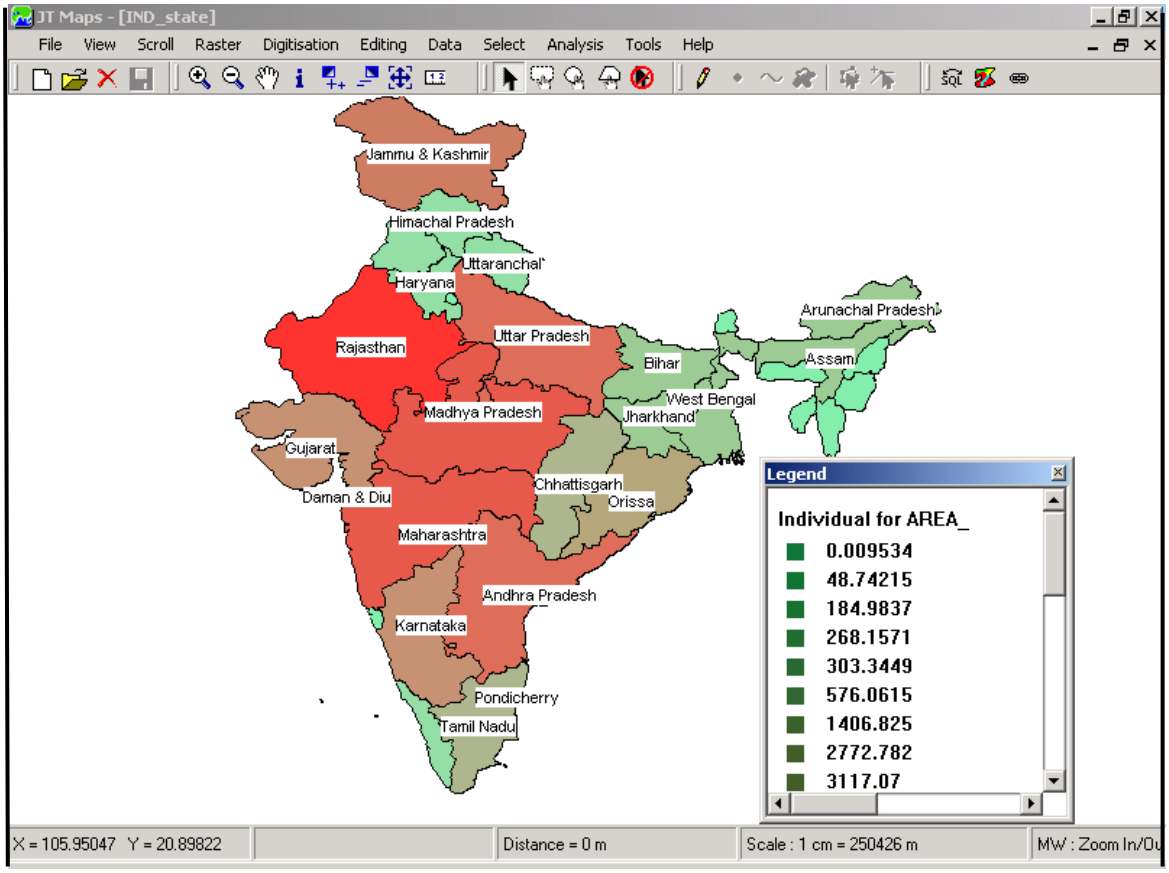
Display Maps by Ranges

Lets generate a **Thematic map** on Indian State on Range Value. Select the **Range option** from the **Create Thematic Map** dialog box. Set the Range parameters and follow the instructions. The result below is the generated Thematic Map.

Displays your data according to ranges you set. The ranges theme divides the data on the basis of number of ranges defined. The user can specify the colors to be used with each particular range unit. To view Legend "Right Click" > View > Legend



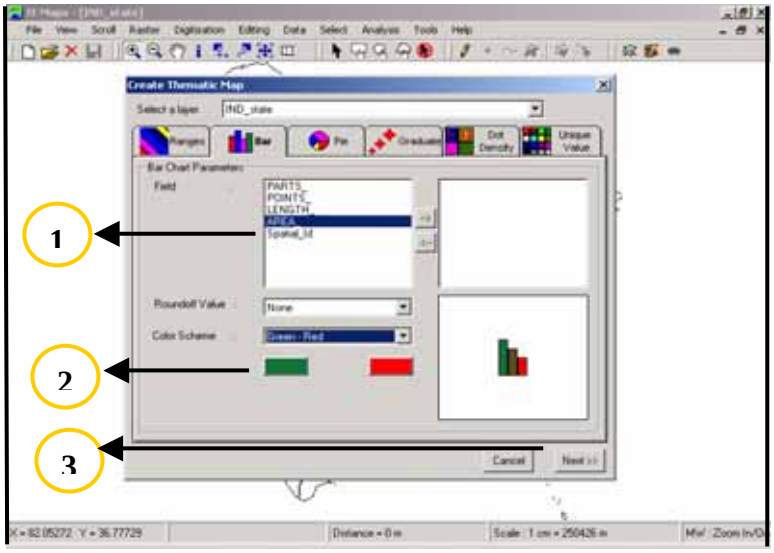




Bar Chart

Similarly to create Bar Chart go to Analysis Menu > Thematic Map. Choose “Bar” option. Highlight the field on which bar chart need to be created on a particular layer.

1. Select the field parameters, either AREA, POINTS etc in this case.
2. Option to select color scheme as per user requirement.
3. Preview of the bar



The software will itself guide you to “Bar Chart Settings” options. Set the parameters and click “OK” button. The example below shows bar chart on area of different Indian States.

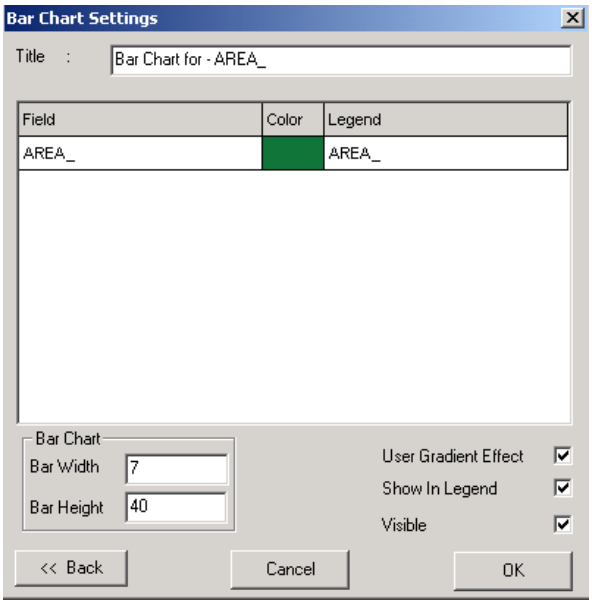
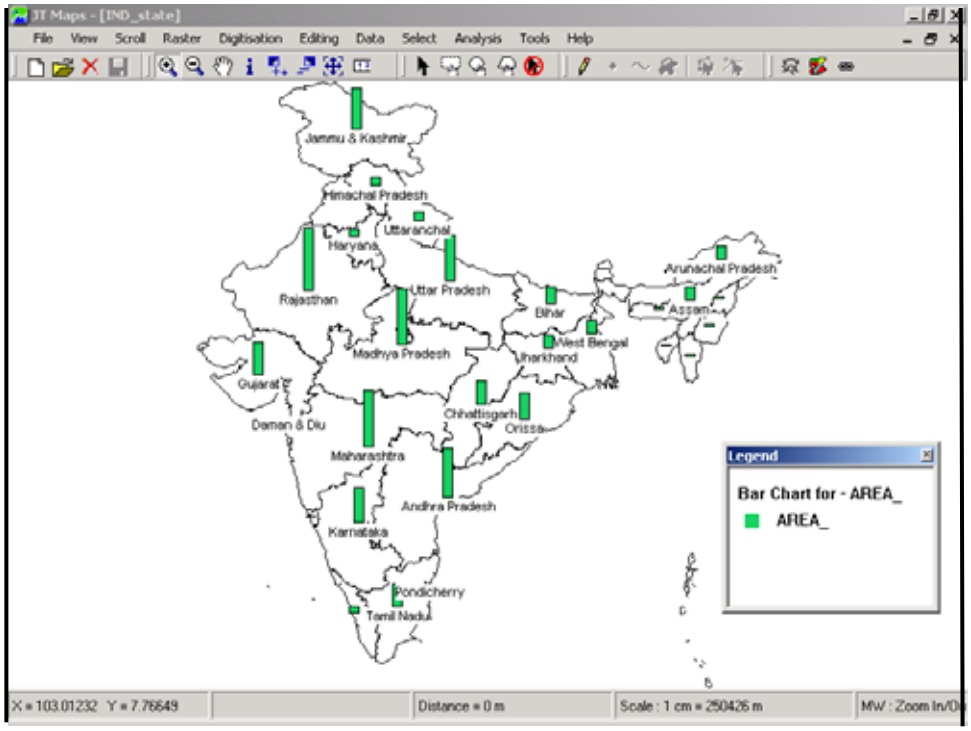


Figure below shows Bar Chart for Area for different States of India. To view Legend **"Right Click" > View > Legend**



Thus we see that generating Thematic Maps with different set of themes becomes easy using JT Maps. The above-mentioned steps can be followed to generate Thematic Maps using other theme options provided by the software.

Buffer and Overlay

Functions of GIS not only helps generating Thematic Maps (ranged colour maps or symbol maps to denote intensity of a mapped variable) or overlaying of different pieces of information, but also helps creating buffer areas around selected features. In this chapter we take a look at how JT Maps helps generate buffer zones and assist in overlay analysis.

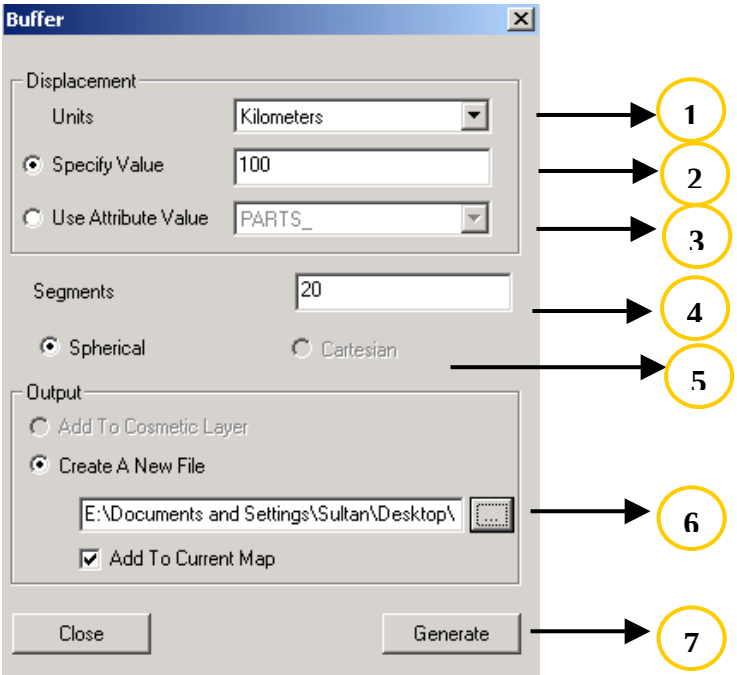
Among the simpler GIS applications, buffering is a process of identifying objects within a specified distance of a reference object. The reference object may be a point location, a line, or a polygon. It creates a new polygon around the reference object. The user specifies a distance that the buffer is to extend from the feature, and the GIS create a polygon that encompasses all the points within the specified distance of the feature.

Creating Buffer Zones

Buffer analysis is used for identifying areas surrounding geographic features. The process involves generating a **buffer** (A zone of a specified distance around coverage features. Both constant and variable width buffers can be generated for a set of coverage features based on each features attribute values) around existing geographic features and then identifying or selecting features based on whether they fall inside or outside the boundary of the buffer.

To create buffer zones follow these simple steps

1. Open the Layer on which to create buffer.
2. Select the object or objects around which you want to create the buffer.
3. Go to Analysis Menu > Buffer or press Ctrl+B. the following dialog box opens.



Dialog Box to set Buffer Parameters.

1. Select the measuring unit

2. Specify the value of buffer zone

3. Select Attribute value

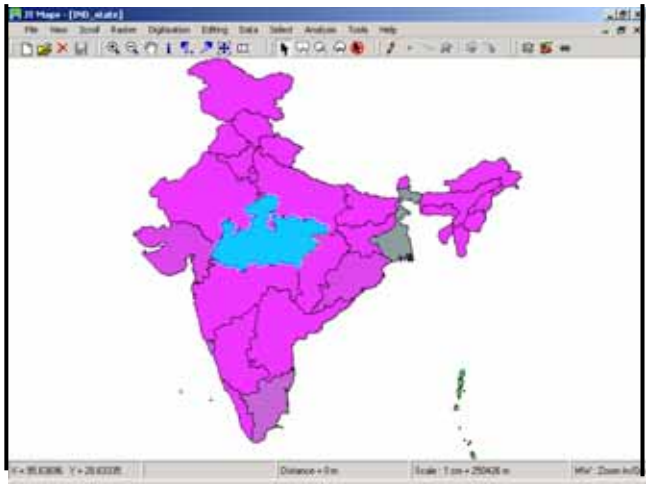
4. Select Segment parameter

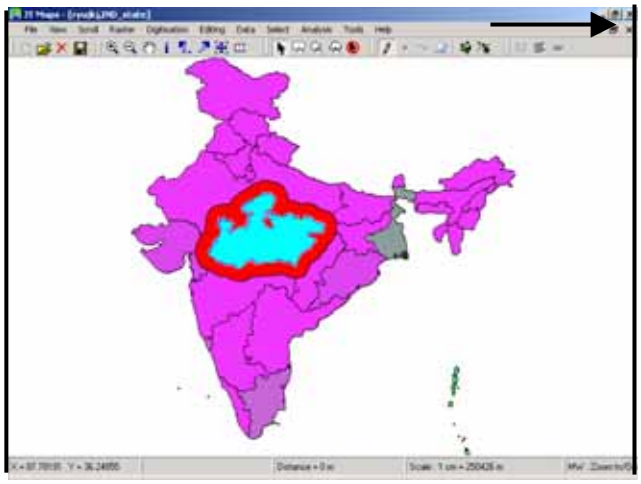
5. Toggle between radio buttons to define the type of buffer zones.

6. Browse, define the path and save the new layer as a separate file.

7. Click the "Generate" button to create buffer zone.

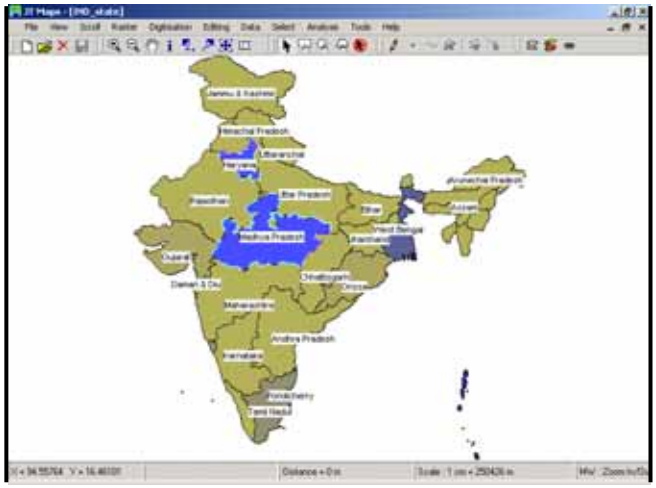
Figure below shows buffer zone (indicated in red color) around the state of Madhya Pradesh with above depicted buffer parameter.

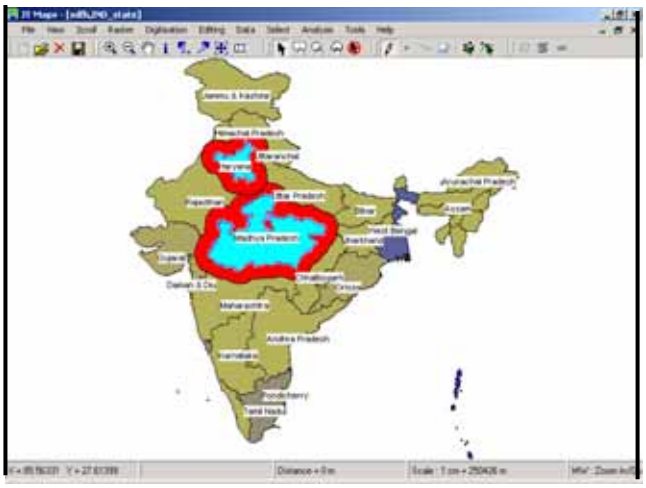




Generating Multiple Buffers

Select more than one object on which buffer zones to be created. Rest of the steps is same as defined above. Examples below suggest the same.





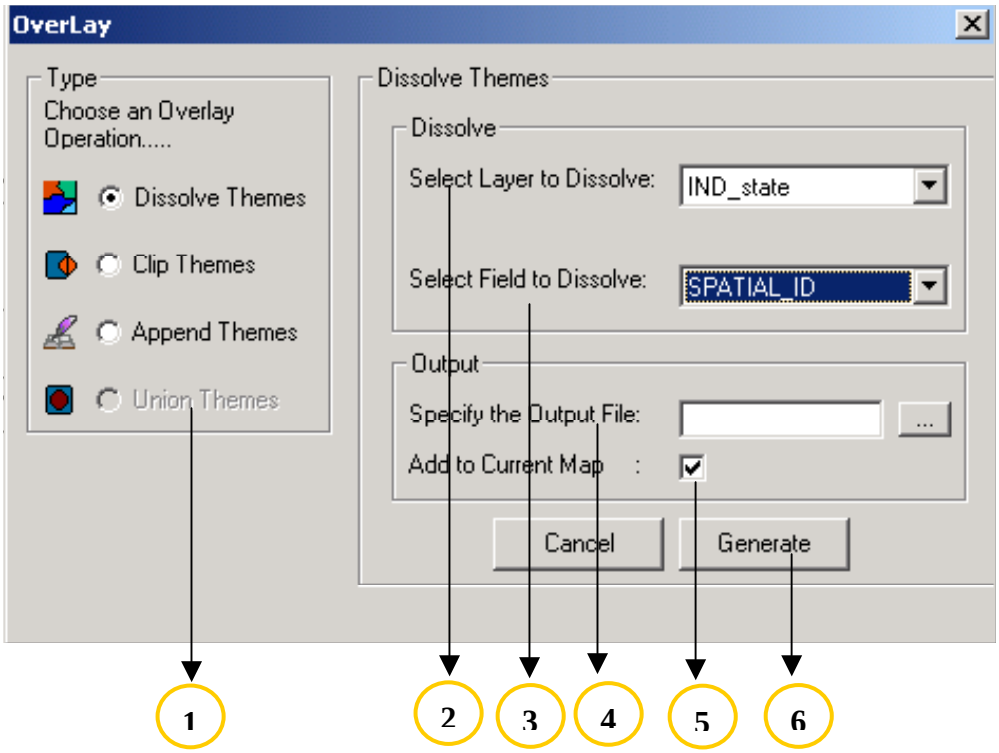
Overlay Analysis

The process of overlaying usually involves taking two layers and combining them by some mathematical operation. Layers can be added, subtracted, multiplied, or divided according to the values of certain attributes. Buffering is especially powerful when combined with overlaying to extract information.

To perform Overlay analysis following steps are required

1. Open the Layers on which to perform Overlay.
2. Go to Analysis Menu > Overlay or press Ctrl+Y. the following dialog box opens.

Overlay analysis using dissolve themes



1. Choose an Overlay Operation among the Radio Buttons

2. Select the Layer to Perform Overlay

3. Select field

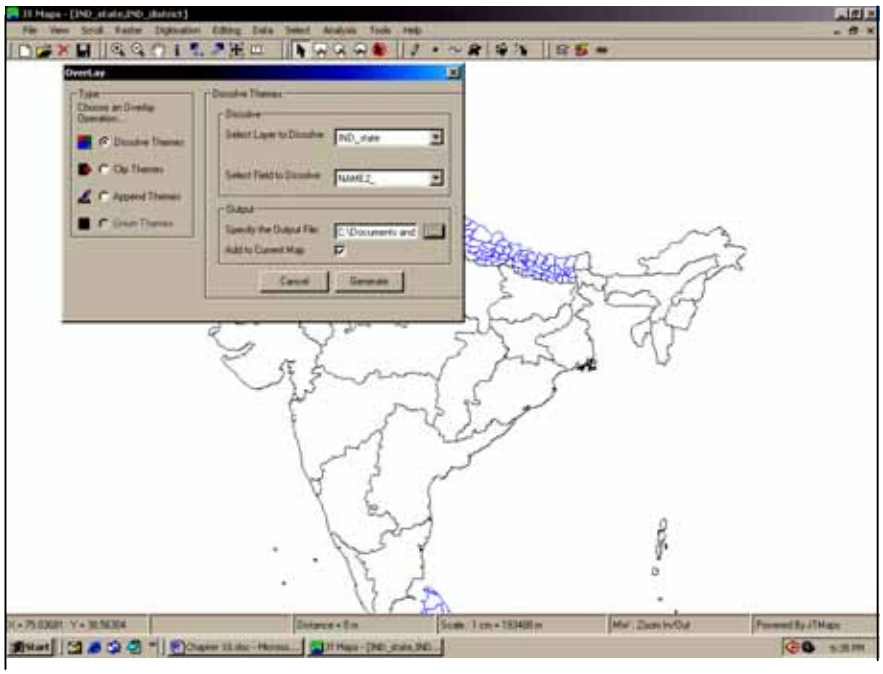
4. Select Output File Path

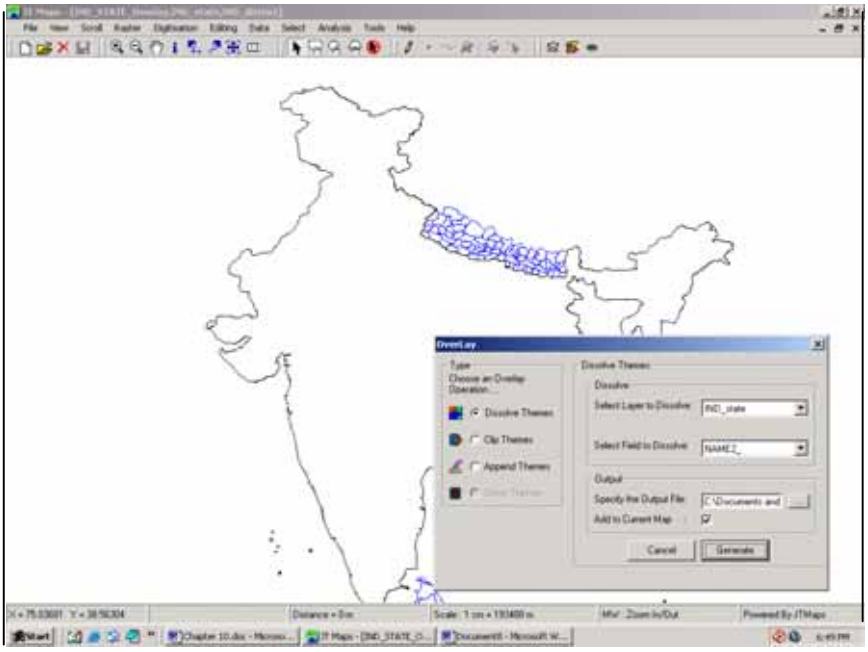
5. Option to Add the Generated Layer to the Map

6. Click the "Generate" Button to Perform Overlay.

To perform the Overlay operations select the dissolve themes from the overlay operation. Select layer to dissolve from the various layers opened in the map window. Select field to dissolve from the different fields in the attached database. Specify the output file name and the path in the output box. Click on generate button to get the desired result as shown below.

Similar operations are performed for Clip themes and Append themes options.





Network Analysis

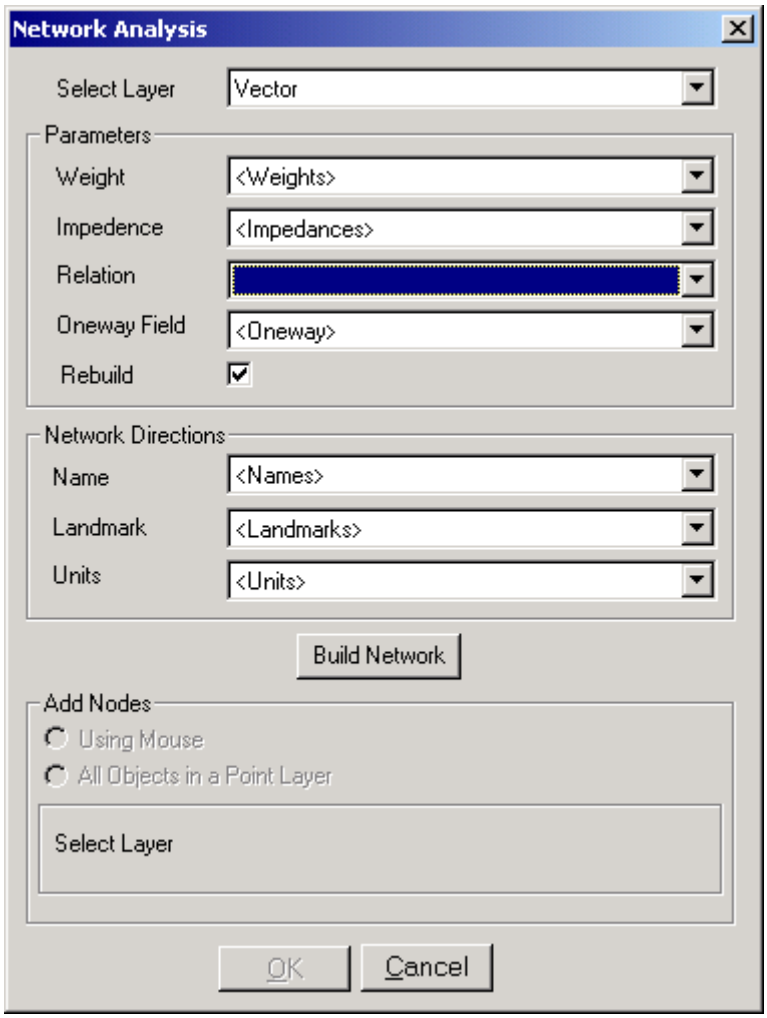
There are a variety of services available in the real world which depend on the establishment of relationships between one point and another and finding optimal solutions for traversal between these objects, it is clear that these utility services use a set of connected linear features called 'network'. Hence it can be said that a network forms one of the primary infrastructures of the modern world. The form and shape of the Network influences the capacity and the efficiency of the system and how well it will respond to real-life situations. JT Maps provides several advanced analysis tools for planning and operations and one such tool is Network Analysis which mainly plans, manages and optimizes the utility of man-made resources such as transportation networks, allocation and distribution of resources like natural gas and water, sewer disposal, location of servicing plants etc.

Using JT Maps, analysis can be performed on the network, once a network has been created and its attributes defined. The analysis of the network will depend upon the characteristics of the utility under study and its requirements. The software has a variety of configurable options within the network analysis module, which makes it a comprehensive and highly flexible system. The user has the option of attaching weights and impedances to the elements of the network, it can specify the direction of flow within the network as well as indicate those elements which are temporarily out of service. These options are very helpful in depicting and emulating real-world situations, like traffic blockades on road networks etc.

Using this tool the user can perform analysis of various forms like finding shortest path, obtaining directions and estimating optimal route.

To start using Network Analysis the user would require a clean polyline dataset, the data has to be clean to ensure correct result are reflected upon analysis. After loading the layers the following set of steps must be performed.

1. Select Analysis from Menu bar >Network > Start or press Ctrl+ K. Dialog box opens to set Network Parameters.



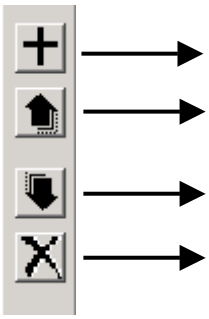
2. The user is required to fill in the required set of parameters for building a topology, which will further be used for conducting the network analysis. The parameters included are:
    a. Layer on which the network analysis and topology creation will take place.
    b. The weight field will define the weight of each object in the network
    c. The impedance field defines the impedance associated with traveling on that object, this impedance is defined as a relationship with the weight of the object.
    d. Relationship field defines the relationship between the weight of the object and its corresponding Impedance.

        For e.g. if we consider a standard road network with three categories of road, A, B and C. We give the values of 1, 2 and 3 to A, B and C respectively. We have a field defined that contains the length of the line segment of the network. Now when defining the network parameters we will assign the weight as the length of the road, the impedance as the category of the road namely, 1, 2 or 3 and the relationship may be multiplication (*). This way a road of category A of length 10 km's will be preferred over a road of category B of 6 kilometers.

e. The one-way will define any object, which can only be traversed in one direction; this field will be used in evaluating possible roads that may not be used when traveling from one direction.
f. The Network Direction parameters define the fields which will be used to create the driving direction instruction set. The fields required are:
    i. Name of the object
    ii. Major landmarks, used for defining change in direction
    iii. The unit of the weight of the object.
g. The check box with the name Rebuild should be checked if the user is aware that the same parameters have been used for previously defining the topology but the user would like to force the rebuilding of the network.

3. The user will then click the “Build Network” button to create the topology and prepare the system for the network analysis. Once the network is created the user has the option of clicking the destination points on the map using the mouse or using a pre-existing point dataset for defining the destinations.

4. The nodes clicked can be manipulated by the following set of buttons on the node add dialog window



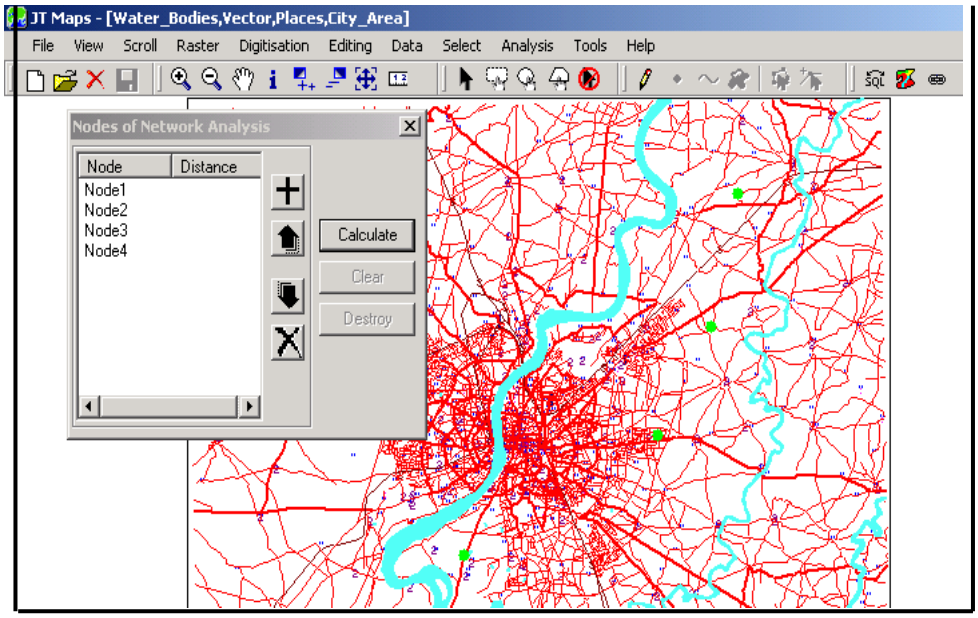
Add a Node

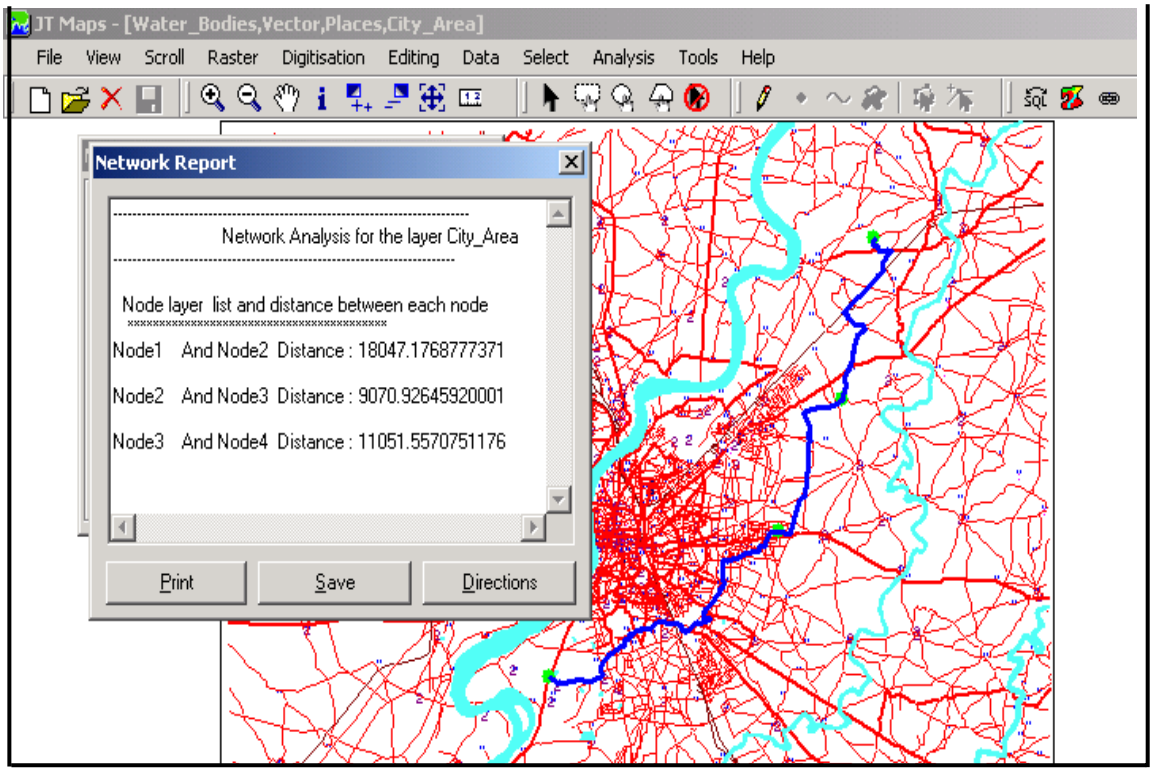
Move a particular Node one step above the current location.

Move a particular Node one step above the current location.

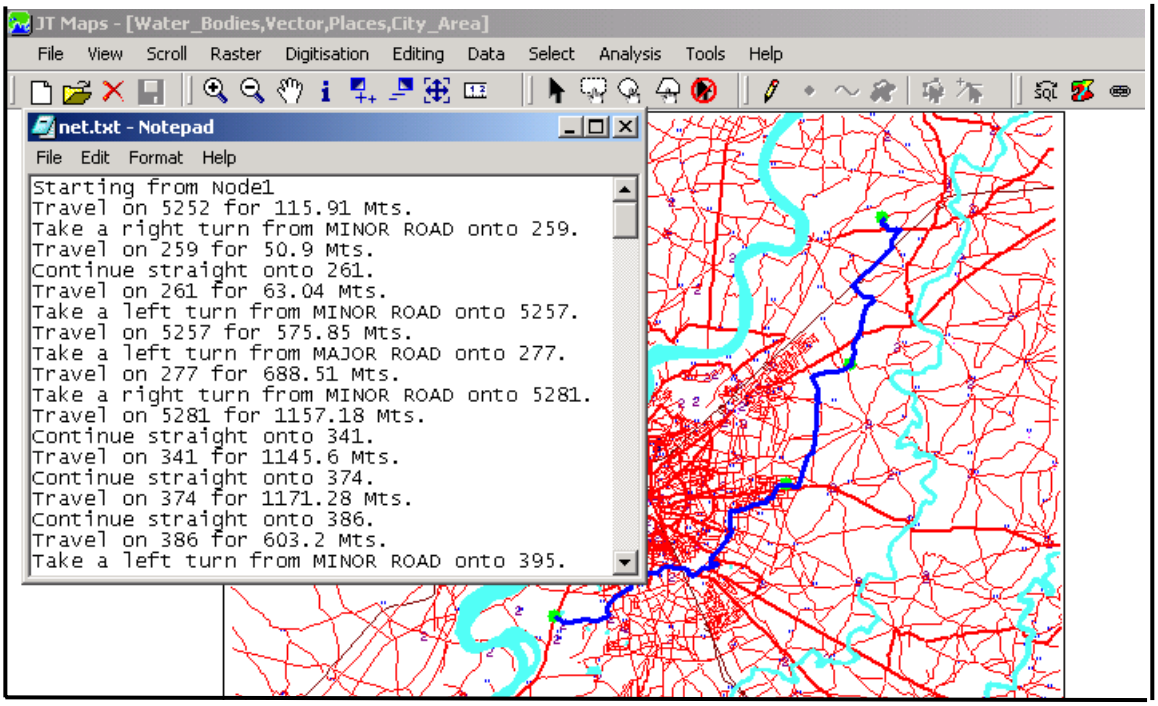
Select and delete an existing Node

5. Once the nodes have been selected, using either of the two sets of options given, the user will click the “Calculate” button on the dialog box to initiate the network analysis. The shortest route from Node – 1 to Node – 4 is indicated on the map as a blue line. The dialog box details information on distance between each node as shown below





To know the direction of travel from the first point to the last point click the “Direction” button on the dialog box. A new window opens giving the direction to be taken to travel from starting point to the destination point. The figure below confirms the result.



In this manner the system can perform a variety of network related activities. The set of configurable options allow the system to be highly flexible and at the same applicable in a large set of areas of operation.

Map Composition

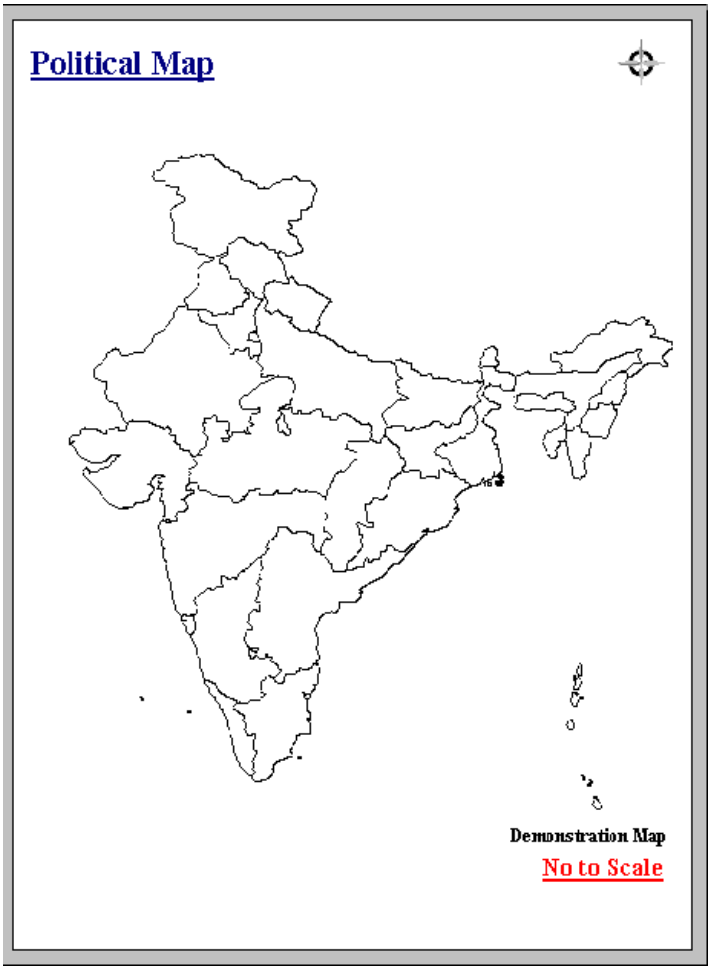
For printing maps the Map Composition module supports functionalities to create print layouts. To access the print layout window select the menu option:

File > **Map Composition** or

press **Ctrl+P**.

Composition Window

Composition Widow provides some options for the user to prepare the layout for printing the map. It enables the user to make the map explanatory by adding relevant information about the map like its orientation & legend.



Various options accessible with Map Composition window are available through the toolbar shown below:

Page Set Up Tool: Helps adjust the size, orientation and margin of the paper

Print Tool: Takes you to standard print option

Select an Object Tool: Enable to select any object

Deselect Tool: Undo the previous operation

Move: Click on the icon and select an object. It makes the selected object movable.

Add/Modify Tool: Click on the icon and select the the text to modify or add a new one.

Modify Text Attribute: Helps to change Font, Text colour and its orientation.

Insert/Modify Tool: It enables insertion of new Picture or modify an existing one.

Map Margin Tool: Toggle it to display or hide the Map margin

Legend Display Tool: Toggel it to make the legend of the map visible or hidden.

Zoom in: Click on the icon to zoom the map window

Zoom out: Click on the icon to zoon out of the map window

File Translator

Geographic Information System incorporates data from various sources; hence it becomes imperative that data files with different format need to be **imported or exported** for compatibility. JT Maps supports data import of different format other than .jtv thus rendering it compatible with JT Maps software. Once imported the data becomes editable for user to effect changes or manipulate as per the requirement. We take a look at these options to understand the way its been done.

Data Import and Export

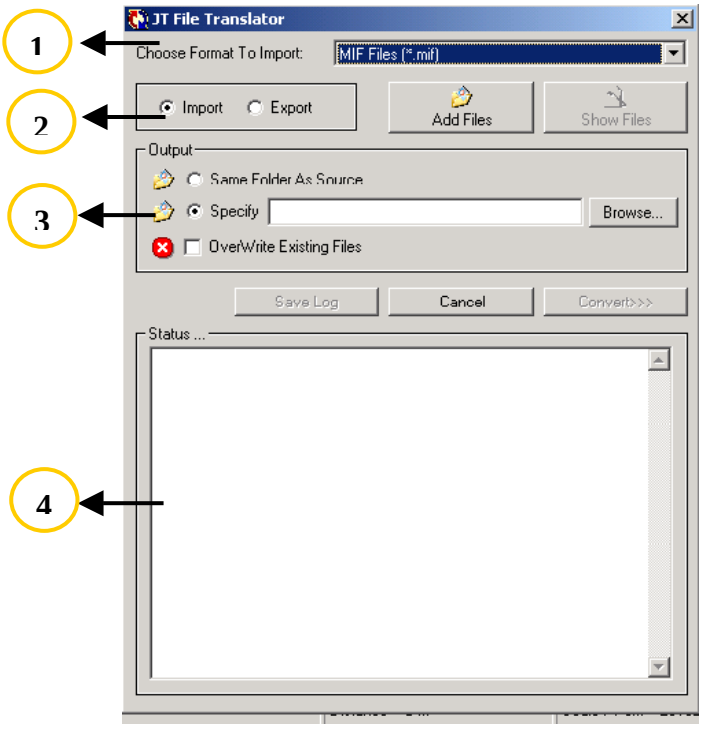
Import allows user to bring in data of different formats to a single format. JT Maps supports importing of data formats (other than .jtv files) into .jtv formats. To import data, Tools Menu > File Translator. The following dialog box appears.

1. List the details of files to be imported.

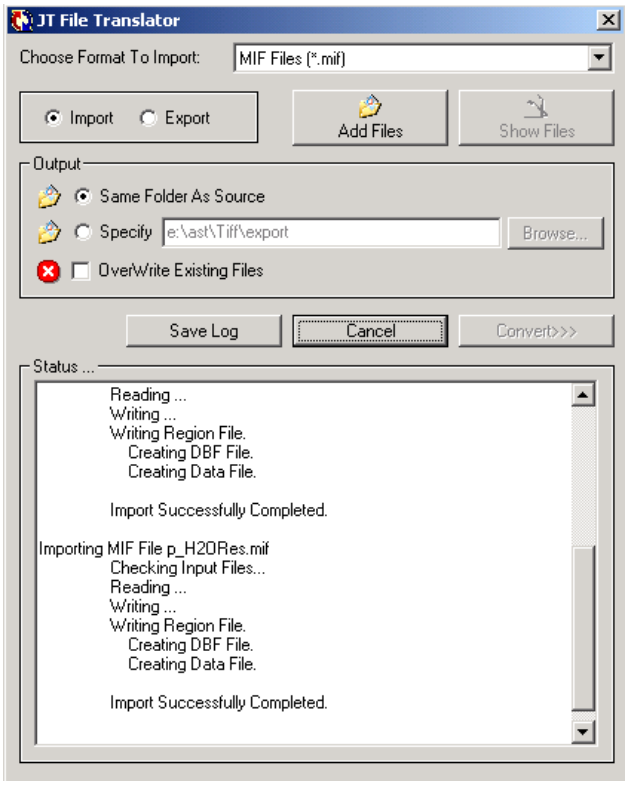
2. Radio buttons to specify a choice. In this case “Import”

3. Specify the output source. Where to store the imported files.

4. List the status (done/undone) of import/Export process



To import file(s) go to **Tools Menu** > **File Translator**. Choose the file format to be imported. Ensure to "tick" on import radio button. Now Click the **Add Files** button. It opens the browser box. Select the files to be imported. Tick on the **"Specify"** option to browse the location for storage of imported file(s). Click the **"Convert"** button to initiate the import process. Status area shows the successful importing of the selected file.

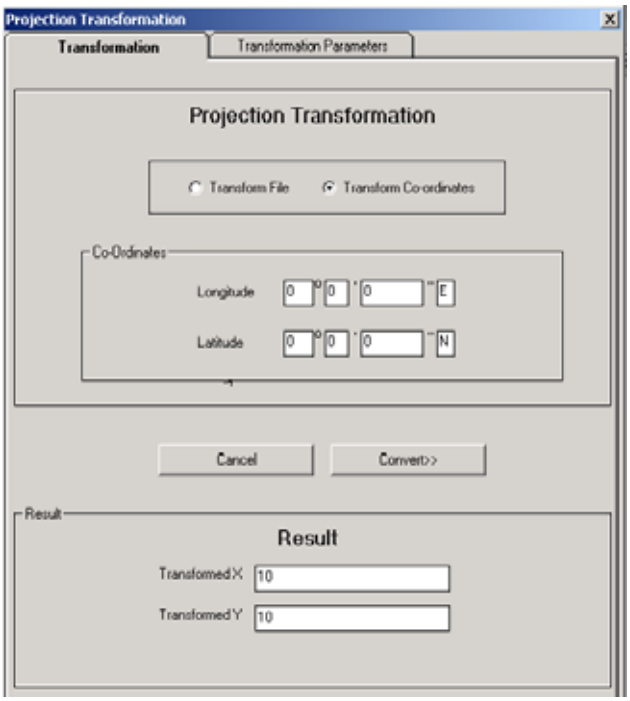


Data Export

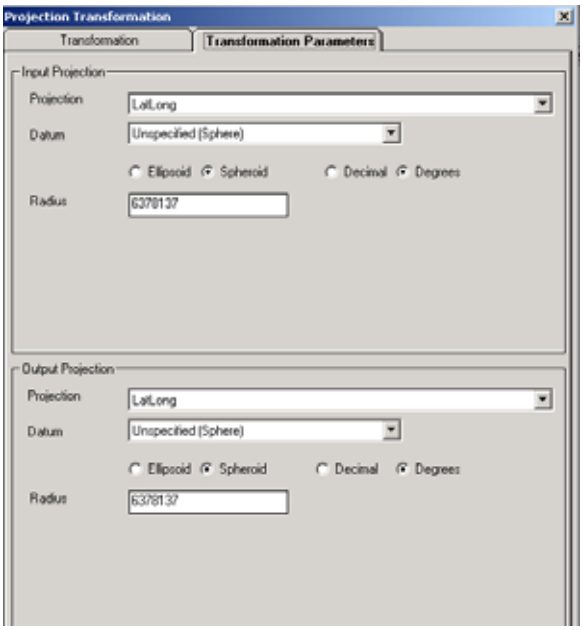
Following the above described steps user can **"Export"** the file(s) to other formats. The export radio button need to be activated and destination directory to be defined. Follow the steps as mentioned. The status bar will indicate successful export of file(s).

Projection Transformation

JT Maps allows user the facility for either file transformation or Co-ordinate transformation. To achieve the purpose go to Tools Menu bar > Projection Transformation or press Ctrl + F2. The Tab Strip Window opens. Set the parameters and press the "Convert" button.



Transformation Window

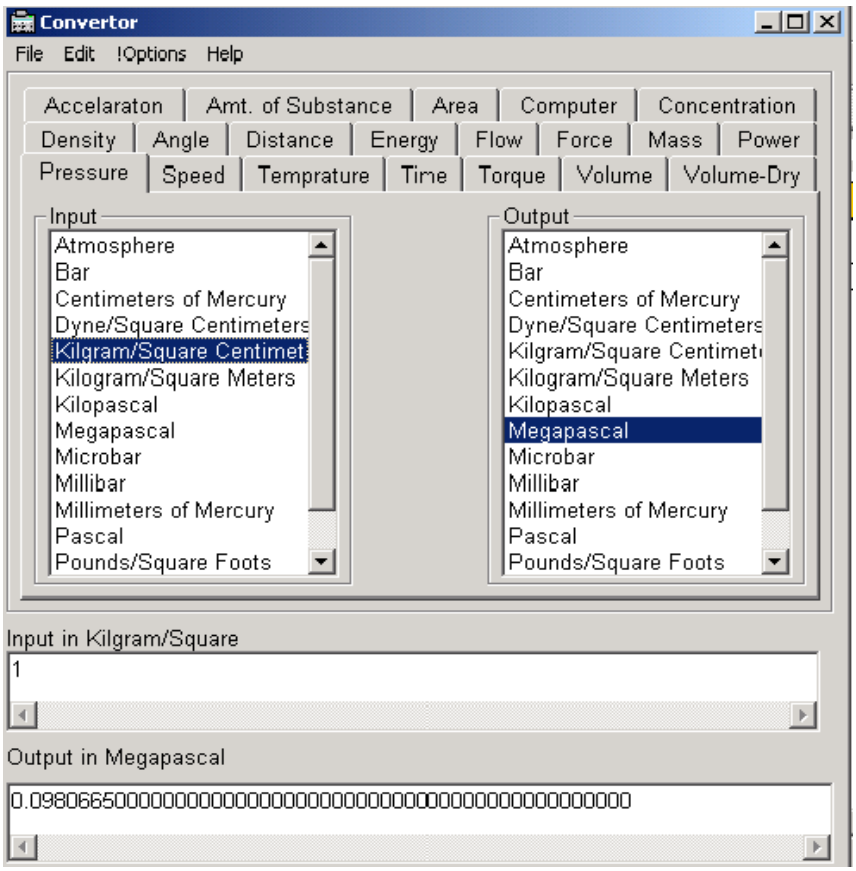


Transformation Parameter Window

Transformation parameter window allows user to choose **"Projection Parameters"** (Lat/Long, Mercator etc.) and select the **"Datum"** for layers.

Unit Converter

Another tool provided by JT Maps is the **"Unit Converter"** tool. It helps the user to convert an input data with a specified unit to equal values in other unit. To get a feel of the same click Tools from Menu bar. Go to Unit Converter OR press Ctrl+F3. The following Tab Strip window opens.



The above example reflects conversion of 1 Kilogram/Square to Megapascal.

XIV Glossary

Keyword	Description
Attribute	A characteristic of a geographic feature described by numbers, characters, images and CAD drawings, typically stored in tabular format and linked to the feature by a user-assigned identifier (e.g., the attributes of a well might include depth and gallons per minute).
Azimuth	The horizontal direction of a vector, measured clockwise in degrees of rotation from the positive Y-axis, for example, degrees on a compass.
Axis	A reference line in a coordinate system.
Area	A closed figure (polygon) bounded by one or more lines enclosing a homogenous area and usually represented only in two dimensions. Examples are provinces, lakes, census tracts and forest stands.
Byte	A memory and data storage unit composed of contiguous bits, usually eight. For example, file sizes are measured in bytes or megabytes (one million bytes). Bytes contain values of 0 to 255 and most often represent integer numbers or ASCII characters (e.g., a byte with an ASCII value of 77 represents a capital M). A collection of bytes (often 4 or 8 bytes) represents real numbers and integers larger than 255.
Coordinate System	A reference system used to measure horizontal and vertical distances on a plan metric map. A coordinate system is usually defined by a map projection, a spheroid of reference, a datum, one or more standard parallels, a central meridian, and possible shifts in the x- and y- directions to locate x,y positions of point, line, and area features.
Coordinate Data	Data digitized by recording Cartesian coordinates, which define boundary locations. Also called polygon, line or point based data.
Database	A logical collection of interrelated information, managed and stored as a unit, usually on some form of mass-storage system such as magnetic tape or disk. A GIS database includes data about the spatial location and shape of geographic features recorded as points, lines, areas, pixels, grid cells, or tins, as well as their attributes.
Data Set	A named collection of logically related data items arranged in a prescribed manner.
Datum	A set of parameters and control points used to accurately define the three-dimensional shape of the Earth (e.g., as a spheroid). The datum is the basis for a planar coordinate system. For example, the

	North American Datum for 1983 (NAD83) is the datum for map projections and coordinates within the United States and throughout North America.
Digitize	1. To encode geographic features in digital form as x,y coordinates. 2. The process of using a digitizer to encode the locations of geographic features by converting their map positions to a series of x, y coordinates stored in computer files. Pushing a digitizer button records an x, y coordinate. A digitized line is created by recording a series of x, y coordinates.
Double-Precision	Refers to a level of coordinate accuracy based on the possible number of significant digits that can be stored for each coordinate. Whereas single-precision coverages can store up to 7 significant digits for each coordinate and thus retain a precision of 1 metre in an extent of 1,000,000 metres, double precision coverages can store up to 15 significant digits per coordinate (typically 13-14 significant digits) and therefore retain the accuracy of much less than 1 metre at a global extent.
Easting	The x-coordinates in a plane coordinate system; see northings.
Feature	An object or aspect of the earth's surface, such as a road, vegetation, or town site. On a map, a "map feature".
Format	The arrangement of data in record or file.
Index	Special data structure used in a database to speed searching for records in tables or spatial features in geographic data sets.
Layer	Layers organize a database or map library by subject matter (e.g., soils, roads, and wells). Conceptually, layers in a database or map library environment are exactly like coverages.
Line	A set of ordered coordinates that represents the shape of a geographic entity too narrow to be displayed as an area (e.g., contours, roads, and streams). A digital line begins and ends with a node. A line on a map (e.g., a neat line).
Longitude	Angular distance, in degrees, minutes, and seconds, of a point east or west of the Greenwich meridian.
Latitude	Angular distance, in degrees, minutes, and seconds, of a point north or south of the Equator.
Map Extend	1. The rectangular limits (x min, y min and x max, y max) of the area of the Earth's surface displayed. Map extent is specified in the coordinate system of the coverage or other geographic data set used. Typically, the extent of the geographic database (or a portion of it defined by a zoomed-in view) defines the map extent for display. 2. The geographic extent of a geographic data set specified by the minimum-bounding rectangle (i.e., x min, y min and x max, y max).

Glossary

Map Projection	A mathematical model that transforms the locations of features on the Earth's surface to locations on a two-dimensional surface. Because the Earth is three-dimensional, some method must be used to depict a map in two dimensions. Some projections preserve shape; others preserve accuracy of area, distance, or direction. See also coordinate system. Map projections project the Earth's surface onto a flat plane. However, any such representation distorts some parameter of the Earth's surface be it distance, area, shape, or direction.
Nothings	The y-coordinates in a plane-coordinate system
Point	1. A single x, y coordinate that represents a geographic feature too small to be displayed as a line or area; for example, the location of a mountain peak or a building location on a small- scale map. 2. A coverage feature class used to represent point features or to identify polygons. It is not possible to have point and polygon features in the same coverage. When representing point features, the x,y location of the label point describes the location of the feature. When identifying polygons, the label point can be located anywhere within the polygon. Attributes for points are stored in a PAT
Polygon	A coverage feature class used to represent areas. A polygon is defined by the arcs that make up its boundary and a point inside its boundary for identification. Polygons have attributes (PAT) that describe the geographic feature they represent.
Parallel	A property of two or more lines that are separated at all points by the same distance. A horizontal line encircling the earth at constant latitude. The equator is a parallel whose latitude is 0 degrees. Digital measures of latitude are positive up to 90 degrees above the equator and negative below. On maps they are identified by degrees N or S from the equator
Region	A coverage feature class used to represent a spatial feature as one or more polygons. Many regions can be defined in a single coverage. Regions have attributes (PAT) that describe the geographic feature they represent.
Skew	Distortion from the true or symmetrical form. A term often used in remote sensing to denote distortion of a digital image due to the earth's rotation, or due to the movement of a satellite along its path.
Spatial Data	Information about the location and shape of, and relationships among, geographic features, usually stored as coordinates and topology.
Spline	A mathematical curve used to smoothly represent spatial variation. A spline operation inserts vertices to create a curve in an arc. See also grain tolerance and density.

Symbol	A graphic pattern used to represent a feature. For example, line symbols represent arc features; marker symbols, points; shades symbols, polygons; and text symbols, annotation. Many characteristics define symbols, including color, size, angle, and pattern. See also text symbol, marker symbol, shade symbol, and line symbol.
Symbol Table	Tables, which contain information about a database, such as the data dictionary and database transactions.
Vector	A coordinate-based data structure commonly used to represent linear geographic features. Each linear feature is represented as an ordered list of vertices. Traditional vector data structures include double-digitized polygons and arc-node models.