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# Making Maps with Map Maker

*An Introduction to Vector GIS for Schools*



# 3

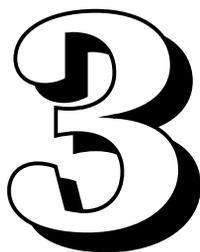
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Srinivas.V**

**FERALX**

Foundation for Ecological Research, Advocacy and Learning

# Making Maps with Map Maker

## An Introduction to Vector GIS for Schools



R.S.Bhalla, Neil Pelkey and Srinivas.V



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## Chapter 1:

# Introduction

### OVERVIEW

This manual is to accompany a two day introductory course to MapMakerGratis, a free<sup>1</sup> yet capable software package for vector Geographical Information Systems. Geographical Information Systems or GIS is a vast topic, certainly more than what can be covered in a short workshop. But that does not prevent you from learning the basics. This workshop assumes that you are familiar with techniques such as compass traverse and sight level mapping. If not, you need to read the field methods manual which accompanies this booklet.

### WHAT IS GIS ?

Geographical Information Systems, are a computer intensive system combining geographical (spatial) and information (database). For a long time, GIS was only accessible to rich organisations, largely because some kinds of GIS require a great deal of computer space and processing power. Things are different today, computers are much faster and store far greater data than earlier. Software too is cheaper, in fact there are a large number of free GIS packages, such as MapMaker Gratis.

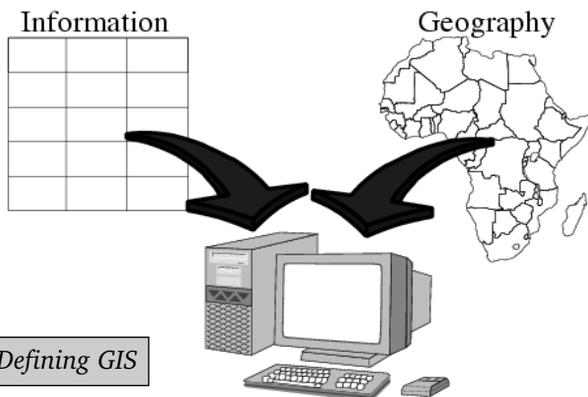


Figure 1.1: Defining GIS

1. MapMaker Pro is the commercial version of the package which costs about \$300 for a site license. In other words, your entire school or college could use Map-Maker Pro for that amount, a small fraction of the cost of other GIS packages.

There are two basic types of Geographic information systems raster and vector.

Raster GIS is based on pixels small boxes of colour, which are combined to make an image. This is quite similar to photographs on some newspapers, where dots are used to create the image, see figure 1.2. Thus the following set or matrix of numbers could also be represented as a 9 column by four line picture with 4 shades of grey (or four shades of blue if we have a colour print out).

1	1	1	2	2	2	3	3	3	4	4
1	1	1	2	2	2	3	3	3	4	4
1	1	1	2	2	2	3	3	3	4	4
1	1	1	2	2	2	3	3	3	4	4

Figure 1.2: Defining GIS

Note that the fifth row is a repeat of the first because in some GIS packages, this is used to let the software know that the object is a closed polygon (we will talk more about this later). Thus in summary, raster GIS is based on a matrix of numbers which fill the entire area of interest. Vector GIS, on the other hand, is based on a set of vertices which are connected by straight lines or curves. Many of the better and newer GIS packages can use both raster and vector GIS.

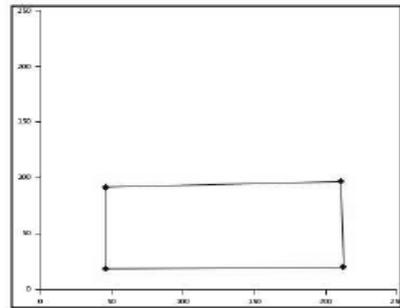
**GIS AND DATA**

Data is to GIS what a cable connection is to a TV. Sure you can still watch a few programmes without a cable, but probably not the ones you want to see. While you can use a GIS to draw, what you are producing is nothing more than pretty pictures. It is only when you add data to the map that you are “doing” GIS. Vector GIS uses a combination of spatial and non-spatial

Vector GIS is based on storing a set of points or vertices that define a point, line, or space. Just like raster GIS these are usually just a collection of numbers. Thus a square or rectangle can be represented by four pairs of numbers - the x and y coordinates of each point.

Figure1.4: A Vector Image with its representation

X Location	Y Location
46	91
46	18
213	19
211	96
46	91



data. This enables us to map areas according to attributes other than their locations. For example, colouring all houses belonging to a particular income group in a city in red or colouring roads in accordance to the traffic they carry.

Spatial data refers to the x,y and z coordinates of what you are drawing. GIS packages are good at spatial calculations. In other words they are able to measure distances, areas and relationships between two points in terms of their distances.

Non-Spatial Data does not refer to specific locations. For example a crop like paddy. You might say that a particular field has paddy on it but paddy itself does not refer to a location, the field however does. Non-spatial data is also called attribute data because it provides additional information about a spatial location.

## Scanning Maps

Once you have a map, you need to scan it so that the computer can read it. This is the basic step required to be able to begin digitising. Scanning maps is really easy, most “computer centres” will have a scanner. If your map is very large you can take it to one of the CAD shops in town.

There are a couple of things you need to know about scanning maps:

- Make sure they are scanned at 300 dpi (dots per inch) and in colour if the map is in colour.
  - Ensure the map is placed correctly, with the Northern side up. If it is rotated by accident or because of the shape of the map, get the shopkeeper to re-orient it to North. This will save you a lot of time.
  - Ensure the scanned file is saved as an uncompressed tiff (tagged image file format) and in a jpeg (joint photographic experts group) format.
  - Please make sure the files are saved on a CD and NOT on a floppy. Floppies have the habit of getting corrupted and waste a lot of time.
  - Test the medium before you pay up, not on the CD writer used to burn the CD but on a normal CD-Rom drive. Very often the person doing the scanning forgets to close the CD or does not create it using standard method.
- Once you have the desired map on a CD, you are ready to roll.

## Getting data for your GIS project

There are a number of places which offer various kinds of data that is useable for a GIS project. See table 1.1:

*Table 1.1: Getting Maps*

Sl. No	Location/ Contact	Kind of Data
1	FERAL Campus Plot 170/3 Morattandi Village, Tiruchitrambalam Panchayat, Vanur Tk. 604 101 Contact : Anupama	All kinds of maps and satellite photographs, including Pondicherry, Vanur and Marakannam.
2	French Institute Contact: Balu	Various kinds of paper and satellite maps, largely from the Western Ghats and also of the Pondicherry region.
3	PTDC&TDC	Various small maps and interesting information about Pondicherry. A good place to get started for a project on Pondicherry.
4	Survey of India	The largest makers of maps in the country with maps of almost all regions. Unfortunately Pondicherry is a restricted area and we can't get "topo-sheets" for it.
5	Institute of Remote Sensing, Chennai	Have a wide range of maps, both paper and digital, of our area.
6	Your favourite book shop	Book store almost always have guide maps, maps of roads, rails and tourist destinations. These are a great starting point.

## Chapter 2:

# Using MapMaker for Vector GIS

Mapmaker is a fairly powerful and very user friendly vector GIS package. It comes in two flavours, MapMaker Gratis - which is free, so you are free to use and distribute copies to your friends and cohorts. The Pro version of MapMaker is not free, but is much cheaper than many equivalent packages, also you can use the features of MapMaker Pro as a trial version for a month. We will cover the following sections in this part of the course:

1. Playing with the tools
2. Digitising on a blank layer
3. Mapping from satellite data
4. Mapping from an aerial photo
5. Mapping from a scanned map
6. Editing in Map Maker
7. Using Map Furniture
8. Linking field surveys to a GIS
9. Working with databases
10. Thematic mapping



You must have a computer in front of you to be able to proceed from here.

## PLAYING WITH THE TOOLS



Open MapMaker by double-clicking on the icon or shortcut in windows. The map maker window (figure ??) appears. Let us now go through the various parts of the screen in a little detail. The menu bar is a floating bar on the top left of the screen. The menu bar (figure 2.2) has six drop down menus which we will use continuously during our work with MapMaker.

Figure 2.2:  
MapMaker's Menu Bar



The toolbar (figure 2.3) is the next item on the window. The vertical bar comprises of a number of tools that you will use for digitising and editing maps.

*Figure 2.3:  
MapMaker's Tool Bar*



Navigation in MapMaker is done using pan buttons on either side of the scroll bar on the right. Linked to the panning buttons are the various zooming facilities that allow you to digitise more accurately. These are located on the bottom right corner of the screen (figure 2.4).

*Figure 2.4:  
MapMaker's Zoom Bar*



*Figure 2.5  
The Scale Bar*

Finally look at the lower left corner of the screen for the scale and position information (figure 2.5).



We will discuss scale in greater detail later. The position tells you where you are on the map as it appears to MapMaker.

## **DIGITISING**

Now let's draw some points, lines, circles, polygons etc. Most of the drawing and editing tools are accessible from the toolbar. More are available from the Tools--> Drawing menu.



To get to the drawing tools use: Tools . Drawing

Each item you digitise is called an "Object" in GIS jargon. This is because digitised items are actually treated as individual entities, each with specific properties. Most objects have unique identification numbers that allow you to link them to data. This is also where GIS packages are different from drawing or CAD packages.

There are three fundamental kinds of objects in a vector GIS namely, Polygons, Lines and Symbols. A polygon is a closed object, a symbol a point object and a line, well, a line. You can draw any desired shape with these three objects.

### **A note on layers**

Practically all GIS packages use a system of layers. Each layer is like a transparency sheet which you can see through. You can pile many layers, one on top of another and see through them, just like you would on a transparency sheet. The other similarity is that you can only edit the layer which is on the top - just as you can only write on the transparency sheet which is at the top. Layers are necessary in a GIS because they help organising a map. Typically one uses a separate layer for every type of object. For example if I were to digitise a map of your school, I'd create the following layers:

- Buildings.
- Playground.
- Roads.
- Parking lot.
- School boundary.

This might seem to be a bit of a round about way of doing things. After all, why can't we put all these objects on the same layer? Here are a few reasons:

- It would make it difficult for us to create maps which show only one kind of object.
- Layers make it easy for us to attach non-spatial attributes to objects.
- Layers are easier to work with because they contain only one kind of information.

Now let us start playing with the drawing tools:

## Digitising a polygon

A polygon is a “closed object” and you draw it by clicking on the polygon tool and then clicking to create a corner. Clicking on the first point or vertex again closes the polygon, otherwise click on the right mouse button, the polygon will close automatically. So if you only click on three corner, you get a triangle and so on.

A polygon style box pops up automatically. This box has three tabs on it, as shown in figure 2.6.

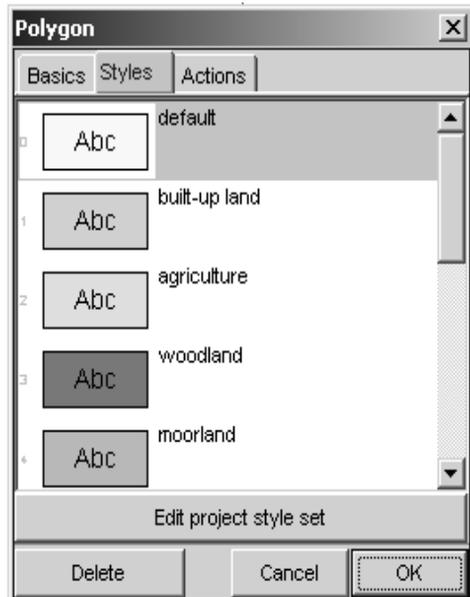
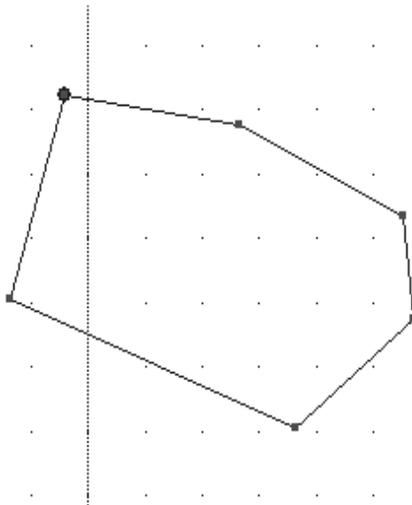


Figure 2.6  
Digitising a polygon

In the styles tab you are given the option of picking a preferred colour (each of which corresponds to a specific land cover). The second tab - Basics (figure 2.7), allows you to allocate a unique ID and label to the polygon. The unique ID is how the map is linked to a database and corresponds to a field in the database. More on this later.

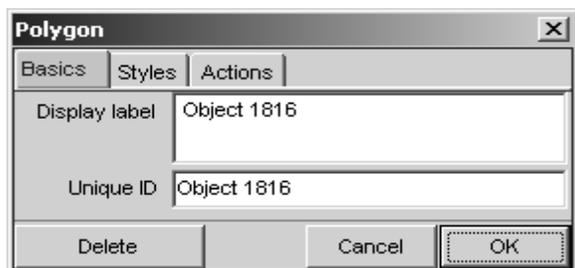
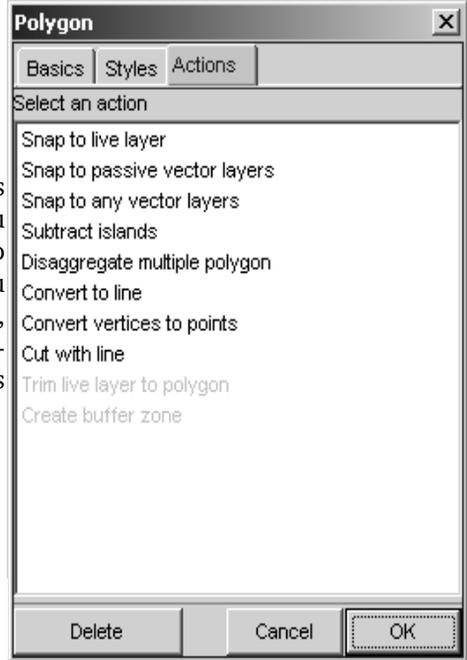


Figure 2.7  
basic Tab

The final tab - Actions, allows you to control the manner in which the new object (polygon) behaves in relation to other objects on the screen. This allows you to control the process of digitising and is a great time saver because it reduces the amount of editing you need to do later.

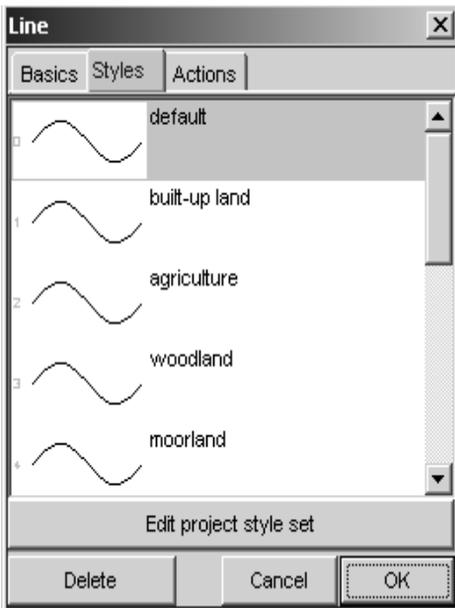
Figure 2.8  
Actions Tab



### Digitising a line

A line is digitised much the same way as a polygon, only it is not "closed". You need to right click the mouse button to finish digitising a line. On doing so you are presented with a similar pop up box, as when digitising a polygon. The difference is that the styles are line styles as shown in figure 2.9 below.

Figure 2.9  
Line Styles

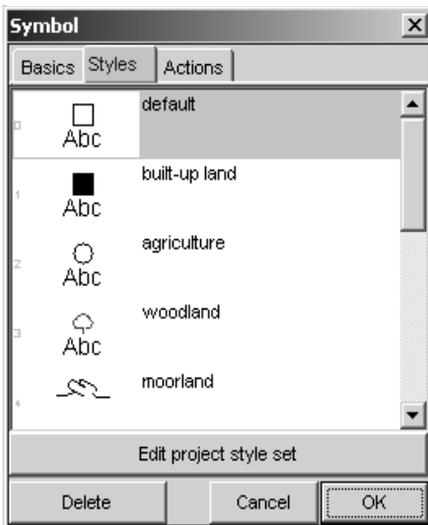


### Digitising a symbol

This is a point object, which implies you only need to click once to create it. On doing so the style box appears (figure 2.10).

Now go ahead and digitise a few polygons, lines and symbols on your screen. Give each of the objects you digitise a unique ID and a sensible label. (picture next page)

Figure 2.10  
Point or Symbol Styles



### The file menu bar

The file menu (figure 2.12) is where we operate on files and directories, or, in GIS jargon, layers and projects. The distinction is important because a map - the final output, is normally comprised of a number of layers. In terms of organising these layers, they are normally saved at a single location a directory, which then corresponds to a project.

The most important items on the file menu are:

**Clear** This removes any objects you might have on the screen; creates a blank project. Use it carefully because it deletes whatever is on the screen.

**Add layer** Allows you to add a layer onto your screen. **Project Manager** A tool which is used to organise and display layers. The layer manager is perhaps the most complex and useful tool in the package.

**Save screen image** Allows you to

## GETTING TO KNOW THE MENU IN MAP MAKER GRATIS

The menu, (figure 2.11) , consists of six drop down items. We will go through each briefly. Please note that MM offer a wide range of actions, not all of which are going to be covered in this course. Also note that a number of features in MM Gratis are notavailable, however you can run MapMaker Pro for a month as a trial.

Figure 2.11  
The Floating Menu Bar

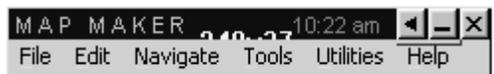
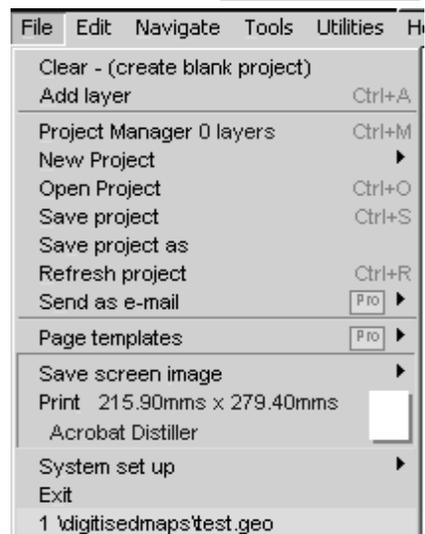


Figure 2.12  
The File Menu



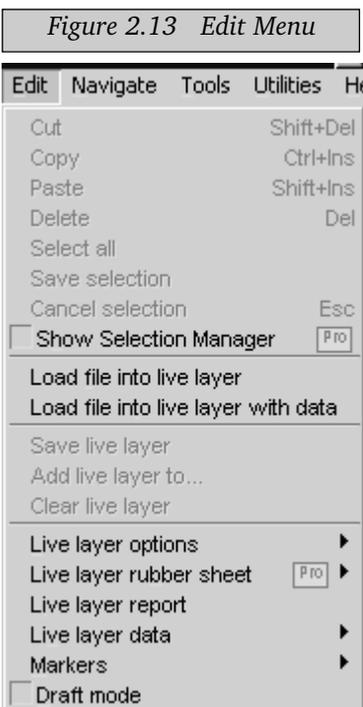
take a photograph of your screen and save it as an image.

**Print** Controls printers and printing.

**Exit** Exits MM.

MapMaker also shows a list of recently opened projects (\*.geo) below the exit menu.

**Edit Menu** This menu (figure 2.13) presents you with a range of options with which you edit a layer or project.



### Tools Menu

The tools menu (figure 2.15) gives you control over the various items you use while digitising and editing maps. Many of these are available on the tool bar to the left of your screen. However you may need to use the menu to access

The important tools are:

**Load file into live layer** Loads an existing (DRA) file into the live layer.

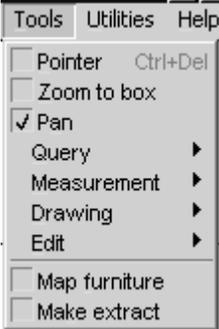
**Save live layer** Saves the live layer to a new (DRA) file.

**Live layer options** A range of options to facilitate digitising.

**Navigate Menu** This menu (figure 2.14) allows you to move around the map. You will probably use it only if you're digitising really large maps - such as complete topographical sheets.



Figure 2.15  
Tools Menu



some special drawing tools.

Let us go through the items.

**Drawing** Various drawing tools.

**Edit** Various editing tools.

**Map furniture** Tools to set up scales, legends and inserting various other objects onto the map.

### Utilities Menu

The utilities menu

is one that you will end up

using more than most others (given that most of the drawing and editing tools are on the tool bar). Among the things it allows you to do are:

#### Database utilities

Access to a range of utilities to create and edit databases linked to the objects on you map.

#### Bitmap utilities

Various utilities to edit and modify bitmaps, including scaling.

#### Vector utilities

Various utilities for importing and exporting vector files and formats.

#### Text editor

Opens up a text editor.

**Print Enhanced Metafile** Prints an emf version of the screen.

#### Help Menu

The final menu, and perhaps the most important during your initial days using the MM Gratis program. The help menu (figure 2.17) gives you access to the following items:

**What is Map Maker?** A brief over view of the programme.

Figure 2.16 Utilities Menu

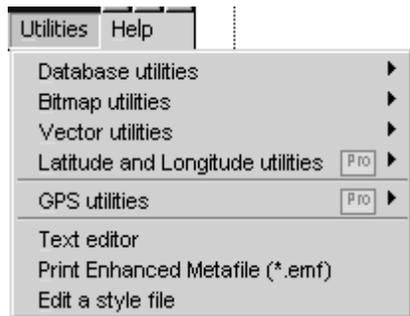


Figure 2.17 Help Menu



**Manual** The on-line tutorial for MapMaker.

**Fact sheets** A quick overview of the essentials of Map Maker and GIS concepts. A must read for newbies.

**Library** A utility which allows you to add various reference material to the programme.

**Useful web sites** No explanation needed.

**Licences for add-on modules** This is where you enter your license key to activate the MM Pro features of your package. You will have to purchase a license for this.

**About Map Maker** Gives you a brief history of the programme and its authors, version etc.

## MAPPING FROM A (FUZZY) SATELLITE PHOTO

We will now open a scanned image from a satellite photo of the Auroville area. The quality of this photo is rather poor so the quality of the map will also be a little on the fuzzy side. We will use a better aerial photo in the next exercise so bear with us.

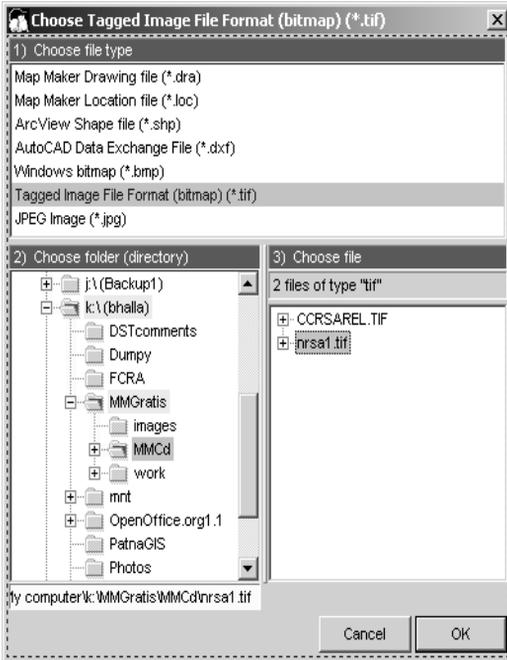
Here are the commands:

**File --> Clear** to clear the screen. **File --> Add layer** : to add a new layer.

The satellite photo is located in your `~/MM Gratis/work/images` directory and is called `nrsa1.tif`. Browse to it and open it using the dialogue as shown in figure 2.18.

To be able to select it you need to first choose **Tagged Image File Format (bitmap) (.tif)** from the upper panel of the dialogue. This will filter the files in the directory and show you only the tiff files.

Figure 2.18  
The File Browser in Map Maker



Use the 50% down arrow on the scroll bar to move down the scanned image. You should now see a couple white circular areas. The higher larger of the two is Bharat Nivas, the smaller of the two is the Matrimandir. Use the polygon for each of the sites. Now save the live layer as aurbldg.dra. Now draw some lines for roads and save the layer as roads. Do the same for fields and forests.

Note: Earlier versions of map maker had a default setting here live objects were indicated by a blue dot. Were the live layer to be saved, the blue dot disappeared. This option is set off in the latest version.

Once you have created all the layers as above clear the screen using the File->Clear command. Now we will build a map using the add layer command from the file menu, we can now build up a map of all the layers. Mine looks like figure 2.19.

## MAPPING FROM AN AERIAL PHOTO

The quality of the last image may have left you a little less than impressed with GIS from satellites. We will change that perception in this lesson. If you still have anything on your screen, use the **File-->Clear** command. Now use the **File--**

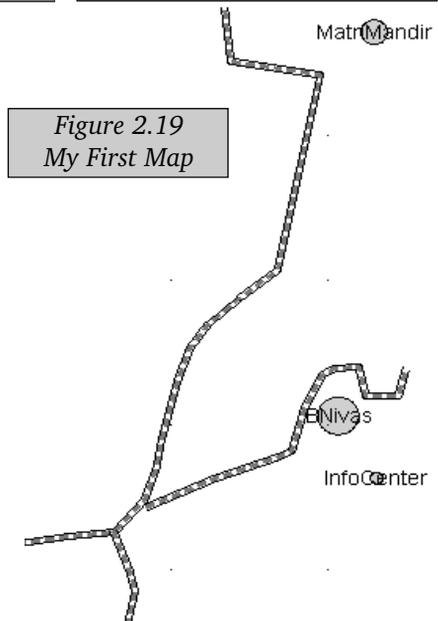


Figure 2.19  
My First Map

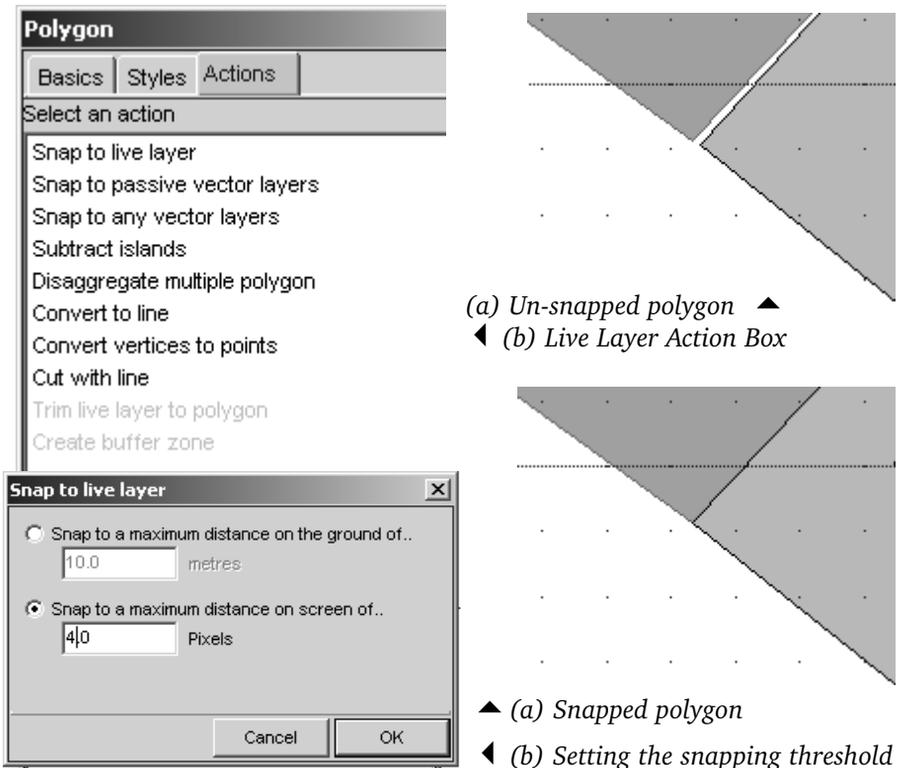
>**Add Layer** command to open a tif called CCRSAREL. This is an aerial photo shot at 1 meter resolution, but reduced to 4 meter resolution, so you can see the approximate scale of the IRS 1-C data at its best. To practise, first draw a few lines to fill in roads layer. Save it.

Now lets use a few techniques to digitise polygons and roads which have common borders. This feature has been greatly improved in the new version of Map Maker and is also quite different from earlier versions. There are two basic techniques to create contiguous polygons. The first, and more intuitive is to digitise the first polygon normally. The second (and continuous) polygon is drawn next to it. However before saying OK in the polygon dialogue, go the the actions tab and select snap to live layer as shown in figure 2.20.

Once you have changed the basic and styles attributes as well, press OK. A new dialogue pops up which asks you for a snap threshold (figure 2.21). Select 4 pixels, which tells MM to snap lines which are closer than 4 px.

Figure 2.20 Digitising Contiguous Borders

Press OK, the



*Figure 2.21*  
Setting Snapping Distances

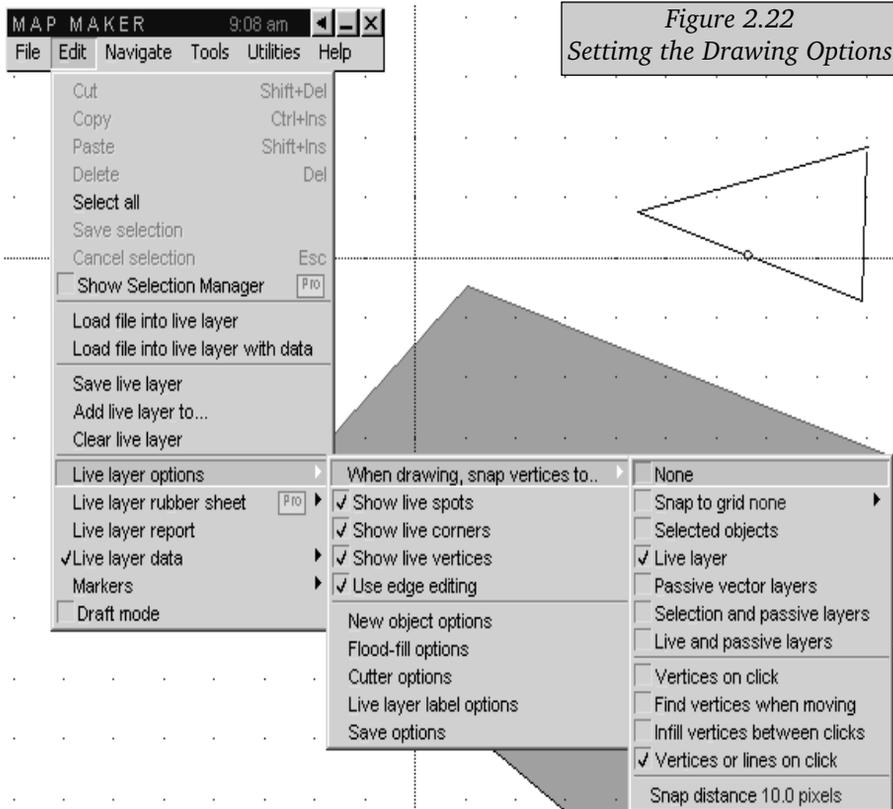


lines should have snapped together. If this does not work the first time, you need to edit the object and reset the snap threshold to a higher value.

The second technique that can be used to create polygons uses a neat feature which essentially automates this snapping process. All you need to do is set the snapping type and distance in the live layer drawing options (figure 2.22).

I've set the snapping distance to 10, this may be a bit excessive for very detailed digitising but is OK for those not too comfortable with mice.

## MAPPING A SCANNED MAP



*Figure 2.22*  
Setting the Drawing Options

Since one of the primary areas we can get maps from is scanned versions of paper maps, we will look at the type of info that can be scanned from a paper map. There are many items from this map that can be scanned:

- roads
- contours
- rivers
- drainages
- towns etc.

Use the tools you have learned so far to create a map of small area of the map. Create a roads layer, a contour layer, and a rivers layer. When you are done, we will play with some of the map furniture and other tools.

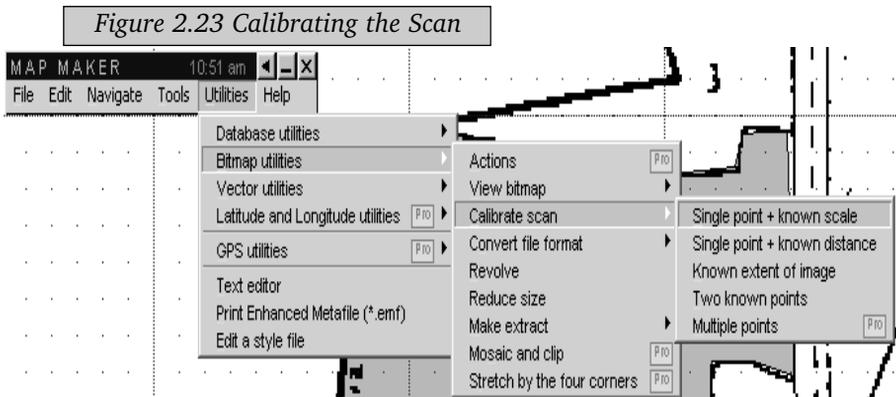
## Setting up scanned files for digitising

### Introduction

Calibrating scans is the first thing you do when you take up a project. Ensure that you have the figures right before you start digitising. It might be well worth your time and money to hire a field team to verify the coordinates on the ground and to geo-register the scan for you professionally.

### Ten steps to calibrate the scan

Images are calibrated using the : **Utilities-->Bitmap utilities-->Calibrate scan** from the Utilities menu (figure2.23).



### Step 1.

Select the Single point + known distance option. MM asks you to identify the file you want to calibrate. Navigate to the images directory and select the scanned file.

**Step 2.**

On opening the file, the calibration screen appears which contains the cadastral map of Thuruvai village. Navigate to the scale bar on the map, which is on the top left of the map.

**Step 3.**

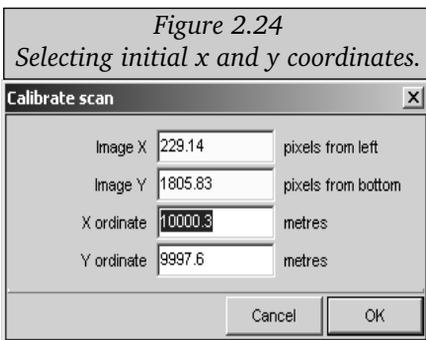
Use the zoom box tool to magnify the scale bar so it covers the bulk of your screen.

**Step 4.**

Select the calibrate icon from the bottom right corner of your screen

**Step 5.**

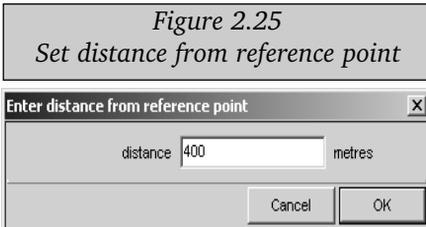
Click on the scale bar at the point that corresponds to zero. The dialogue (figure 2.24) pops up.

**Step 6.**

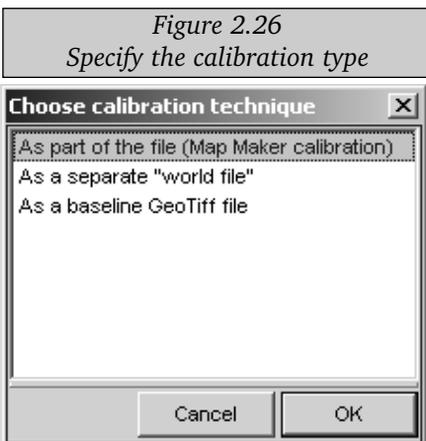
Enter the figure 0 for the X ordinate and the figure 10000 for the Y ordinate. This is selected because the scale bar is to the West and North of the map.

**Step 7.**

Click on the other end of the scale bar - which says 400m. Another dialogue asking you for the distance pops up (figure 2.25). Fill in 400 metres and press OK.

**Step 8.**

Map maker now gives you three options for the kind of calibration technique you want to use. Select As a baseline Geo-Tiff file (figure 2.26). This will allow you to use this scaled map with other programs.

**Step 9.**

Clear your screen and then reload the calibrated image.

**Step 10.**

Test whether the calibration is accurate by navigating to the scale bar and using the tape tool to measure the distance between 0 and 400 on the scale bar. The tape should give you the expected figure of 400.

## EDITING IN MAP MAKER

No matter how well you have digitised a map, it is almost inevitable that you will need to make changes and improvements on it later. Map Maker provides a number of useful utilities for editing files. These can be accessed through the **tools-edit** menu or through the **ctrl-e** key combination. Among the things you can do with the edit tool are:

- Changing the basic object attributes styles, ID numbers and labels
- Basic editing of styles in selected objects
- Moving objects around
- Moving object labels to different locations
- Cutting objects
- Modifying lines, polygons by adding and moving points, either as lines or as free form
- Joining objects
- Resizing or scaling objects
- Rotating objects

Using these different features you can achieve most of the basic edit functionality you would require while cleaning up and finalising your map.

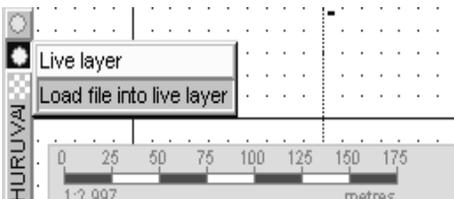
### Steps in editing

#### Style editing:

##### Step1.

Copy the layer you want to edit to the live layer. This can be done from the **File-->Add layer** menu or by going to the blue dot near the bottom left corner of the screen and selecting the **copy file to live layer** option as shown in figure 2.27.

*Figure 2.27  
Copying a file into the live layer.*



##### Step 2.

Choose Edit from the tool menu or press Ctrl-E

##### Step3.

Click on the object marker (normally a blue dot with a thin red outline). The familiar styles box pops up - make the changes you want and click on OK.

## Changing objects

### Edit mode:

Double click on the respective objects

**Moving labels:** Move the label or the object itself (except if it is linked to nodes).

### Interting vertices:

Insert points by clicking on the objects, drag and change the shape.

### Scaling:

In case you want to scale the object grab the square handles. The one on the bottom left or top right to scale along the desired plain.

### Rotating:

If you want to rotate the object grab the round handle which is placed in the top left of the object. You only need to drag is slightly to make it rotate so be careful.

### Cutting:

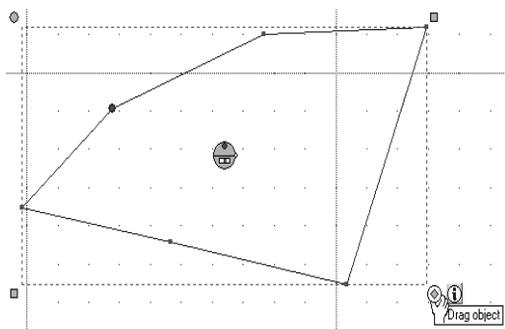
Cutting objects involves drawing a line within a polygon or line and the object gets chopped along the new line. You need to use the cutting tool or **Tools-> Edit-> Cutter** for this.

### Joining:

Joining is another useful tool which is accessible from the toolbar or from **Tools-> Edit-> Join**.

The various editing options available are shown in figure 2.28.

Figure 2.28 Editing objects.



## MAP FURNITURE

### Introduction to map layout

Map Maker provides a number of tools that enable you to prepare professional maps. This section covers these tools which are accessed through the **Tools-->Map**

**Furniture** menu. Even if you have done a brilliant piece of work in digitising a very large complex topo-sheet, if you can't present it, it is as good as not being there. But presenting is not only a skill, it requires aesthetics. There are some common denominators of a good map.

- Keep the legend so that it is clearly visible but not so large that it distracts the observer.
- Don't dump too much info on the same map, use two or more maps instead.
- Always provide locational information, lat and long are fine, but a landmark or known location such as a nearby city or town might be better.
- A map without a scale has limited use, put at-least an approximate scale (and indicate that it is approximate).
- Show the directions either through a north point or by arrows giving the direction to other known landmarks (such as road to XYZ city).

### **Hints for printing**

- If maps are for distribution, ensure that the symbols and polygon colours can print.
- Colours look much better on a computer screen or for presentations - slides and OHPs.
- Colour printouts can add lots of life to your documents - use them for proposals or reports to funding agencies, term papers etc.

Map furniture is a set of tools that help you insert various display objects onto your map. Many of these objects are linked to databases, the various layers on your map and often to other files and images on your disk. The image below gives examples of the various things the Furniture Maker does. Using them judiciously can lead to professional looking maps, using them like I have can lead to very confused or very angry teachers. Among the items that have been shown are :

- A Northern point
- A scale bar
- A simple text box.
- A project legend
- A legend from a data band file
- A button (to launch other programmes)

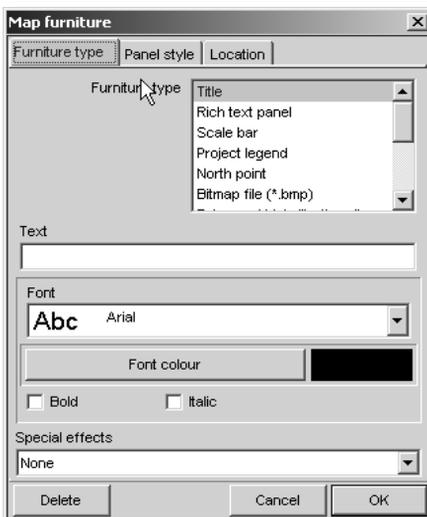
Various other items can be inserted using the map furniture tool. You'll have to play around with the tool and get to know them.

## Steps in using the Map Furniture tool

- Select **Tools--> Map Furniture**
- Drag your cursor so it makes a box outline which fits the object you want to insert. Make it long and narrow if it is a scale bar, more of a square if it is a legend and a tall rectangle if you want to insert a North Arrow.
- The box shown in figure 2.29 pops up. Select any of the furniture types you want to insert. For each item you select, the furniture dialogue changes to support various customisation options.
- Change the panel style from the appropriate tab and the location from the third tab.
- Press OK.

You can re-size your box by stretching it in either direction. This is a little non-intuitive because the outline of the box is not visible. To edit any furniture you should left click on the item. Hitting the delete key while it is selected will delete the selected furniture item.

Figure 2.29 Map Furniture



## LINKING FIELD SURVEYS TO A GIS

### Introduction

Digitising a map, having all the layers, attaching the database; all this works out fine if the maps you work off are accurate. However, often maps are outdated and one is not sure how much the details have changed over time. Even more often, the area that you want to map is not

available. So you need to do actual surveys and transfer this information to a GIS.

This section covers conducting a field survey for GIS. The equipment required is a compass and a metertape. If you want to include heights a sight level (or dumpy level) will be required. Finally a global positioning system or GPS will enable you to georeference the field survey. As an exercise we will generate a map of the school campus.

### **Simple Survey Methods**

The basics of surveying is the ability to locate points in relation to other points. There are four basic ways of locating a point in relation to other known points:

- Distance and direction : Measuring the distance and direction of the new point from a known point.
- Two distances : Measuring the distances from two known points.
- Two directions : Measuring the directions of the new point from two known points.
- Offset from a line : Measuring the perpendicular distance of the new point away from a point a known distance from one end of a straight line between two known points.

We will cover what we consider is the most practical of these methods - distance and direction. For details of how to do a compass traverse, you need to refer to the field methods manual.

### **Processing survey data**

Map Maker can create drawings from a text file arranged in a simple format called the "XY" format. Similarly, Map Maker can export drawing files (.DRA) to the XY format. The XY format has been designed specifically for entering simple survey data. Also it can be used to convert a drawing file into numbers

Map Maker provides you a neat text editing programme to make the creation of ascii files easy. Access it from the Utilities menu.

which can be used to set out objects in the field. The following is an example of surveying the course of a stream. From a start point, compass bearings and distances are taken along the length that has to be sur-

veyed. Distances can be taken either as tape measures or as step counts.

Here is an example of a compass traverse:

The first number pair of each object is an XY coordinate, subsequent number

#### COMPASS TRAVERSE

Stream,190,108.06

185,60.05.38

210.5,29.08

274,27.00

314,47.08

326.5,75.05

334,110.03

268,34.08

320,60.02

344,114.09

318,73.20

259,48.11

290,99.11

304,97.09

312,128.08

77,40.08

355,28.11

342,69.08

343,118.00

249,58.06

284,56.11

286,48.07

303.5,67.06

319,111.10

pairs are a compass bearing from the previous point to the next point and the distance. Pull this into Map Maker and see what it looks like, follow these steps:

#### **Entering the data:**

Enter the data as a simple XY file. Use the **Utilities--> Text editor**. We now move to MapMaker and use the **Utilities--> Vector utilities --> Import tool** (figure 2.30) to translate field data to a vector layer.

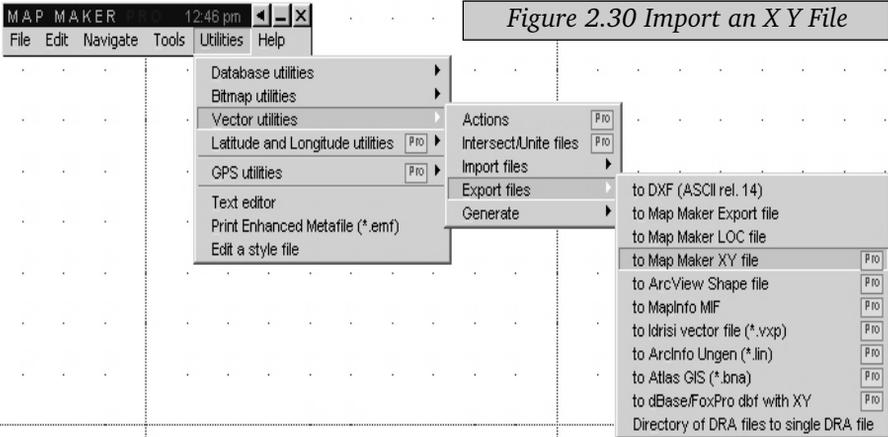


Figure 2.30 Import an XY File

### Choose the file:

Select the XY file you created by clicking on the button shown in figure 2.31:

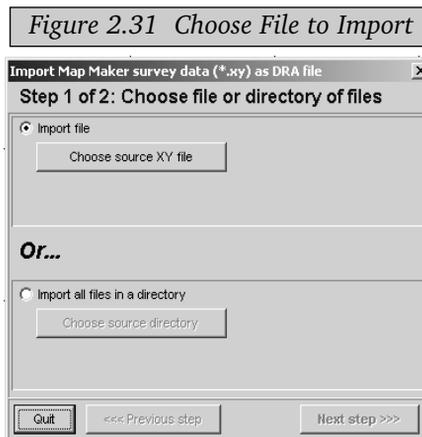


Figure 2.31 Choose File to Import

### Select the XY file:

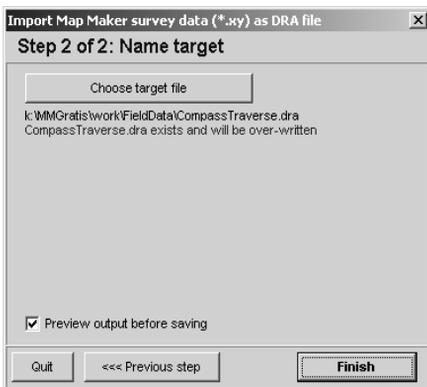
Select the file you have created by clicking on the Choose source XY file button. This takes you to the file browser. Choose the XY file and press the Next Step button.

### Name the DRA file to be created:

The second step is similar to the first, only this time you are prompted for the name of the DRA file you want to create (figure 2.32, *next page*). Select the file

Note: the default name is the same as the name of the XY file. This is good because it helps you keep track of your survey data and maps.

*Figure 2.32  
Name The Target dra File*



### Complete the import:

Press OK and your DRA is created - as simple as that. Now clear screen and view the file. It should look like figure 2.33.

*Figure 2.33 The Imported File*



## WORKING WITH DATABASES

Having gone through the basics map making and digitising, we now turn to the core of GIS - the ability to visualise spatial data. It is data which differentiates GIS from other visual tools and graphic packages. The ability to visually represent information makes GIS what it is today, one of the most used applications in information technology.

But before we discuss databases, let us create a database for our school. This will require two steps:

- Creating a database from our DRA file.
- Editing the database to add attributes about the school.

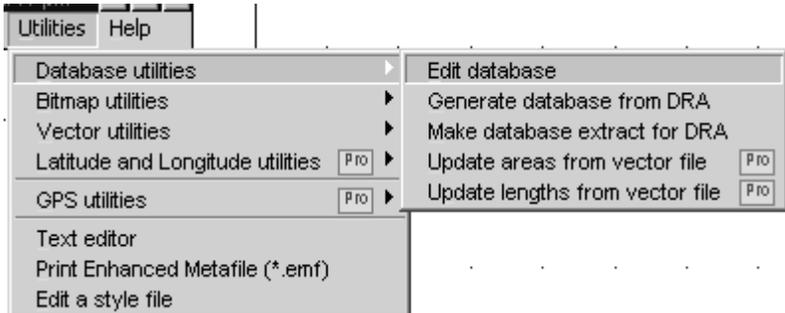
### Creating and Editing Databases

In this exercise we will create a database file from an existing .dra file and then add additional data to the file. First let us convert our digitised map into a database and add a few fields.

- Go to **Utilities-->Database utilities--> Edit Database** if you have already created a dbase file from your layer. If not select Generate

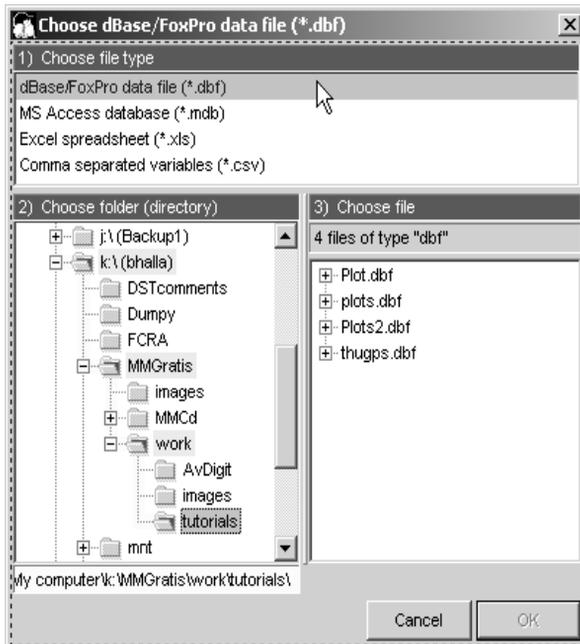
database from DRA using **Utilities-->Database utilities-->Generate Database** from DRA (figure 2.34). You are prompted for a DRA file. Browse to the file you generated from the compass traverse.

Figure 2.34 Database Utilities

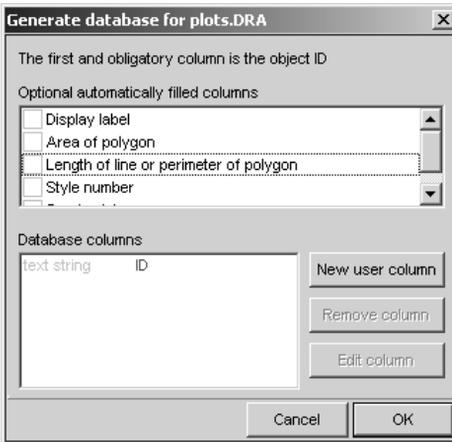


- Choose your .dbf file if it exists. If you are creating a new .dbf file you will first have to choose a .dra file from which you want to create it figure 2.35.

Figure 2.35 Database File Browser



*Figure 2.36*  
*Generate Database From DRA File*



- Now go back into the **Utilities** -> **Database utilities** and edit the file you just created (figure 2.37).

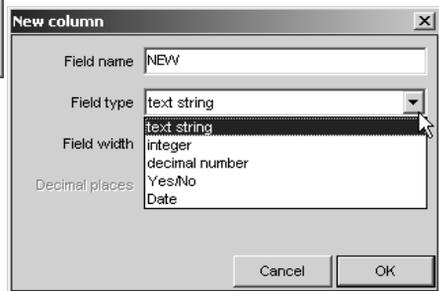
Map Maker has a very good interface for editing database files. You may, however, prefer doing so in other programmes such as a spreadsheet (Gnumeric or Excel). For the sake of this exercise we will stick to MM. Add a column called LANDUSE using the edit column button and selecting Add column as shown in figure . Change the field name of the column and the type to text string in the New column dialogue box. Click OK to save your changes or click Save As if you want to save your file under a different name. It really is as simple as that.

- Chose the fields you want the database table to contain. This is illustrated in figure 2.36.

- You will now be prompted to save the file. We are interested in dbf files, so you should ensure you have the correct type selected.

- Click on OK and you have your database table created.

*Figure 2.37 Add Fields*



### **Additional suggestions and precautions regarding databases.**

There are some precautions you need to take while working with databases.

- Store all the data in a separate folder.
- Name tables intuitively.
- Stick to 8 characters while naming columns or fields.
- Stick to letters while naming fields. No numbers, no punctuation marks, no symbols.
- Do not use spaces while naming a table or a field.

- Use the underscore "\_" if you must have a space.
- Try to have your data coded into numbers if possible.

Now depending on the mapping exercise and your project, you should add attributes to your object IDs. Here is an example.

Suppose you have mapped the layout of your school and have the location of all the rooms on the ground floor. You could categorise the rooms according to their uses, so you would have

- Classroom
- Administrative room
- Staff room
- Washroom
- Laboratory
- Other

Each of the above would therefore need to be placed on a different layer. Once you've done that, proceed with adding data to the classroom layer. The fields could be:

- Standard
- Number of students
- Average age of the student

Add this data to the database table using the MM data base editor. Once you've done that you are set to create thematic maps.

## **THEMATIC MAPPING**

**T**hematic maps are maps which show a non-spatial attribute on a map. For example the states of India can be coloured according to their populations. For the sake of our exercise, we will use the classroom.dra file that you created in the previous example.

### **Linking the data to a dra file**

- Clear the screen.
- Add a layer using the File-->Project Manager and pressing the Add layer-button.
- Click the Assign according to tab on the style tab of the layer set up as

shown in the figure.

- Click on Database. The dialogue shown earlier pops up.
- Select your database (classroom.dbf), the choose link column shown in the figure below pops up.
- Select the ID column (id). This is the column that links each object on your DRA file to an entry on your database.
- Select the column titled -No\_Students for the style.
- Press OK.

NOTE: None of the database functionality of MM will work if you don't select the correct link.

Voila, you have your first thematic map. You can generate a number of thematic maps and have many ways to depict data in MapMaker. We leave it to you to explore these.

## Chapter 3:

# Wrapping up

### SOME EXERCISES

The best way to master Map Maker is to use it. Here are some exercises you can do in your spare time, or as a project. They require some work but you will probably find them quite interesting.

#### Mapping the school campus

You should already have collected much of the data for this. Now you need to transfer it onto MapMaker and add some data to the digitised objects.

Here are some suggestions.

#### Buildings

Differentiate them into academic, administrative and logistics.

#### Open areas

Categorise them into playgrounds (cricket, football, hockey etc.) courts badminton, basketball, tennis etc.) and others which might include garden areas, ponds etc.

#### Roads

Break these up according to the traffic and nature of roads.

#### A street map of your locality

Map the streets around your house. A compass traverse is an ideal way to do this. You can then add a range of data to this map. For example the various buildings, shopping centres, playgrounds etc. Such a map can help you answer some interesting questions such as:

- What is the distance of your bus stop from the house?
- Which milk shop is closest to the house?
- What is the shortest way to get to the house from any given point?

You can use this map to design a walk for your parents, if they like going out for morning or evening walks. They'll surely be interested in knowing ex-actly how many kilometres they walk in a day.

### **Digitising Pondicherry**

Here is a really big project, which you can do with your classmates. Each of you can take a portion of the city to digitise. It would make sense if this portion is where you actually stay. Once the map is done, you can use it for various things. Here are a few questions you can answer.

- How many kilometres do you travel to school and back every day?
- If you were to organise a school bus or van to pick up students, what route would it follow to pick up the maximum number of students and yet stick to the main road?
- How far are you from the main market, Gandhi statue, JIPMER, Ousteri and other areas of interest to you?

### **FOLLOW UP**

**T**he purpose of the manual is to introduce you to vector GIS. You should be comfortable in the use of Map Maker now and we hope you use what you have learned in your various school and classroom projects. We have made a copy of the MapMaker programme available to your school, feel free to make more copies and distribute them. If you have a computer at home, we encourage you to load MapMaker on it. The programme is quite small. If you have any trouble with the programme, do e-mail us at [feral@satyam.net.in](mailto:feral@satyam.net.in).

We hope you keep in touch with us and keep us informed about the way in which you have used the manual.