UPPSALA UNIVERSITET

Institutionen för Geovetenskaper
Geoinformatiklaboratoriet

INTRODUCTION TO SCREEN DIGITALISATION OF TOPOGRAPHY FROM SATELLITE IMAGERY AND AERIAL PHOTOGRAPHY

Requirements
This exercise requires a PC with Windows 95/98 or Windows NT and the GIS software ArcView 3.0 or later. The necessary data are available on the CD in the folder /data/Arbetsstuga2000/arcview/metria/ssc/spot-pan and …/metria/rodakartan/ortofoto/ as well as on the Geografiklab-server under earth2/_sharedfiles/geoinformatik/data…

Objectives
The aim of this exercise is to introduce you to image data based on remote sensors and screen digitising. You will work with satellite and aerial photography as a backdrop. Based on the themes you have digitised you will discuss different areas of use for the separate types of remotely sensed material.

Task
You should digitise point, line and polygon themes using screen digitising. After completing the themes, discuss the different properties and possible fields of application for the different background data.
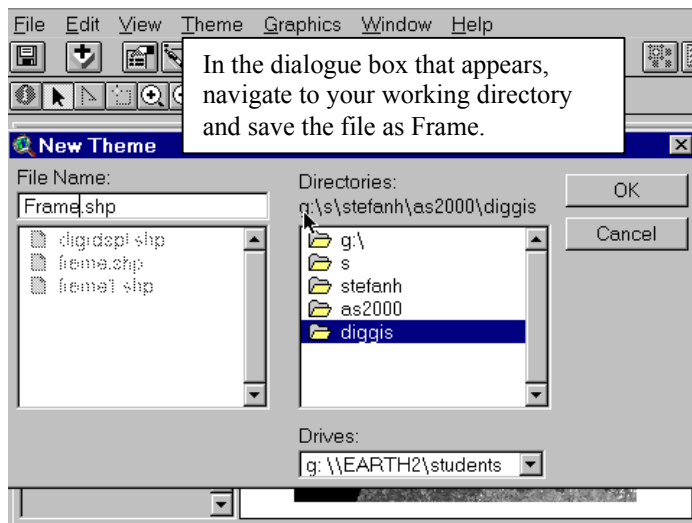
Add The Necessary Data

Start ArcView, open a new project and add the SPOT image (54228nv) and the ortophoto (10e5j), which both covers an area north-west of Örebro. In the scanning exercise you worked with these two data sources. Hence you know something about their resolution quality. (For the GISMN1 Distans course from the CD under the directory /data/arbetsstuga2000/arcview/ssc/spot_pan/54228nv/ and for the Geography courses earth2/_sharedfiles/geoinformatik/data/arbetsstuga2000/arcview/ssc/spot_pan/54228nv/. The ortophoto is available under …/arcview/metria/ortofoto)

You should digitise features from the SPOT image. However, there are some preparations to do before you can start digitising. As the ortophoto is covering a much smaller area than the SPOT image, you must make sure to digitise in the area where the ortophoto covers the satellite image to make comparisons possible. Therefore, you must first create a new polygon theme that will indicate the position of the ortophoto. Call the new theme Frame.
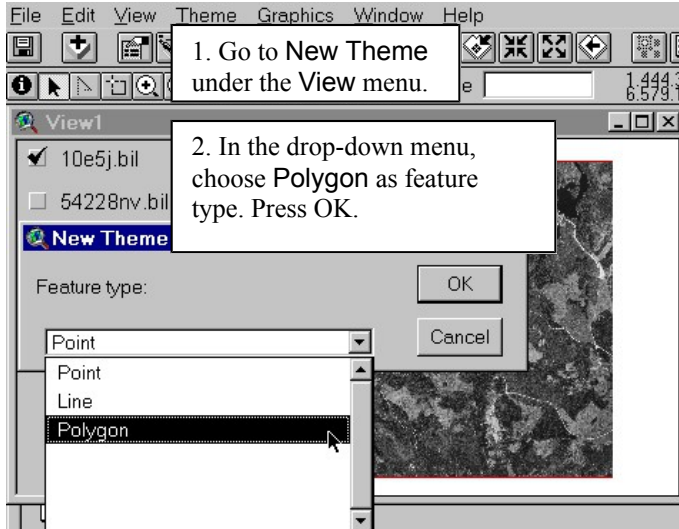
To create the new polygon theme, go to the View menu and choose New theme. In the box that appears, select Polygon as Feature type.

File   Edit   View   Theme   Graphics   Window   Help

1. Go to New Theme under the View menu.

View1

✔ 10e5j.bil

☐ 54228nv.bil

2. In the drop-down menu, choose Polygon as feature type. Press OK.

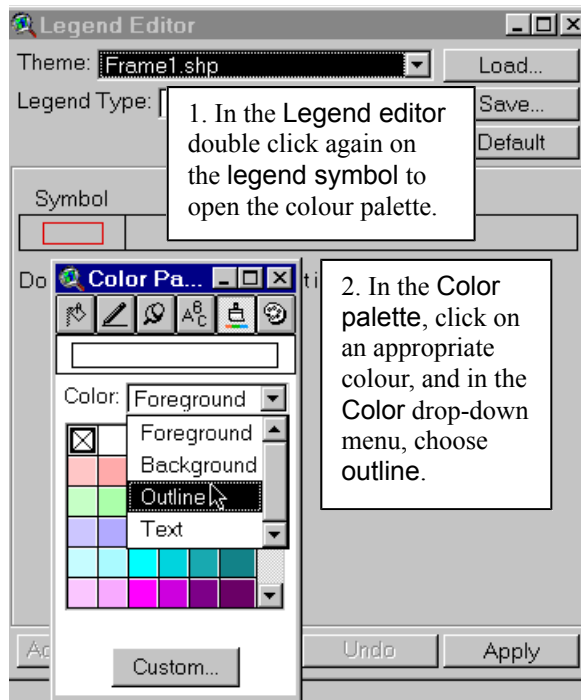**New Theme**

Feature type:

OK

Cancel

Point

Point
Line
Polygon

You must also save theme as a file. After clicking OK in New theme box in the picture above, navigate to your working directory and save the file as Frame. Click OK and the theme will automatically be displayed in the View.

File   Edit   View   Theme   Graphics   Window   Help

In the dialogue box that appears, navigate to your working directory and save the file as Frame.

New Theme

File Name:

Frame.shp

digidopi.shp
frame.shp
frame1.shp

Directories:

g:\s\stefanh\as2000\diggis

OK

Cancel

g:\
s
stefanh
as2000
diggis

Drives:

g: \\EARTH2\students

When the theme appears in the View it appears as a filled polygon. You must then change its appearance so that only the outline of the polygon is visible. This is done by double clicking on the legend symbol for the theme Frame in the view.
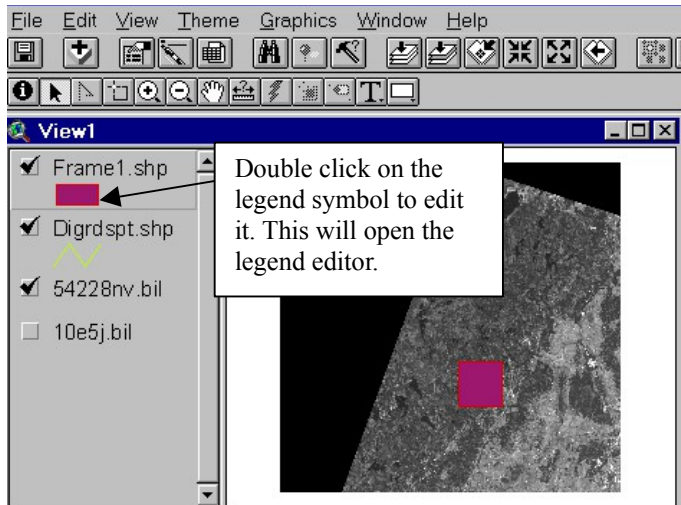
Double click the legend symbol to activate the **Legend editor** of your newly created theme **Frame**.

Double click on the legend symbol to edit it. This will open the legend editor.

1. In the **Legend editor** double click again on the **legend symbol** to open the colour palette.

2. In the **Color palette**, click on an appropriate colour, and in the **Color** drop-down menu, choose **outline**.

If the **color palette** is not opened immediately when you have double clicked the legend symbol (when you are in the **Legend editor**), click on the **paintbrush symbol** at the top of the **Color Palette**.

You can also click on the other symbols on top of the palette toolbox to view the other types of palettes available.

After you have chosen **outline** in the **color palette** and returned to the view, you are ready to digitise the frame. By setting the colour of the legend symbol to **outline**, you are able to draw a polygon that is transparent and with its borders clearly visible in a colour of your choice. If you had left it to be **Foreground**, which is the default choice, the polygon you draw would have covered the underlying themes with its colour.

Make sure the theme Frame is editable and add a rectangle exactly covering the ortophoto. If you have forgotten about screen digitising, have a look at the exercise **Vectors and Topology**. When you have set the legend colour type to **outline**, hide the

ortophoto so you can see the SPOT image as foreground and the frame marking the position of the ortophoto.
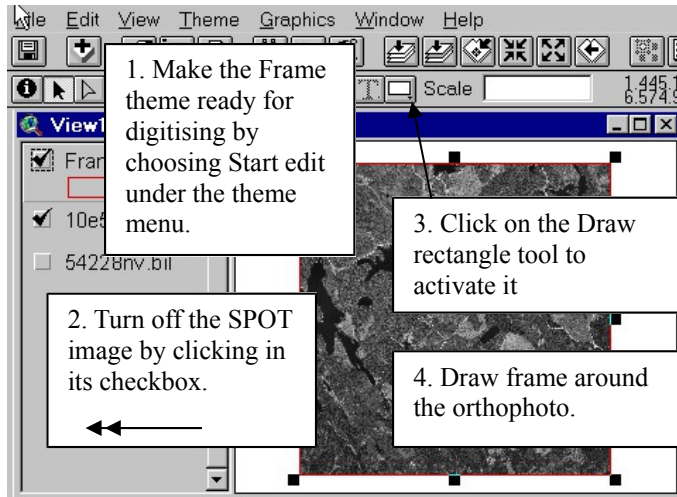
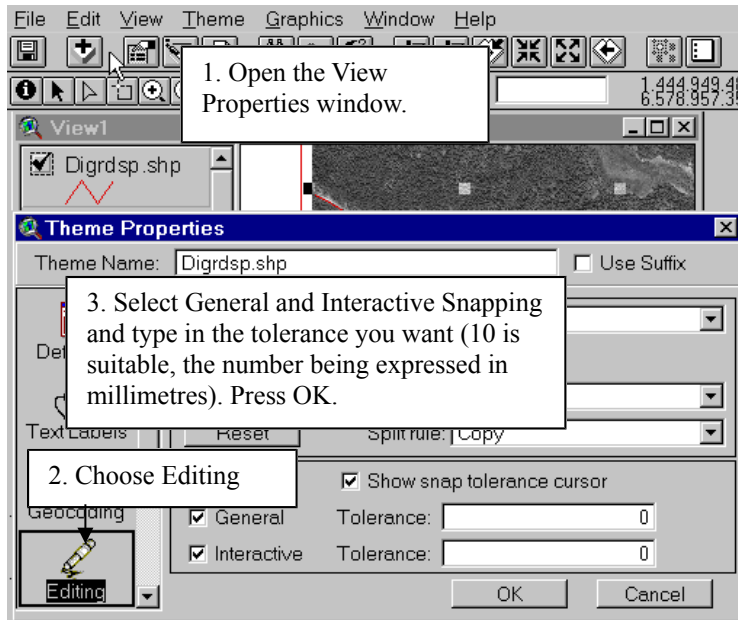It will be easier to digitise the frame around the ortophoto if you turn of the SPOT theme (54228nv) by clicking in its checkbox.

You also need to make the Frame theme ready for editing by choosing Start edit under the Theme menu.

Digitalisation

The objects you are now going to digitise from the satellite image are **roads**, **houses** and **lakes**. Since the three object types are quite different you will have to digitise them in separate layers. Roads need to be line features, houses should be points and lakes should be polygons. Name the themes logically (e.g. DIGRDSP for roads, DIGLAKESP for lakes and DIGHOUSESP for houses).

Start with roads. To create this new theme, follow the same steps as when you created the Frame theme, except choose line as feature type. You should thus start by going to the View menu and choose New Theme. Select line as feature type, click ok and navigate to your working directory and save the file as DIGRDSP or something else you will remember. You should now set the snapping environment for your digitising by typing in then tolerance under Editing in the Theme properties menu. The new theme is automatically ready for editing when it is added to the view. Before you start digitising however, zoom in to an appropriate level (try what you like best). Zooming in will make you able to digitise with higher accuracy.

File Edit View Theme Graphics Window Help

1. Open the View Properties window.

1.444.949.48
6.578.957.35

View1

Digrdsp.shp

Theme Properties

Theme Name: Digrdsp.shp   ☐ Use Suffix

3. Select General and Interactive Snapping and type in the tolerance you want (10 is suitable, the number being expressed in millimetres). Press OK.

Det

Text Labels   Reset   Split rule: Copy

2. Choose Editing

Geocoding   ☑ Show snap tolerance cursor

☑ General   Tolerance: [0]

☑ Interactive Tolerance: [0]

Editing   OK   Cancel

The **snapping environment** is a tool that will enable you to connect the endpoints or vertices of lines. When end points of two lines are within snapping tolerance you have specified, ArcView moves the endpoints or vertices of new features and aligns them with the endpoints or vertices of other features. Thus, by setting a snapping environment, you avoid **undershoots** or **overshoots**.

overshoot   undershoot   snapped nodes
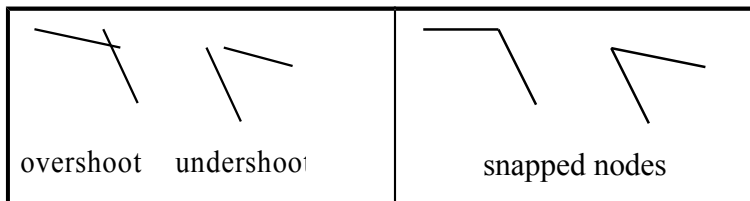
You can also set both **general** and **interactive** snapping tolerance with the mouse when the theme is in **edit** mode. Put the cursor in the view and hold down the right mouse button to display the pop up menu. To set the General snapping environment, **choose Enable General snapping** from this menu and go to the **Snap Tool palette** and in the list of tools that pops down, click the **General Snap** tool . In the view, click and drag out a circle to represent the tolerance distance. The radius of the circle is displayed in the status bar. This radius value becomes the general snap tolerance. To set the **Interactive Snapping,** again hold down the right mouse button in the view and select **Enable Interactive snapping.** Select the **Interactive Snap tool** and put the cursor in the view and draw the radius for the **interactive snapping tolerance.** Setting the snapping tolerances with the mouse can be a fast way of changing the tolerance while you are digitising.

A useful tool is the **Show Snap Tolerance Cursor**. This can be enabled by holding down the right mouse button and selecting **Show Snap Tolerance Cursor.** When the tool is active, a circle appears around the cursor, indicating the snapping tolerance.

Holding down the right mouse button will open this menu. Move the cursor to the command you want to execute.
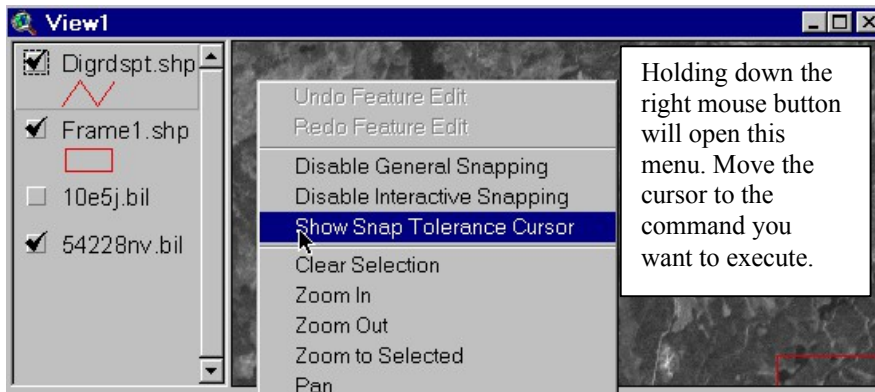
Try the Snap Tolerance Tool, by making the DIGRDSP ready for editing (choose start editing under the Theme menu).
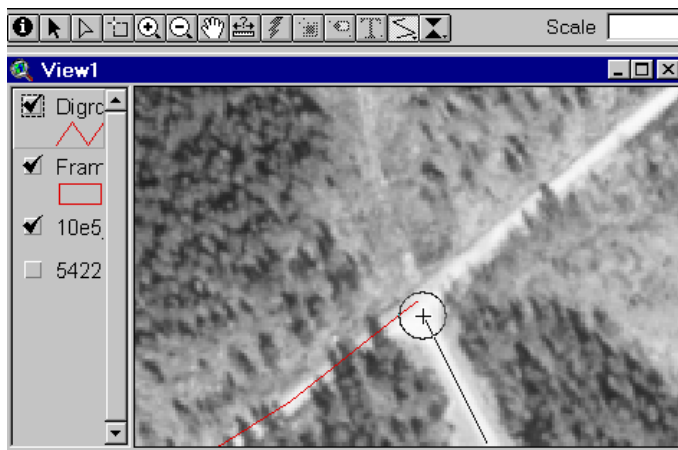
In the picture to the left, the line that is being drawn will snap to the end point of the previous line, as the Tolerance cursor is encircling the end point of the previous line.

Start digitising the roads. If the tolerance and zoom levels you have previously set does not work well, set new that you are comfortable with. Digitise all roads you can identify from the ortophoto. When you are finished with the roads save the file and create the theme where you will digitise lakes. Follow the same steps as before when creating new themes, but make sure the lakes theme is of the polygon feature type.

The new polygon theme DIGLAKESPT is in edit mode when it is added to the view. To start digitising the lakes, choose the Polygon Tool. This tool enables you to digitise a polygon with vertices. Zoom in on a lake and click once to set the first point of the polygon. Move the cursor along the edge of the lake drop points, by clicking **once** with the left mouse button. Double clicking will complete the polygon so only do that when you have come back to the first point of the polygon. The last feature type you should digitise in the SPOT image is buildings. Create a new point theme, using the same steps as above and digitise all major buildings you can find.

When you have digitised all layers from the SPOT image you should do the same from the ortophoto. Display the ortophoto and hide the SPOT image. Name the new themes in

a similar way as the SPT themes but call e.g. PH instead. Since the ortophoto has a higher resolution, you should be able to distinguish between more features. Try to digitise lakes, buildings and roads in the same way as in the SPOT image. Also try to distinguish between open lands and forest and digitise these two types in two separate polygon themes.

After you have digitised the different themes from all data types you should compare your digitalisation with available products. To be able to do that we need some more themes. Add themes /blåkart/c103bv, rodkart/rt_ev94, my_10e5j, bb_10e5j. Make the my_10e5j theme transparent.

To make the comparison, add all the themes you have digitised to the same view along with the existing maps from METRIA at the bottom. The polygon themes you have digitised you need to make transparent in the same way as you when you made the theme Frame.

Questions to answer

- How does the satellite image and the ortophoto differ and why?
- What are the pixel sizes in the two?
- How accurate was your digitalisation? Measure distances.
- What is the difference in roads between the ortophoto and the blue map?
- What is the difference in roads between your digitalisation in the two road themes?
- What is the difference in roads between the ortophoto and the red map?

Do similar comparisons for the house and lake themes.

Discussion

What can the different databases be used for?

What type of applications are ortophoto and satellite images best suited for?

When is high accuracy required for map-making?