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NOTES

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1 CHANGES IN ILWIS VERSION 1.4

Some of the major changes since version 1.3 are:

1.1 General

- Read-only files can now be used
- Logging of previous commands
- File selection through pop-up menus

1.2 Vector

- Window definition can be done as a percentage of the map
- Bounding segments of a mapping unit can be retrieved

1.3 Raster

- Coordinates can be added to a raster map

1.4 Tables

- New operators have been added:
  - sec converts a string in degrees/minutes/seconds
  - dms converts a long integer to a string in degrees/minutes/seconds notation

1.5 Points

- Module no longer exists: is part of SegPol (Vector mudule)

1.6 Output

- User defined graphical fonts are possible in EditPatt.
- Quality and speed of oiutput has been improved.

2 MAP PROJECTIONS

2.1 Theoretical considerations

Map projection requires the transformation of positions from a curved surface, the Earth, onto a plane surface, the map. It is impossible to transform from a curved surface to a plane surface without distortion.

The ideal map should have the following characteristics:

- Areas on the map maintain correct proportion to the areas on the Earth
- Distances on the map must remain in true scale
- Directions and angles on the map must remain true
- Shapes on the map must be the same as on the Earth

The best one can hope for in a projection is the realization of two of these ideal properties at the same time. Most maps have only one!

2.2 Type of projections

The following map projections may be categorized:

- equal area projection: preserves the ratio of areas on the Earth and on the map
- conformal projection: the shape of a figure of the Earth is preserved in its transfer to the map. This means that at a given point the scale is the same in all directions and the directions at a point are the same as on the Earth. So there is distortion in size!
- conventional projection: neither equal area nor conformal.

2.3 Projection surfaces

The three plotting surfaces in use for practical map projections are the plane (azimuthal), the cone and the cylinder. The various surfaces can be further classified according to their point/line of contact with the Earth. For the plane they are: (see fig 1)

- polar
- equatorial
- oblique

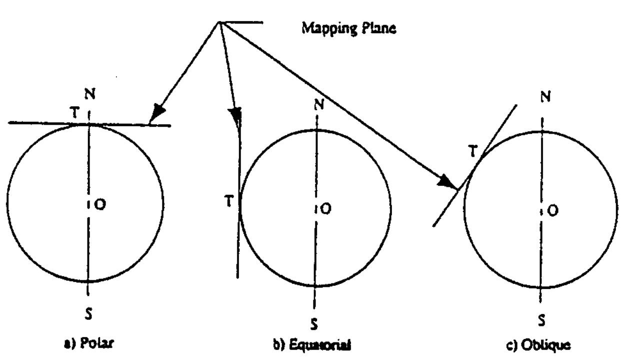

Figure 1. Orientation of the azimuthal plane.

For the cone and cylinder there exist: (see fig. 2)

- regular or equatorial (axis of cone/cylinder is parallel with polar axis of Earth)
- transverse (axis is perpendicular to Earth axis)
- oblique (any other position of axis)

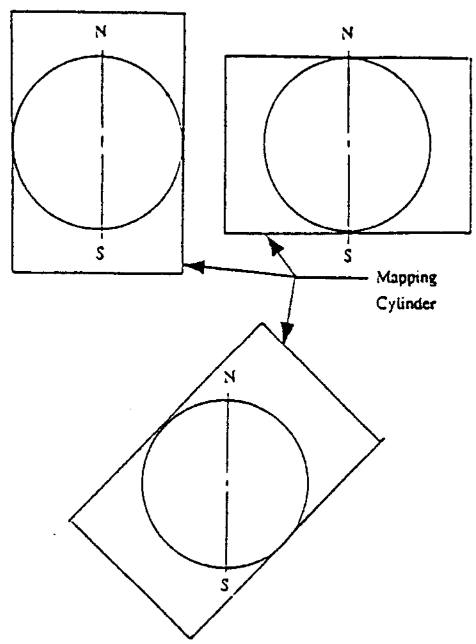

Figure 2. Orientation of the mapping cylinder.

The plotting surface may either touch (tangent) or cut the surface of the Earth (secant) fig 8

2.4 Map projections supported by ILWIS

Equal area projections

- Albers (with one or two standard parallels)
- Azimuthal (or Lambert Azimuthal Equal Area)
- Sinusoidal
- Hammer-Aitoff

Conformal projections

- Lambert conformal conic (with one or two standard parallels)
- Stereographic (equatorial, polar and oblique)
- Mercator (regular or equatorial, transverse and oblique)
- UTM

Conventional projections

- Gnomonic
- Azimuthal equidistant (equatorial, polar and oblique)

- Orthographic (equatorial, polar and oblique)
- Simple conic/equidistant conic
- Polyconic
- Equirectangular (Plate Carrée)
- Miller
- Van der Grinten

Note: Geographic is not a projection!

In ILWIS many cartographic projections can be changed to other projections. This applies to:

a) vector maps (with files .CRD, SEG and .SLG)
b) individual coordinate pairs (e.g. control points)
c) point tables (with files .PNT, e.g. locations of rainfall stations)

Polygon information of the original map can still be used for the transformed map.

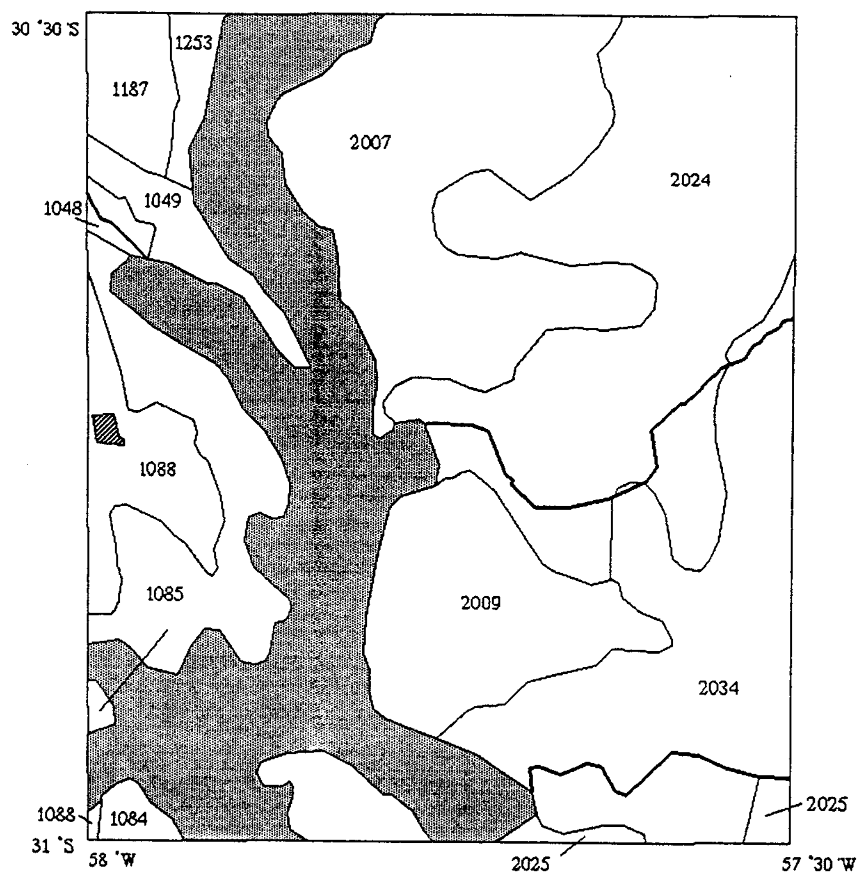

Figure 3. Part of LASOTER polygon map.

Case (a) is to be applied when the original map has georeferences that were taken care of when digitizing. Case (b) is applied when converting real world coordinates of a map to for ILWIS acceptable X and Y coordinates in the digitizing program. In digitizing mode only metric coordinates can be accepted.

The geographic coordinates of the map above have to be converted to metric coordinates (e.g. UTM).

* Select: **VECTOR**
  ChangeProjection
  Manual

From Source Projection

* Select: **Geographic**

From Target Projection

* Select: **UTM**

From Select Elisoid

* Select: **International**

UTM Zone depends on the location of the map on the globe. See the table on p.6.46 of the ILWIS manual for the correct zone.

Input coordinates e.g. for the first control point of the map:]

latitude: **31 00 00 S**
longitude: **58 00 00 W**

Watch the parameters of the conversion on the text screen. False easting is position of the origin from which the UTM central meridian is positioned.

Fill in the coordinates for the other 3 control points too.

Important notice

Before any digitizing of a georeferenced map can start in ILWIS the coordinates of the control points have to be converted to metric coordinates by means of the ChangeProjection programme. If not, the map will have only relative coordinates to an imaginary origin defined by the user. Output to scale is than not possible!

3 OUTPUT AND SCALE

If a map has been correctly geo-referenced (in other words has coordinates) in the Output option of the Output command block the scale can be entered. We can try this with the test map of fig 1 and print it at various scales.

EXERCISE

Print the map of fig 3 in scale 1:1M. What is the scale of fig 3?

If no coordinates have been indicated, or if no cale is given, the enlarge factor is asked for. The enlarge factor is defined as the number of dots (produced by the printer) that is used for representing one pixel of the map. If the default is accepted, the smallest possible scale is used to fit on one sheet of paper (size of paper is defined in the Configuration command block, only accessible by the System Manager).

An enlargement factor greater than the default will require more sheets of paper and this is indicated by 'Nr of papers = a x b'.

4 GEOMETRIC CORRECTION

This programme does not change the projection of a map. It adjust the control points of one map to another map with the same projection but with slight distortions due to e.g. instable material (paper maps can shrink) of images (e.g. aerial photographs) without control points. In other GIS programmes this function is also knowns as 'rubber-stretching': it tries to fit control points of an non-referenced map to the same points on another map with real world coordinates.

The 'master' map has to be correctly registered with real world coordinates (see under 2) before another map can be use as 'slave' map. Control points of the master map are selected with th^E cursor on the slave map.

No practical exercise is foreseen.

5 PATTERN EDITING

In the ILWIS\STANDARD directory a number of standard patterns is stored for :

- printing of shades of colors
- printing of patterns (pictures) to fill map units, either in black and white or colour

The user can design his own patterns or fonts. It is however quite a tasks to develop a full set of letters!

* Select: **OUTPUT**
MakePattern

* Type: <ENTER> after 'Enter pattern input file:'

A new pattern file is created.

* Type: 32 after 'Enter nr of rows/columns in pattern'

Any figure between 1 and 72 is accepted. If you want to create very intricate patterns/fonts a large figure is recommended. Follow the instructions in the ILWIS manual (p. 6.168-169).

A pattern file with user defined fonts must be saved as a .FNT file. A pattern file with user defined patterns as .PAT.
Font files can be loaded in Configuration, when leaving the option Graphics Board.

A standard font pattern file (\ILWIS\STANDARD\GENERAL.FNT) is used for Annotation. Changes to this file can be made in MakePattern.

6 ALES APPLICATION

A decision tree in ALES for two land uses in Kenya (low-input maize and sorghum) has been developed. We will study the decision tree. Data from the KENSOTER database are not yet complete for entering in the model.

EXERCISE

Start ALES by going to the directory **\DTM** and typing: **ALES**. The evaluation model we will study is called **SOTALS**.

7 SWEAP PROCEDURE IN SOTER94

The SWEAP programme was developed for SOTER version 4. Changes in SOTER (1993) made is necessary to either (1) modify the SWEAP procedure or (2) to make a conversion from 'new' SOTER data to the 'old' SOTER version. As the SWEAP programme is likely to be modified in the future ISRIC has opted for the second solution: conversion of the SOTER data to the SWEAP format.

This conversion has been implemented in the SOTER94 input programme for attribute data. For each individual SOTER unit the user has to select a climate station which will be linked to the SOTER unit. An automatic transfer to the SWEAP format occurs and also the climate parameters needed by SWEAP are caluculated. The end result will be an ASCII file which can be used by SWEAP for the assessment of erosion harzards under various scenarios.

EXERCISE

Convert SOTER (version5) data to SWEAP files. Make a new map of the LASOTER area using the SWEAP run results.