DEPARTMENT OF GEOGRAPHY, GEOINFORMATICS & METEOROLOGY
FACULTY OF SCIENCE
GGY221 INTRODUCTORY GIS
SECOND SEMESTER TEST

16 September 2010 **TIME: 50 min**

1. Acquire the data

1.1 Explain what is meant by the data stream of a data set. Also discuss the importance of the data stream.

The process of getting data into the computer is called data encoding. The whole process of data acquisition, data encoding and data editing is called the data stream.

The sequence in which many of these operations take place may vary. Many may need to be performed iteratively. Much depends, as ever, on the types of data involved, on the systems being used and on the object of the exercise. Where the end result is no more than a cartographic display, for example, the degree of integration required of the data may be relatively small. On the other hand, where the data are to be input to quantitative models, or used to assess spatial correlations between phenomena, the issues of data quality, topological structure and spatial registration become paramount

(4)

1.2 Explain the influence of a large scale map vs. a small scale map on the generalization of real world features.

A smaller scale - more generalisation
A bigger scale - less generalisation

(2)

1.3 Name and discuss the three main components of a GNSS.

- Satellite segment – constellation of satellites orbiting the earth and transmitting signals.
- Control Segment – tracking, communications, data gathering, integration, analysis and control facilities.
- User segment – set of individuals with one or more GPS receivers.

(6)

1.4 Name the advantages of working with remotely sensed data.

- Large area coverage
- Extended spectral range –detect light at wavelengths outside range of human eye (infrared)
- Geometric accuracy
- Permanent record –fixed at specific time and date – comparison with earlier or newer images

(4)

1.5 Name and discuss the distortions that may occur on aerial images due to the existing terrain and possible camera tilt.

- Terrain variation is often the largest source of geometric distortion in aerial photographs
- Relief displacement – radial displacement of objects that are at different elevations
- Key characteristics of terrain distortion:
- Terrain distortions are radial – points are displaced inward or outward from the image centre
- Relief distortions affect angles and distances
- Scale is not constant on aerial photographs
- Vertical photograph taken over varied terrain is not orthographic
- Camera tilt may be another large source of positional error. Object towards back are distorted – cannot be used to capture features in a GIS

(6)

1.6 Name and explain the different encoding methods that can be used when working with a GIS. Also indicate how the encoding method will influence the quality of the data sets.

Encoding Method	Quality
Manual data encoding	Can be of high quality if coordinates are typed correctly form General Land Surveyor maps or diagrams
Scanning -	Depends on source document (or scanner)
Digitising	Depends on skills of operator and quality of source document
Electronic data transfer	Depends on data stream followed

(12)

1.7 Name and discuss any 5 editing methods that can be used when working with a GIS.

- cleaning and editing - Data will contain errors from earlier in the data stream or introduced during data capturing – needs constant management

- edge matching - When area of study extends over more than one sheet, data is initially stored as separate layers. Easier to check for errors and keep files small. Is necessary to join the separate layers before data can be analysed as a whole – called edge matching

- projection change (conversion) Many projections are used in GIS. Map overlays of data from different projections will result in mismatchesMake sure that type of projection matches application.

- Rubber sheeting - The image or layer to be re-projected is stretched to fit the target projection at a number of known control points and the rest of layer is adjusted accordingly.

- Generalization – simplification of real world features. May be needed for the following reasons:

    1. To change data to less detailed scale.

    2. To integrate layers of different scale for overlay

    3. To produce a 'broader brush' picture of conditions in the study area

    4. To search for patterns that may only be evident at a smaller mapping scale

    5. To reduce the effects of local variability or error in the data sets.

- Registration - After all the mentioned processes it is still possible that the data sets will not fit exactly. Minor discrepancies because of digitising, differences in base maps used, or effect of editing and cleaning that has been carried out. Appear as small misregistrations

- scale change - GIS will allow us to zoom in and out to any scale. Results can be printed in any scale. GIS is scale free and the software will allow you to zoom to any scale – but your application is according to a specific scale!

- Tiling - Whole database is subdivided into spatial blocks (or map sheets). Tiles are designed to fit perfectly

- raster-vector conversion - Large proportion of GIS data is captured and processed in vector form . Some types of data processing or analyses are best carried out in raster form. Raster and vector conversions may be necessary. Will influence the accuracy of the data sets

(10)

1.8 Define the following terminology:

1.8.1 **Plane surveying -** horizontal surveying based on a flat surfacedefined by a map projection

1.8.2 **Positional uncertainty -** Errors in range measurements and satellite location

1.8.3 Image extent - is the area covered by an image

1.8.4 **Image resolution -** is the smallest object that can reliably detected on the image

1.8.5 **Metadata -** Information about spatial data **OR** Describe content, source, lineage, methods, developer. coordinate system, extent, structure, spatial accuracy, attributes and responsible organization for spatial data

1.8.6 Data standards - common understanding of the components of a spatial data set, how it was developed and utility and limitations of the data.

(6)

TOTAL [50]