Principles of GIS Course

Introduction

The materials provided after registration is a full introductory course to GIS with a 5 days duration and an estimated study load of 40 hours. The course consists of presentations, exercises including the open-source ILWIS software.

Objective

Participants learn the basics of GIS concepts. GIS concepts are software independent. To digest the principles and get a feeling of how a GIS software tool works the open source ILWIS will be used. ILWIS is the same tool used in the Remote Sensing course. Databases will be discussed but the content is software specific. ILWIS does not have a complete database, but the elements in it allow the learning of the basics.

Generic Syllabus

Introduction to GIS	· What GIS is about? · The GIS data management processing system · The three spatial components of the GIS · Overview of applications and capabilities in hydrology
Spatial data types	· Fields and objects · Computer representations: tessellations and vector-based · Representation for continuous and discrete fields and objects
Database management	· Databases and database management systems (DBMS) · DBMD functionality and architecture · The relational data model o Relations, tuples and attributes o Primary and foreign keys · Querying a relational database o Data integrity o Selection o Attribute projection o Joining · Linking spatial and attribute data
Georeferencing[1]	· Spatial referencing: o Reference systems: geographical and Cartesian coordinates o Ellipsoids and datum o Datum transformations · Map projections: classification and properties o UTM projection
Data acquisition, preparation and input and data preparation	· Data preparation o Digitizing errors and vector cleaning operations (software related) · Interpolation methods from point data o Discrete methods § Thiessen Polygon (nearest neighbor) o Continuous : interpolation techniques § Trend surface fitting (linear, quadratic) § Moving window averages § Inverse distance weighting § Triangulation § Geostatistics
Spatial data Analysis	· Analytical models: description of analytical functions: o Measurements § Vector measurements § Raster measurements o Retrievals § Spatial Selection by Attribute conditions § Spatial Selection using topological relationships o Classification § User controlled classification § Automatic classification o Overlay functions: arithmetic, comparison and logical operators.

	§ Vector overlay § Raster overlays · Decision tables o Neighborhood functions: functions
Data visualization and presentation	· Visualization process o Elements of…: functions, rules and conventions o Nature of the data: nominal, ordinal, interval and ratios o Basic representation elements: point, line and area symbols. Non geographical: text. o Visual variables: form/shape, orientation, color, texture, lightness and size. Examples. o The process of representation

Main Book for the GIS course

This course is based on a number of publications and bibliography. The selected head book is “Principles of Geographic Information Systems: An introductory textbook, 1999, Editors Otto Huisman and Rolf A. de By”, available in PDF format.

Supported study material

The course consists on a total of 11 lectures. Out of them 1 lecture is optional and 1 is alternative to the one offered as official. All lectures are supported with a PDF material and refer to the same chapter or section of the main book.

The free ILWIS software version 3.3.1 is offered for the practicals. There are a total of 5 practicals. Out of them one is optional for those that are not knowledgeable in the ILWIS software and 1 other practical lasts about double time than the others. All single practical folders contain one PDF file with instructions to solve the exercises. This should be opened first. All the files are also in the same directory.