Open Source Software for Preprocessing GIS Data for Hydrological Models

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Introduction

For many studies models are used or developed. During modelling courses not much attention is paid to the preprocessing of input data and parameters needed for the models. A lot of open source software is available for this purpose. Besides desktop tools with graphical user interfaces, scripting is very useful for processing large datasets and timeseries. With the skills learned in this course you will be able to more efficiently process your data and setup and improve your models.

For whom?

The course is designed for professionals (engineers and scientists) active in the water/environmental sector, especially those involved in planning and management of water systems as well as numerical modelling. Pre-requisites are a basic knowledge of computing and water related topics.

Learning Objectives

After this course you will be able to:
- Understand the basic concepts of GIS
  - Raster, vector, projections, geospatial analysis
- Use a GIS for:
  - Thematic mapping

- Basic data processing and editing
- Basic geoprocessing and analysis
- DEM processing and catchment delineation
- Find open source software and open data

References

Software

The free and open source software (FOSS) used in this course are:

- QGIS version 2.18.11 (newer versions have not been tested)
- GDAL

QGIS is a desktop GIS similar to the commercial ArcGIS software. GDAL is the Geodata Abstraction Layer, a set of open source tools that can be used to convert between GIS formats and to reproject data in a standardized way. GDAL commands can also be used in scripts. During the course basic scripting skills will be acquired: shell scripts and the Python programming language.

Books

The following books are suggested to support the course:

- P.A. Burrough, R.A. McDonnell & C.D. Lloyd, Principals of Geographical Information Systems, Oxford University Press, 3rd Edition, 2015
- A. Graser, Learning QGIS 2.0, Packt Publishing, 2014

Lecturer

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The Adjumani dataset in exercise 7 has been deveoped by VEI and the National Water and Sewerage Corporation (NWSC) in Uganda. I thank them for permission to use it for educational purposes.

Some illustrations were taken from A gentle Introduction to GIS and from the PCRaster documentation.
I tried to reference the sources and respect the licenses of the used sources. Please contact me if I missed any.

Short courses

This course material is provided as Open Courseware **without support and interaction with lecturers**. Only exercises are provided. For full lectures and support from lecturers, please register online for one of the related short courses:

- Data acquisition, preprocessing and modelling using SWAT
- Data acquisition, preprocessing and modelling using PCRaster Python
- Data acquisition, preprocessing and modelling using HEC-RAS
- Open source software for preprocessing GIS data for hydrological models

GIS, SDI and modelling courses can also be provided as tailor made trainings for your organisation. Please contact me for more information.

Schedule

Exercise	Software	Study load (hours)
Digitizing from a scanned map	QGIS	4
Importing tabular data into GIS and interpolation	QGIS	4
Importing data from a GPS and conversion to vector	QGIS	4

Spatial planning using map algebra	QGIS	8
Catchment delineation	QGIS	8
Using Open Access data	QGIS	4
Styling and map design	QGIS	4
Introduction to DOS and GDAL	GDAL	8

Using QGIS for preprocessing

Exercises: Using QGIS for data acquisition and preprocessing (v 2.18.13)

Data Exercise 1: Digitizing from a scanned map

Data Exercise 2: Importing tabular data into GIS and interpolation

Data exercise 4: Spatial planning using map algebra

Data Exercise 5: DEM analysis and catchment delineation

Data Exercise 7: Map design

YouTube Channel with screencasts

Slides of lectures

🌐 Recorded webinar: Open Source Software and Open Data for Integrated Water Resources Management

Using GDAL for preprocessing

📕 Exercises: Introduction to DOS and GDAL

📑 Data GDAL Exercises

📑 Excercise data GDAL batch conversion

Thanks!

Thanks for choosing this course. We hope it was useful for you. Looking forward to see you at one of our short courses at IHE Delft in the Netherlands!

Pictures

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