Geophysical Research Abstracts
Vol. 17, EGU2015-8142, 2015
EGU General Assembly 2015

Analyzing rasters, vectors and time series using new Python interfaces in GRASS GIS 7

Vaclav Petras (1), Anna Petrasova (1), Yann Chemin (2), Pietro Zambelli (3), Martin Landa (4), Sören Gebbert (5), Markus Neteler (6), and Peter Löwe (7)

(1) North Carolina State University, Raleigh, USA (wenzeslaus@gmail.com), (2) International Water Management Institute, Pelawatta, Sri Lanka, (3) EURAC Research, Institute for Renewable Energy, Bolzano/Bozen, Italy, (4) Faculty of Civil Engineering, Czech Technical University in Prague, Czech Republic, (5) Thünen Institute of Climate-Smart Agriculture, Braunschweig, Germany, (6) Research and Innovation Centre, Fondazione Edmund Mach, San Michele all'Adige, Italy, (7) German National Library for Science and Technology, Hanover, Germany

GRASS GIS 7 is a free and open source GIS software developed and used by many scientists (Neteler et al., 2012). While some users of GRASS GIS prefer its graphical user interface, significant part of the scientific community takes advantage of various scripting and programing interfaces offered by GRASS GIS to develop new models and algorithms. Here we will present different interfaces added to GRASS GIS 7 and available in Python, a popular programming language and environment in geosciences. These Python interfaces are designed to satisfy the needs of scientists and programmers under various circumstances.

PyGRASS (Zambelli et al., 2013) is a new object-oriented interface to GRASS GIS modules and libraries. The GRASS GIS libraries are implemented in C to ensure maximum performance and the PyGRASS interface provides an intuitive, pythonic access to their functionality. GRASS GIS Python scripting library is another way of accessing GRASS GIS modules. It combines the simplicity of Bash and the efficiency of the Python syntax. When full access to all low-level and advanced functions and structures from GRASS GIS library is required, Python programmers can use an interface based on the Python ctypes package. Ctypes interface provides complete, direct access to all functionality as it would be available to C programmers.

GRASS GIS provides specialized Python library for managing and analyzing spatio-temporal data (Gebbert and Pebesma, 2014). The temporal library introduces space time datasets representing time series of raster, 3D raster or vector maps and allows users to combine various spatio-temporal operations including queries, aggregation, sampling or the analysis of spatio-temporal topology.

We will also discuss the advantages of implementing scientific algorithm as a GRASS GIS module and we will show how to write such module in Python. To facilitate the development of the module, GRASS GIS provides a Python library for testing (Petras and Gebbert, 2014) which helps researchers to ensure the robustness of the algorithm, correctness of the results in edge cases as well as the detection of changes in results due to new development. For all modules GRASS GIS automatically creates standardized command line and graphical user interfaces and documentation. Finally, we will show how GRASS GIS can be used together with powerful Python tools such as the NumPy package and the IPython Notebook.

References:

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