

GeoPython 2017 MuttENZ/Basel

QGIS AND PYTHON - EASY PROGRAMMING QGIS WITH PYTHON FOR EXPRESSION FUNCTIONS

Prof. Stefan Keller and Simran Khare

May 8, 2017, 16:00 - 18:00



HSR

HOCHSCHULE FÜR TECHNIK
RAPPERSWIL

FHO Fachhochschule Ostschweiz



Easy Programming QGIS with Python for Expression Functions 2

Workshop QGIS Custom EFns. > Intro

■ Goals

- You know what Expression Functions (EFns) are in QGIS
- You applied own Custom Efns in QGIS
- You know the limits and get a first step to QGIS programming

■ Program Overview

- 16:00-16:15 Welcome and QGIS installation (Stefan)
- 16:15-16:30 Intro to QGIS (Stefan)
- 16:30-17:00 Intro to PyQGIS and Expression Functions (EFns) (Stefan)
- 17:00-17:45 Custom EFns with Hands-on Exercises (Simran & S)
- 17:45-18:00 Wrapup & Outlook (Stefan)



Workshop QGIS Custom EFns. > Intro

■ Prof. Stefan Keller

- Head of Geometa Lab HSR Rapperswil
- Teaches Database Systems/Data Engineering and Geo-Information Systems at bachelor and masters level

■ Simran Khare

- Computer Science student at NTU Singapore
- Intern at Geometa Lab HSR

■ About you

- ?

Workshop QGIS Custom EFns > Intro

■ Material

- <http://bit.ly/GeoPython17-QGIS-WS>
(https://giswiki.hsr.ch/Workshop_QGIS_Python_GeoPython_2017)
- Simran's github repo
- Simran's slides there
- (Stefan's slides and all later on GeoPython page)

■ Software

- Open Source Desktop-GIS QGIS 2.18.x
(2.14 is OK): Download from www.qgis.org
- Webbrowser for downloading material from github

■ Wifi

- See conference



INTRO TO QGIS



HSR

HOCHSCHULE FÜR TECHNIK
RAPPERSWIL

FHO Fachhochschule Ostschweiz

Workshop QGIS Custom EFns. > Intro to QGIS

- **It's a Geographic Information System (GIS) ☺**
- **GIS Desktop, QGIS Server und QGIS Mobile**
- **2D with 2.5D components (not yet 3D except one plugin)**
- **Supported OS: Linux, Mac, Windows and Android**
- **Based on Qt framework (C++ with Python bindings)**
- **Plugin System: C++ (precompiled) and Python („managed“)**
- **Includes other FOSS and GIS libs. GDAL/OGR, GRASS, R, Sextante, SAGA**
- **Supports many GIS file formats and databases (no specific „own formats“)**
- **Good integration of webservice like WMS, WMTS/XYZ, WFS**
- **Open Source GNU General Public License (applies also for plugins/scripts)**
- **Established since 2007 (2002 in Alaska by Gerry Sherman)**

INTRO TO PYQGIS AND EXPRESSION FUNCTIONS (EFNS)

Workshop QGIS Custom EFns. > Intro to PyQGIS and Expression Functions (EFns.)

■ PyQGIS

- QGIS Python console
- A QGIS instance runs only one Python interpreter

■ Help

- PyQGIS Developer Cookbook
http://docs.qgis.org/testing/en/docs/pyqgis_developer_cookbook/
- QGIS API (C++): <http://www.qgis.org/api/>
- Diagram about main QGIS Python API classes:
http://labs.webgeodavore.com/partage/diagramme_principal.html

■ Tips

- Use PEP8, no tabs!
- Debugging: Use Python "print"

■ Expression Functions (EFns)

- There are 2 kinds: Core EFns. (built-in, C++) and Custom EFns (in Python)
- Evaluated by an „expression engine“ – an function internal in QGIS

Workshop QGIS Custom EFns. > Intro to PyQGIS and Expression Functions (EFns.)

■ List of core functions („default group“; list to be continued)

- Aggregates Functions
- Color Functions
- Conditionals
- Conversions Functions
- Date and Time Functions
- Fuzzy Matching Functions
- General Functions
- Mathematical Functions
- Operators
- Record Functions
- String Functions
- Variables Functions

■ List of core functions („special group“)

- Fields and Values
- Geometry Functions
- Recent Functions
- Expressions Plus ("plugged in")
- Custom Functions

Taken from official QGIS docs. v2.18 about „Expression Functions“:

https://docs.qgis.org/2.18/en/docs/user_manual/working_with_vector/expression.html

Workshop QGIS Custom EFns. > Intro to PyQGIS and Expression Functions (EFns.)

■ Custom Expressions Functions

- Written in Python
- Self-contained, achievable task for users who are new with PyQGIS programming. There's no plugin infrastructure/standalone to learn, no scripts - just python bindings. Good first step before programming processing scripts or plugins.

■ The „prelude“ of every Custom Efn in PyQGIS

- Python import PyQGIS:
 - `from qgis.core import *`
 - `from qgis.gui import *`
- Python function decorator:
 - `@qgsfunction(args='auto', group='Custom')`
`def func(value1, feature, parent):`
 `return 1`

■ Usage: See Simran's slides

Workshop QGIS Custom EFns. > Intro to PyQGIS and Expression Functions (EFns.)

■ How to install and share an (own) custom EFn?

- "Function Editor" uses a temporary "scratch" file.
Stored in %USERPROFILE%\.qgis2\python\expressions (where %USERPROFILE% is e.g. "C:\Users\sfkeller\" under Windows).

Tip: Use this really only as scratch (will be lost when saving to new file)!

- Save your file as "New File..." e.g. work.py in "Function Editor".
- Or add it to %USERPROFILE%\.qgis2\python\startup.py:
Create/edit startup.py file.
- Or add it to a QGIS Python plugin.
Tip: like "Expressions Plus" plugin from NathanW by gitub pull request
<http://plugins.qgis.org/plugins/qgsexpressionsplus/>

CUSTOM EFNS WITH HANDS-ON EXERCISES

by Simran



HSR

HOCHSCHULE FÜR TECHNIK
RAPPERSWIL

FHO Fachhochschule Ostschweiz

WRAPUP AND OUTLOOK

■ Wrapup

- Feature selection, Feature labeling and Field calculation
- See goals

■ Drawbacks

- Performance – EFns are applied and evaluated to each feature!
- Relationship of a feature class to another which is other than "one-to-one" (eventually "1:'1.1" taking first feature found)
- Reading data from another layer in general (without own Python code with iterator and accessor)
- Custom Python EFns are not supported in QGIS Server (unless a plugin like Expressions Plus is installed in QGIS Server)

■ Outlook: QGIS 3

- Additional core EFns
- Speed up to 50% (see Matthias' blog post)

■ Custom EFns. - rather outdated!

- Ujaval's QGIS Tutorials (QGIS 2.14):
http://www.qgistutorials.com/en/docs/custom_python_functions.html
- Nathan's Blog post:
<https://nathanw.net/2012/11/10/user-defined-expression-functions-for-qgis/>

■ Misc.

- Nathan's Expressions Plus plugin:
<https://github.com/NathanW2/qgsexpressionsplus>
- Matthias' blog post about EFns. in QGIS 3.0:
<http://www.opengis.ch/2017/05/02/qgis-expressions-engine-performance-boost/>
- Intro to Python Function Decorators:
<https://www.thecodeship.com/patterns/guide-to-python-function-decorators/>

■ QGIS Help and Support

- Mailinglist QGIS-User: www.qgis.org/en/site/getinvolved/maillinglists.html
- GIS Stack-Exchange (Forum): <http://gis.stackexchange.com/?tags=qgis>
- Commercial support: http://qgis.org/en/site/forusers/commercial_support.html

DISCUSSION! ANY QUESTIONS?



Prof. Stefan Keller

Geometa Lab am IFS der HSR

Mail sfkeller@hsr.ch, Twitter @sfkeller

Web www.hsr.ch/geometalab



HSR

HOCHSCHULE FÜR TECHNIK
RAPPERSWIL

FHO Fachhochschule Ostschweiz

