Introducing the RQGIS package

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Find the slides and the code

https://github.com/jannes-m/erum18_geocompr

Installing QGIS

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- Windows users: Use the OSGeo-network-installer (also described in the vignette)!

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For more information and a short introduction by example refer to:

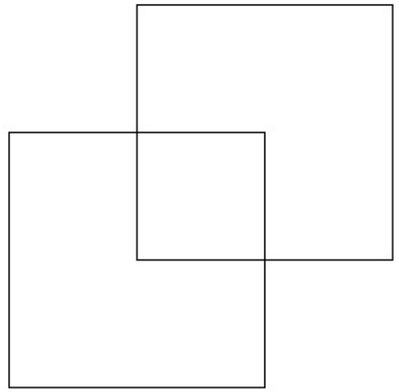
https://github.com/jannes-m/RQGIS

RQGIS by example

To introduce the RQGIS package, let's find the intersection between two polygons. For this we create two polygons using the `sf`-package.

```
library(sf)
coords_1 =
  matrix(data =
           c(0, 0, 1, 0, 1, 1,0, 1, 0, 0),
         ncol = 2, byrow = TRUE)
coords_2 =
  matrix(data =
           c(-0.5, -0.5, 0.5, -0.5, 0.5,
             0.5,-0.5, 0.5, -0.5, -0.5),
         ncol = 2, byrow = TRUE)

poly_1 = st_polygon(list((coords_1))) %>%
  st_sfc %>%
  st_sf
poly_2 = st_polygon(list((coords_2))) %>%
  st_sfc %>%
  st_sf
plot(poly_1$geometry, xlim = c(-1, 1), ylim = c(-1
plot(poly_2$geometry, add = TRUE)
```



Find a QGIS algorithm

Now we would like to know which QGIS geoalgorithm we can use for this task. We assume that the word `intersec` will be part of the short description of the searched geoalgorithm

```
library(RQGIS)
set_env(dev = FALSE)
```

```
## $root
## [1] "C:/OSGeo4W64"
##
## $qgis_prefix_path
## [1] "C:/OSGeo4W64/apps/qgis-ltr"
##
## $python_plugins
## [1] "C:/OSGeo4W64/apps/qgis-ltr/python/plugins"
```

```
find_algorithms("intersec", name_only = TRUE)
```

```
## [1] "qgis:intersection"              "qgis:lineintersections"
## [3] "saga:fuzzyintersectionand"      "saga:intersect"
## [5] "saga:linepolygonintersection" "saga:polygonselfintersection"
## [7] "saga:polygonlineintersection"
```

How to use it

To find out the parameter names and corresponding default values, use `get_usage`.

```
get_usage("qgis:intersection")
```

```
## ALGORITHM: Intersection
##      INPUT <ParameterVector>
##      INPUT2 <ParameterVector>
##      IGNORE_NULL <ParameterBoolean>
##      OUTPUT <OutputVector>
```

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```

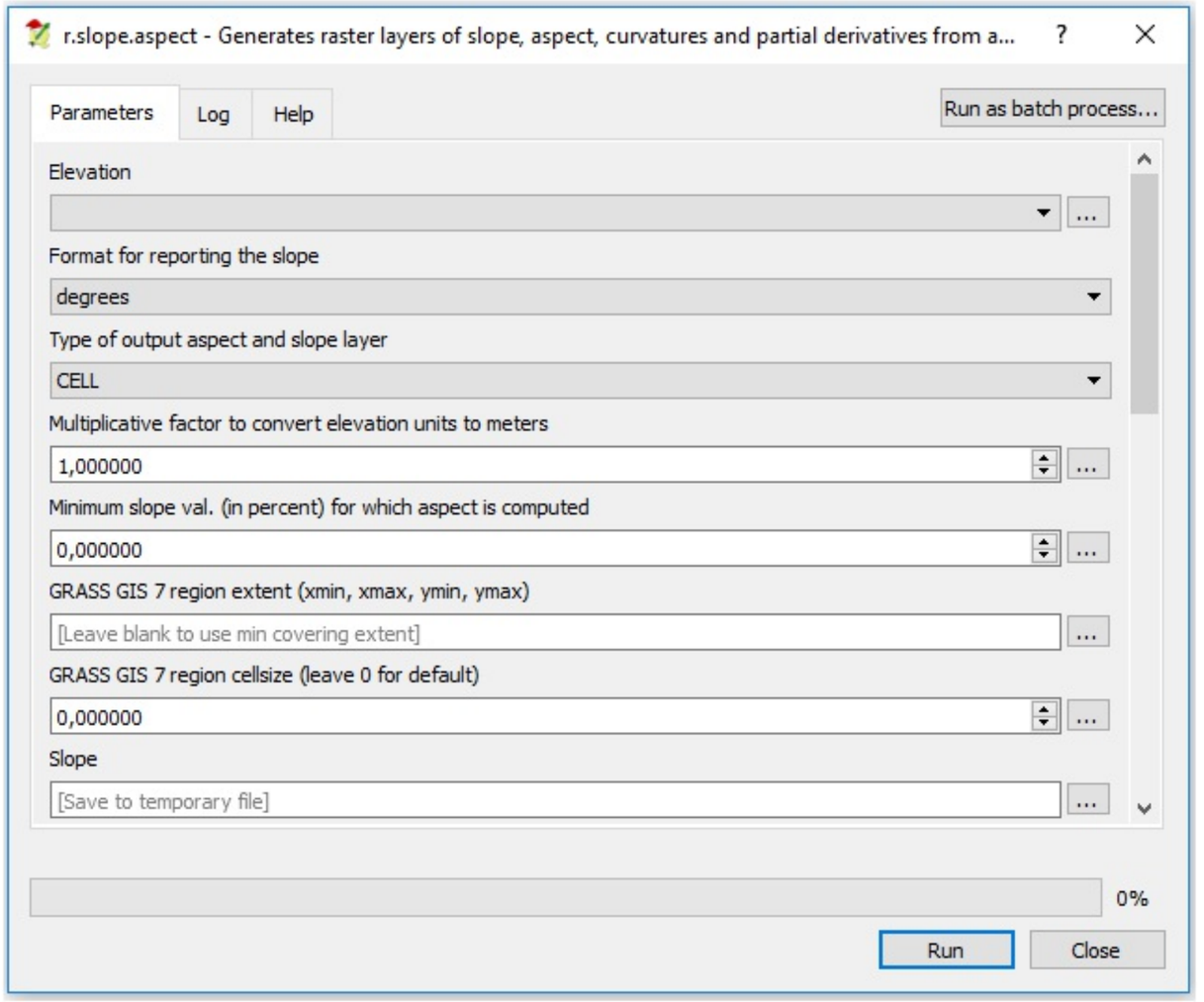
Here, we only have three function arguments, and automatic parameter collection is not necessary, but when I first looked at...

```
get_usage("grass7:r.slope.aspect")
```

```
ALGORITHM: r.slope.aspect - Generates raster layers of slope, aspect, curva
    elevation <ParameterRaster>
    format <ParameterSelection>
    precision <ParameterSelection>
    -a <ParameterBoolean>
    zscale <ParameterNumber>
    min_slope <ParameterNumber>
    GRASS_REGION_PARAMETER <ParameterExtent>
    GRASS_REGION_CELLSIZE_PARAMETER <ParameterNumber>
    slope <OutputRaster>
    aspect <OutputRaster>
    pcurvature <OutputRaster>
    tcurvature <OutputRaster>
    dx <OutputRaster>
    dy <OutputRaster>
    dxx <OutputRaster>
    dyy <OutputRaster>
    dxy <OutputRaster>

format(Format for reporting the slope)
    0 - degrees
    1 - percent
precision(Type of output aspect and slope layer)
    0 - FCELL
    1 - CELL
    2 - DCELL
```

But looking at the QGIS GUI..



Convenience function

get_args_man

```
params = get_args_man(alg = "grass7:r.slope.aspect")
params[1:10]
```

```
## Choosing default values for following parameters:
## format: 0
## precision: 0
## See get_options('grass7:r.slope.aspect') for all available options.
```

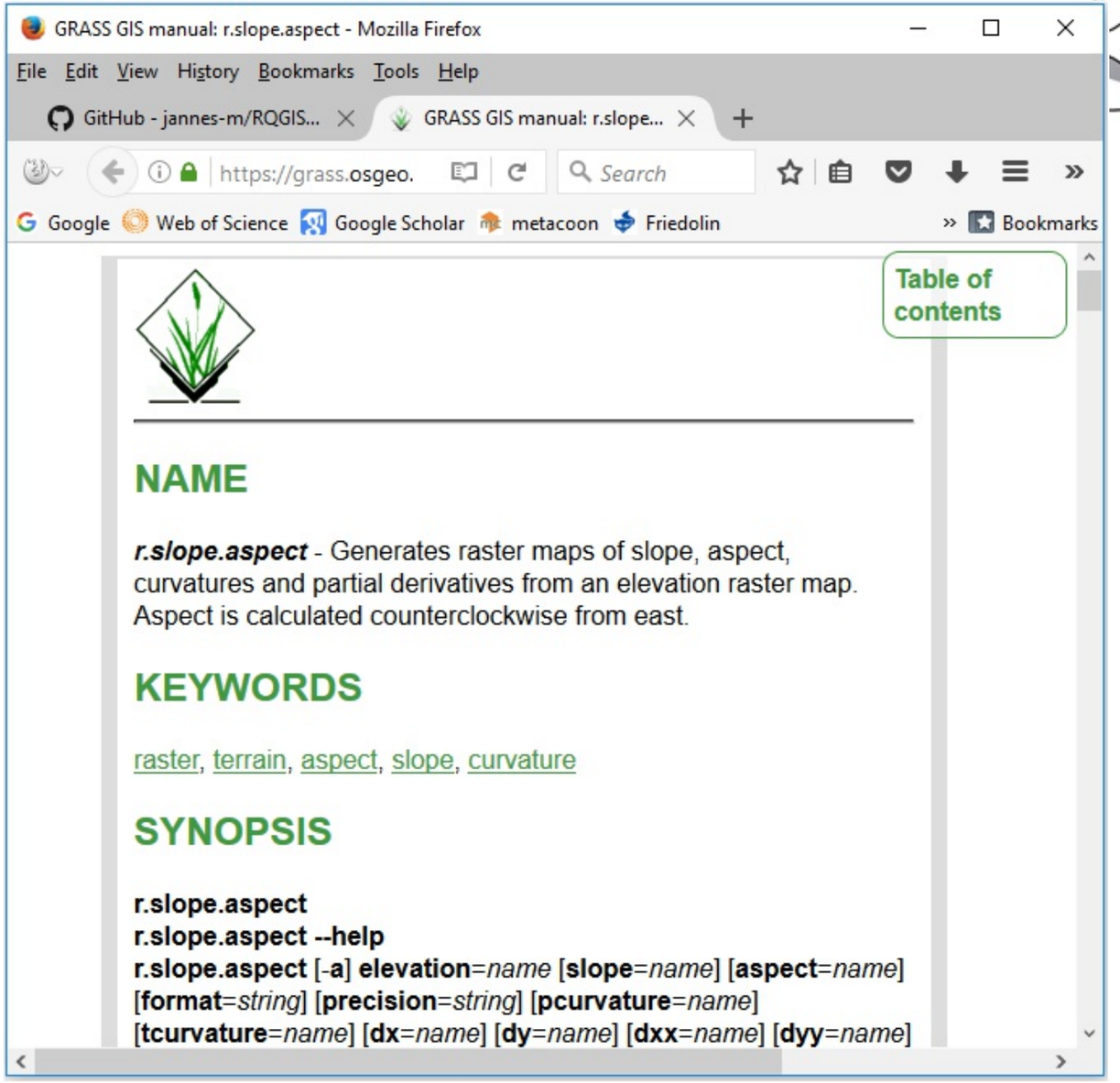
```
## $elevation
## [1] "None"
##
## $format
## [1] "0"
##
## $precision
## [1] "0"
##
## $`-a`
## [1] "True"
##
## $zscale
## [1] "1.0"
```

```
## $min_slope
## [1] "0.0"
##
## $GRASS_REGION_PARAMETER
## [1] "\"None\""
##
## $GRASS_REGION_CELLSIZE_PARAMETER
## [1] "0.0"
##
## $slope
## [1] "None"
##
## $aspect
## [1] "None"
```

Access the online help

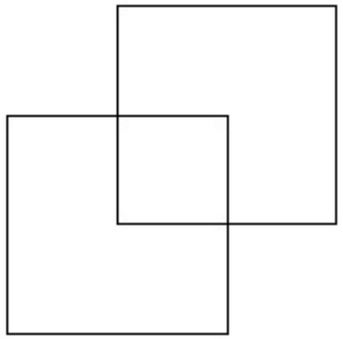
By the way, use `open_help` to access the online help and possibly find out more about a specific geoalgorithm:

```
library(RQGIS)
open_help(alg = "grass7:r.slope.aspect")
```


GRASS GIS manual: r.slope.aspect - Mozilla Firefox
File Edit View History Bookmarks Tools Help
GitHub - jannes-m/RQGIS...
GRASS GIS manual: r.slope...
https://grass.osgeo.
Search
Google
Web of Science
Google Scholar
metacoon
Friedolin
Bookmarks
Table of contents
NAME
r.slope.aspect - Generates raster maps of slope, aspect, curvatures and partial derivatives from an elevation raster map. Aspect is calculated counterclockwise from east.
KEYWORDS
raster, terrain, aspect, slope, curvature
SYNOPSIS
r.slope.aspect
r.slope.aspect --help
r.slope.aspect [-a] elevation=name [slope=name] [aspect=name] [format=string] [precision=string] [pcurvature=name] [tcurvature=name] [dx=name] [dy=name] [dxx=name] [dyy=name]

Back to our use case

We have created two polygons using `sf`, and would like to find the intersection between the two.



Back to our use case

We also know the name of the geoalgorithm (`qgis:intersection`), and its parameters

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## ALGORITHM: Intersection
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```

Hence, we have to specify `INPUT`, `INPUT2` and `OUTPUT`. We can do so using R named arguments.

Run QGIS from within R

```
int = run_qgis("qgis:intersection",
                  INPUT = poly_1,
                  INPUT2 = poly_2,
                  OUTPUT = file.path(tempdir(), "out.shp"),
                  load_output = TRUE)
```

```
## $OUTPUT
## [1] "C:/Users/pi37pat/AppData/Local/Temp/RtmpOesi7A/out.shp"
```

Spatial objects as inputs

```
int = run_qgis("qgis:intersection",
                  INPUT = poly_1,
                  INPUT2 = poly_2,
                  OUTPUT = file.path(tempdir(), "out.shp"),
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```
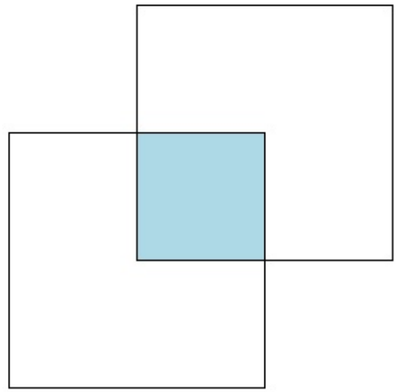

Load QGIS output into R

```
int = run_qgis("qgis:intersection",
                INPUT = poly_1,
                INPUT2 = poly_2,
                OUTPUT = file.path(tempdir(), "out.shp"),
                load_output = TRUE)
```

Visualizing the result

```
plot(poly_1$geometry,
     xlim = c(-1, 1),
     ylim = c(-1, 1))
plot(poly_2$geometry,
     add = TRUE)
plot(int$geometry,
     col = "lightblue",
     add = TRUE)
```



Further reading

https://geocompr.robinlovelace.net/gis.html

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2. Since we could also use **sf** to do the intersection (see also task 3), we will now compute the SAGA wetness index - an geoalgorithm unavailable in R. Calculate the SAGA wetness index of `data(dem)` using RQGIS. If you are faster than the others or if you have trouble using SAGA, calculate the slope, the aspect (and the curvatures) of `data(dem)` using GRASS through RQGIS.

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3. Optional: calculate the intersection of `poly_1` and `poly_2` with the help of `sf`, SAGA and/or GRASS (hint: overlay and `open_help`).
4. Optional: Select randomly a point from `random_points` and find all `dem` pixels that can be seen from this point (hint: viewshed). Visualize your result. Plot a hillshade, and on top of it the digital elevation model, your viewshed output and the point. Additionally, give `mapview` a try.