

# Importing and processing of Czech cadastral data using GRASS GIS and other projects



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## Abstract

The most frequent input GIS (*geographical information system*) data are *cadastral* data, building services, ZABAGED (i.e. Fundamental Base of Geographic Data) data or orthophotomaps. GRASS GIS[?] as a piece of Free Software (GNU GPL license) supports a huge range of external data formats especially in connection with implemented GDAL/OGR[?] library. Nevertheless, support of specific Czech data formats is practically missing.

## Background

*Czech land register information system* contains geographical data and official maps as well as survey data, property attributes, and fund documentation.

Cadastral data can be distributed in exchange data format[?] (VFK). VFK format is ASCII format which includes alphanumeric and graphical data.

## GRASS GIS



Figure: GRASS GIS logo

GRASS GIS is the famous and widely used Free Software/Open-Source GIS, used for data management, image processing, graphics production, spatial modelling and visualization of many types of data. It is released under GNU General Public License (GPL). GRASS is a powerful utility with a wide range of applications in many different areas of scientific research. GRASS is currently used in academic and commercial settings around the world, as well as many governmental agencies including NASA, NOAA, the National Park Service and many environmental consulting companies.

## GRASS module v.in.vfk

The GRASS module `v.in.vfk`[?, ?] allows user to create a GRASS vector map based on VFK data. It means that vector geometry is stored in GRASS native vector format and attribute data is held in a corresponding number of database tables linked to a vector map.

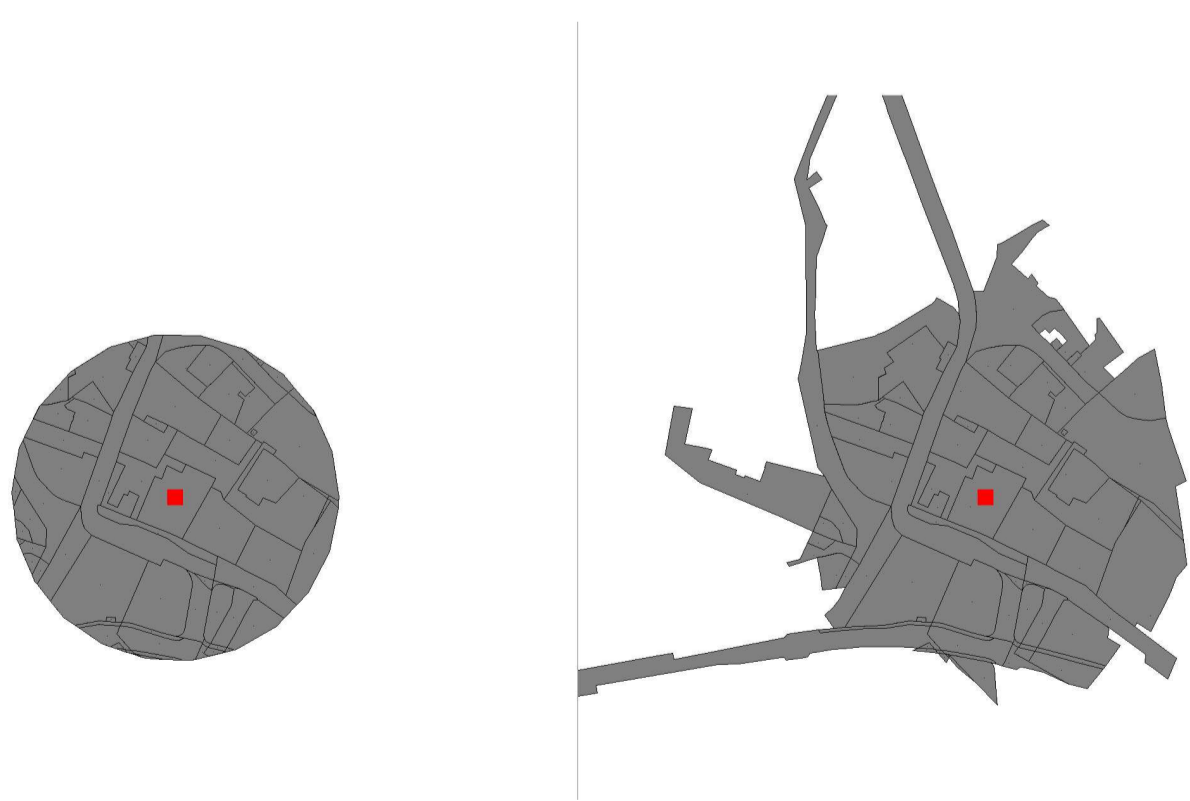


Figure: Parcels selection (100 meters from standpoint)

The module creates a new vector map layer in GRASS database (in native GRASS 6 vector format). Because of many improvements of the native vector format and vector architecture in GRASS 6 which have been done, the module works correctly only in GRASS 6.x. GRASS 5.x (or 4.x) cannot be used (due to its old vector architecture). Created output vector map layer covers vector geometry (stored in GRASS database structure) and a set of corresponding attribute tables (currently, only PostgreSQL database tables supported).

Output vector map layer contains number of thematic layers. For further data processing, it is necessary to split these thematic layers into a corresponding number of GRASS vector map layers. A map produced by module `v.in.vfk` is not topologically correct – contains many duplicate lines, boundaries, centroids or areas without centroids, etc. An user has the possibility to use the special script called `v.vfk.extract` which extracts required thematic layer from the map and creates a new vector map layer in the GRASS database.

## Importing, processing and analyzing of cadastral data in GRASS GIS

We choose appropriate GRASS location and mapset (or we can create a new one). The coordinate system of this location has to be S-JTSK (Czech coordinate system used for civil maps). We also have to set required connection to the database (see GRASS module `db.connect`). As we know, only PostgreSQL database system is supported. For example, we set up the connection to PostgreSQL database "iskn" (we have already installed this database system and set up the access permissions):

```
GRASS: > db.connect driver=pg database=iskn
```



Figure: Composition of four fundamental thematic layer

Now, we are able to start the import of VFK data into chosen GRASS location/mapset. There is a simple example – input file (in VFK format) is "Exportvse.vfk", name of the output vector map layer in GRASS database is "bylany" and all vector types will be imported:

```
GRASS: > v.in.vfk in=Exportvse.vfk out=bylany
```

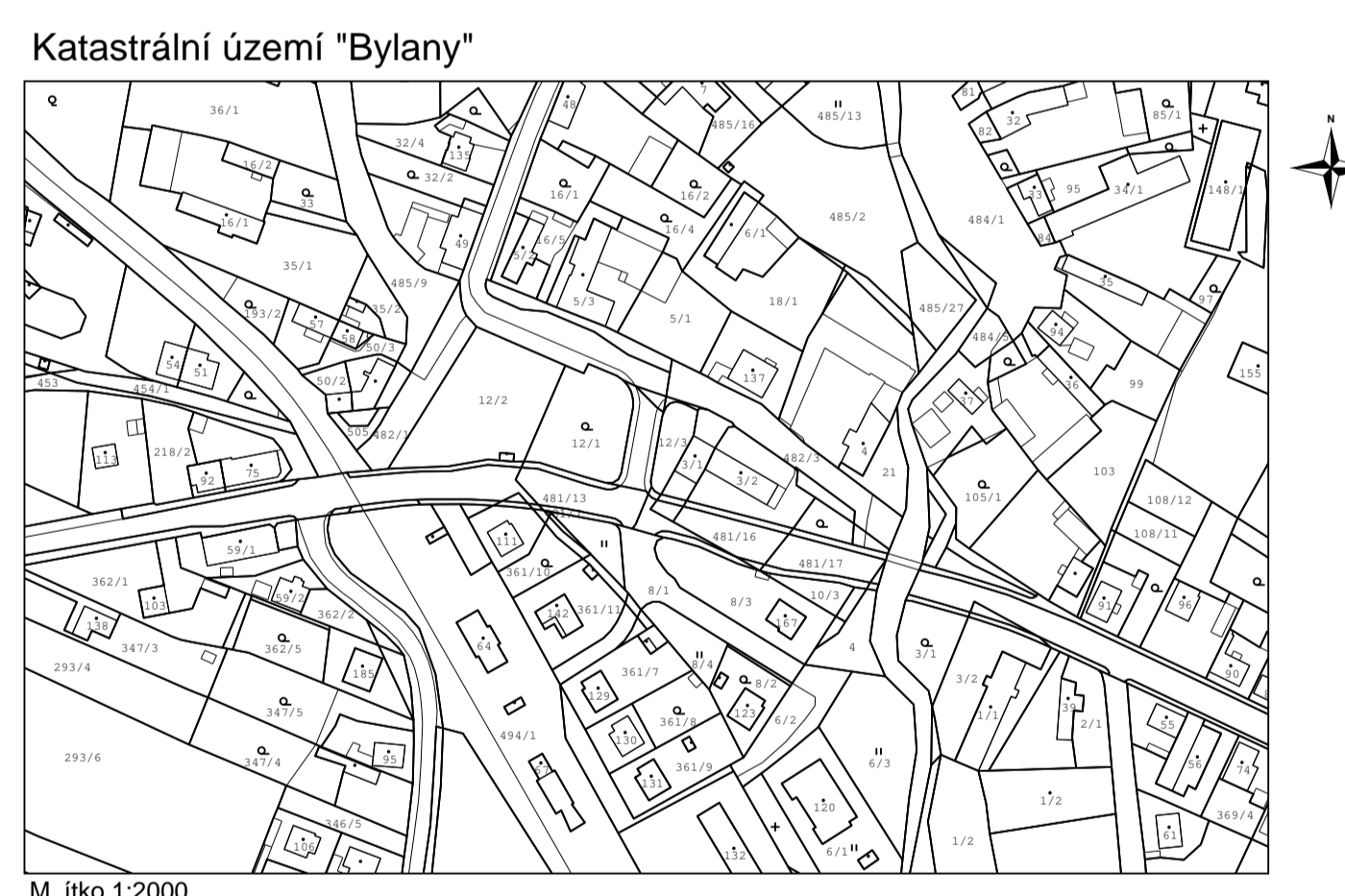


Figure: Hardcopy map output created by ps.map

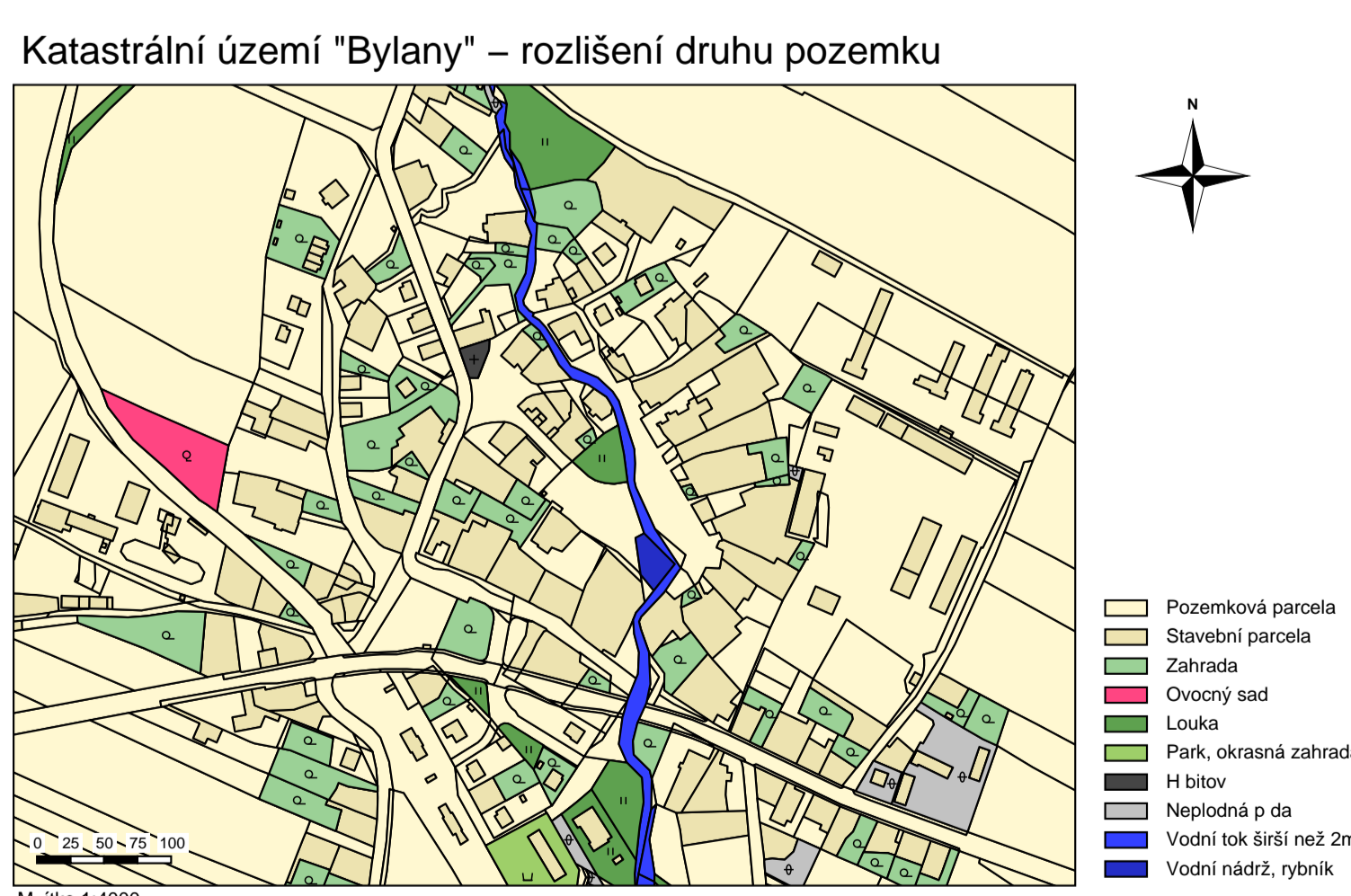


Figure: Hardcopy map output produced by ps.map - land types

## The future development and conclusion

The most of Free Software GIS (including GRASS GIS, QGIS, etc.) are using GDAL/OGR library (translator library for raster/vector geospatial data formats) for reading/writing of external formats.

A better solution would be to implement support of VFK format in GDAL/OGR. As a result, software packages which use the library (e.g. GRASS GIS) will be enable to read (and optionally write) VFK data without need of special module or plug-in.

## GRASS GIS metadata management analysis

GRASS GIS currently does not support any international metadata standard. Moreover the level of ability to handle more structured and sophisticated metadata is relatively low.

The result of the project (research grant no. CTU0604711) will be a new extended (following the ISO standard) metadata model implemented in GRASS GIS.

## Automated georeferencing of cadastral maps

The project slightly relates with digitalization of the Czech land register. Currently, a huge number of analog cadastral maps are scanning. Operators manually identify reference points (map corners) which are necessary for future georeferencing of the maps.

In the frame of the project will be developed an application which supports automated identification of the reference points.

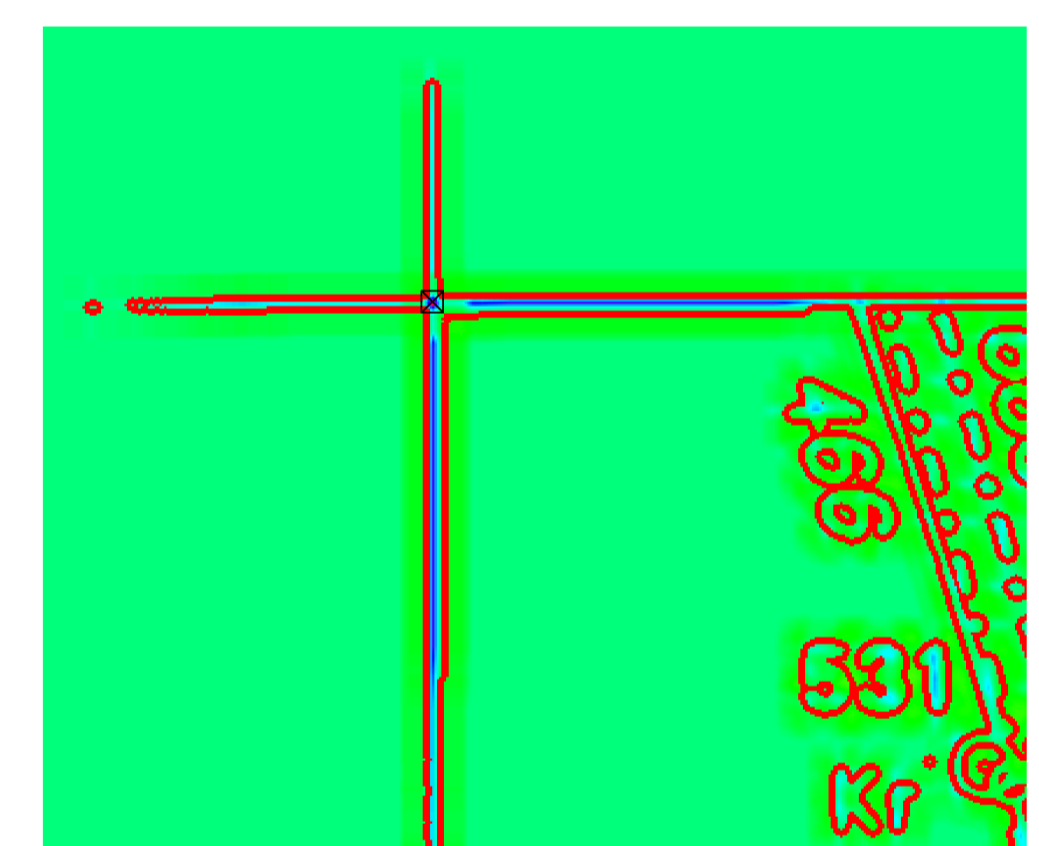


Figure: Automated georeferencing of cadastral maps

## References

- [1] Structure of Czech cadastral exchange data format (only in Czech)  
[http://www.cuzk.cz/GenerujSoubor.ashx?NAZEV=10-STR\\_VF\\_PLNE\\_ZMENI\\_PDF](http://www.cuzk.cz/GenerujSoubor.ashx?NAZEV=10-STR_VF_PLNE_ZMENI_PDF)
- [2] GRASS GIS  
<http://grass.itc.it>
- [3] Implementation of a GRASS module for importing data in Czech cadastral exchange data format (master thesis, only in Czech)  
<http://k153-85.fsv.cvut.cz/~martin/dp/martin.landa-thesis.pdf>
- [4] GRASS module `v.in.vfk`  
<http://k153-85.fsv.cvut.cz/cgi-bin/viewcvs.cgi/grass6/vector/v.in.vfk/>
- [5] GDAL/OGR library  
<http://www.gdal.org>