McSteel. User's manual

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Contents

1 Introduction

Here will be general description of McSteel and its components. Also short review of the software's feasibility.

2   Requirements

McSteel is running only under Windows OS. Software was created and tested with Windows 10 Professional Edition. In the future Unix version will be available.

McSteel is a set of Python scripts. Python 3.7 or higher are required. The software has been tested with v3.7.0, v3.7.1 and v3.8.0. If you notice any bugs in later versions, please inform authors of McSteel raising a GitHub issue. You can download Python from `https://www.python.org/downloads/`.

Essential software packages for McSteel to be run are listed below:
1. McOZone (multi_zone) - full package
`https://github.com/kowalskiw/multi_zone`
2. SAFIR - demo version at least
`https://www.uee.uliege.be/cms/c_4016386/en/safir`
3. GiD - demo version at least
`https://www.gidhome.com/`
4. McSteel - full package
`https://github.com/kowalskiw/mcsteel`
5. text editor (i.e. Vim or Notepad++)

3 Running simulation

```
-simulation_dir/
 ├config/
 │ ├frame.gid/
 │ ├section1.gid/
 │ ├section2.gid/
 │ ├sim_name.cel
 │ ├sim_name.ful
 │ ├sim_name.geom
 │ ├sim_name.mat
 │ ├sim_name.op
 │ ├sim_name.par
 │ ├sim_name.str
 │ ├sim_name.xel
 │ └sim_name.user
 └results/
   ├details/
   │ ├sim1544xxx.out
   │ ├sim1544xxx.ozn
   │ ├sim1544xxx.pri
   │ ├sim1544xxx.stt
   │ ├sim1544yyy.out
   │ ├sim1544yyy.ozn
   │ ├sim1544yyy.pri
   │ └sim1544yyy.stt
   ├sim1544xxx/
   │ ├frame.gid/
   │ ├section1.gid/
   │ ├section2.gid/
   │ └LOCAFI.txt
   ├sim1544yyy/
   │ ├frame.gid/
   │ ├section1.gid/
   │ ├section2.gid/
   │ └LOCAFI.txt
   ├dist_d.png
   ├dist_p.png
   ├sim_name.ozn
   ├results.txt
   └stoch_res.csv
```

Figure 1: Simulation directory structure.

McSteel is software package containing few partially-independent scripts. Some of them like i.e. McOZone's *chart.py* or McSafir's *fd-safir.py* scripts are able to work outside the package. You can also use McOZone or Mc-Safir only. McSteel gather all this scripts together and enable to reduce user involvement to projecting and setting up the configuration.

Therefore, this chapter treats of step by step instruction how to set and conduct simulation using McSteel components.

3.1 Directories tree

Structure of directories and file's content is precisely defined. Rules presented below should be respected in every step of analysis. Figure 1 shows the tree of simulation directory. Warm-colored elements need to be created by user (red - on his own, orange - using GiD). Blue-colored files and directories are created by McOzone, and respectively green ones by McSAFIR.

Main directory consists of two others: *config* and *results*. The first one, with its whole content, is required to set up the simulation. Directories with *.gid* extension should created using GiD (orange-colored). User specifies structure's geometry and properties (*frame.gid*), sections' geometry and properties (*section1.gid* and *section2.gid*). This files will be used to conduct FEM analyses ~~and export as geometry as properties of construction to McOZone's files~~ (not implemented yet). Red-colored files should be created on user's own in text editor. These are McOZone's configuration files and contains data needed to conduct multisimulation.

3.2 Creating model (GiD)

3.3 Multisimulation (McOZone)

3.4 Preparing ISO FEM analysis (SAFIR via GiD problem-types)

3.5 FEM analises (McSAFIR)

4 Results and visualization