Notes on NETGEN

NETGEN[1] is an automatic 2D and 3D mesh generator which can be downloaded from `http://sourceforge.net/projects/netgen-mesher/files/netgen-mesher/`. All comments that follow relate to the 5.3 version of this software and its use in this class.

Main documentation. The main documentation of the software is located in the `doc` folder in the root directory of the installation.

Input files. The geometry of the domain to be meshed is described in input files formatted so that they can be read by the software. Several illustrative example `.IN2D` files for 2D domains and `.geo` files for 3D domains are available in the `tutorials` folder in the root directory of the installation. The appropriate formatting is addressed in the main documentation file.

Meshing. Here are the main steps to mesh a given domain.

- Open the input file via File → Load Geometry....
- Select some meshing or refinement options (see below).
- Generate the mesh via the Generate Mesh button or Mesh → Generate Mesh
- Select the appropriate filetype via File → Export Filetype... :
  - 2D meshes: Gmsh Format
  - 3D meshes: Abaqus Format

  before exporting the mesh.
- Export the mesh in the folder of your choice via File → Export Mesh....

Meshing options. Some initial meshing options are available via Mesh → Meshing Options.... Some useful features are:

- General tab:
  - Mesh granularity: global aspect of the mesh. Choose "user-defined" to allow further controls.
  - Second order elements: check for quadratic elements.
- Mesh Size tab: Some further controls on the mesh size if the "user-defined" granularity is chosen.
  - max/min mesh-size: minimum and maximum element size.
  - mesh-size grading: grading of element sizes between most and lesser refined regions.
  - Elements per curvature radius: number of element per radius of curvature unit for curved regions.
  - Elements per edge: number of element per edge unit for the domain edges.

Mesh refinement. Simple global mesh refinement can be conducted by splitting all existing elements via Refinement → Refine uniform. Finer refinement options are also available but not necessary for this class. They are addressed in the main documentation.

References

[1] Schöberl, J. 1997. Netgen an advancing front 2d/3d-mesh generator based on abstract rules. *Computing and Visualization in Science* 1, 41–52.