

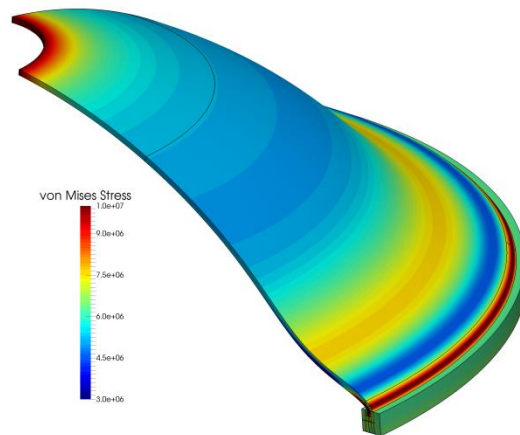
# Curved all Quad/Hex mesh generator based on frame fields

## Setting:

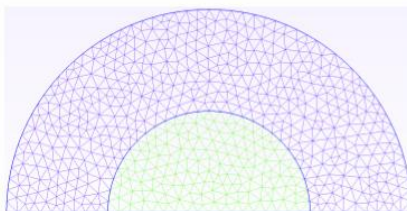
- High-order finite elements (p-FEM) benefit from large, smooth, quad/hex elements
- Pure quadrilateral and hexahedral meshes are either constructed by hand or using methods designed for special geometries (e.g. shell-like structures). **Automatic generation is a difficult task.**

## Project Characteristics

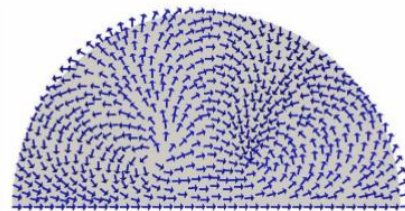
Modeling: ★★★★★  
Mathematics: ★★★★★  
Programming: ★★★★★



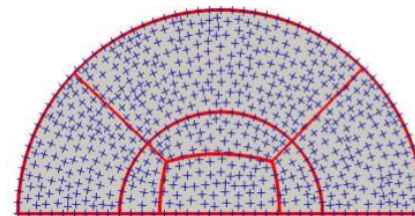
- A recent approach: directionality (frame) fields [1]



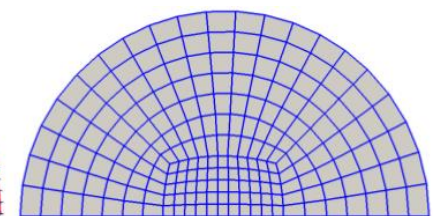
a



b



c

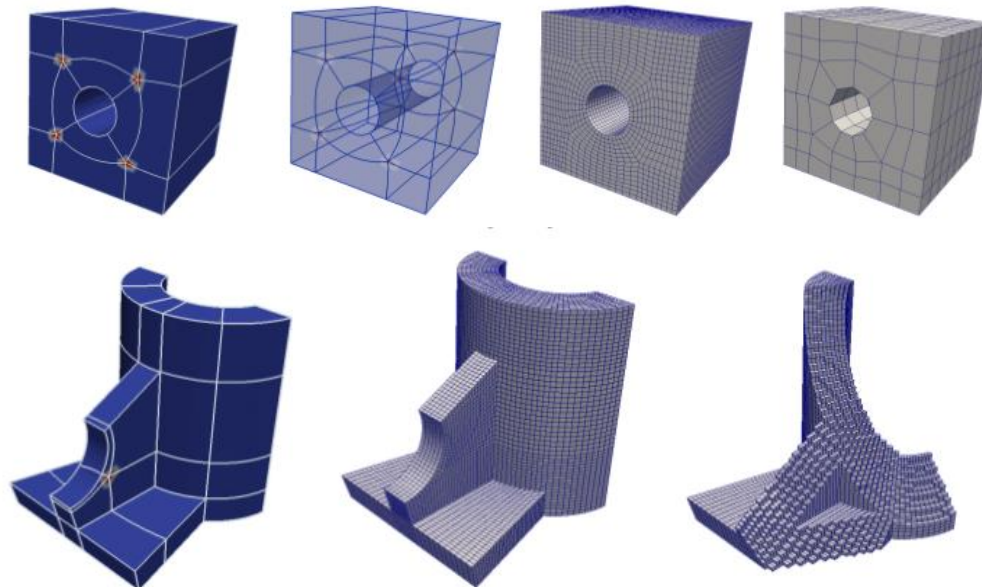
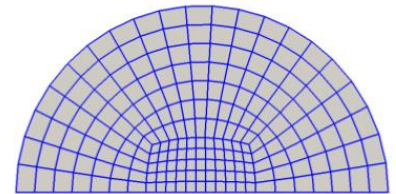


d

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### Task:

- Implement the 2D version of the algorithm [1], delivering quad meshes for p-FEM computations
- Extend the mesh generator to 3D hex meshes [2]
- Recommended language: Python



### References:

[1] Kowalski, Nicolas, Franck Ledoux, and Pascal Frey. "A PDE based approach to multidomain partitioning and quadrilateral meshing." Proceedings of the 21st international meshing roundtable. Springer Berlin Heidelberg, 2013. 137-154.

[2] Kowalski, N., F. Ledoux, and P. Frey. "Block-Structured Hexahedral Meshes for CAD Models using 3D Frame Fields." Procedia Engineering 82 (2014): 59-71.