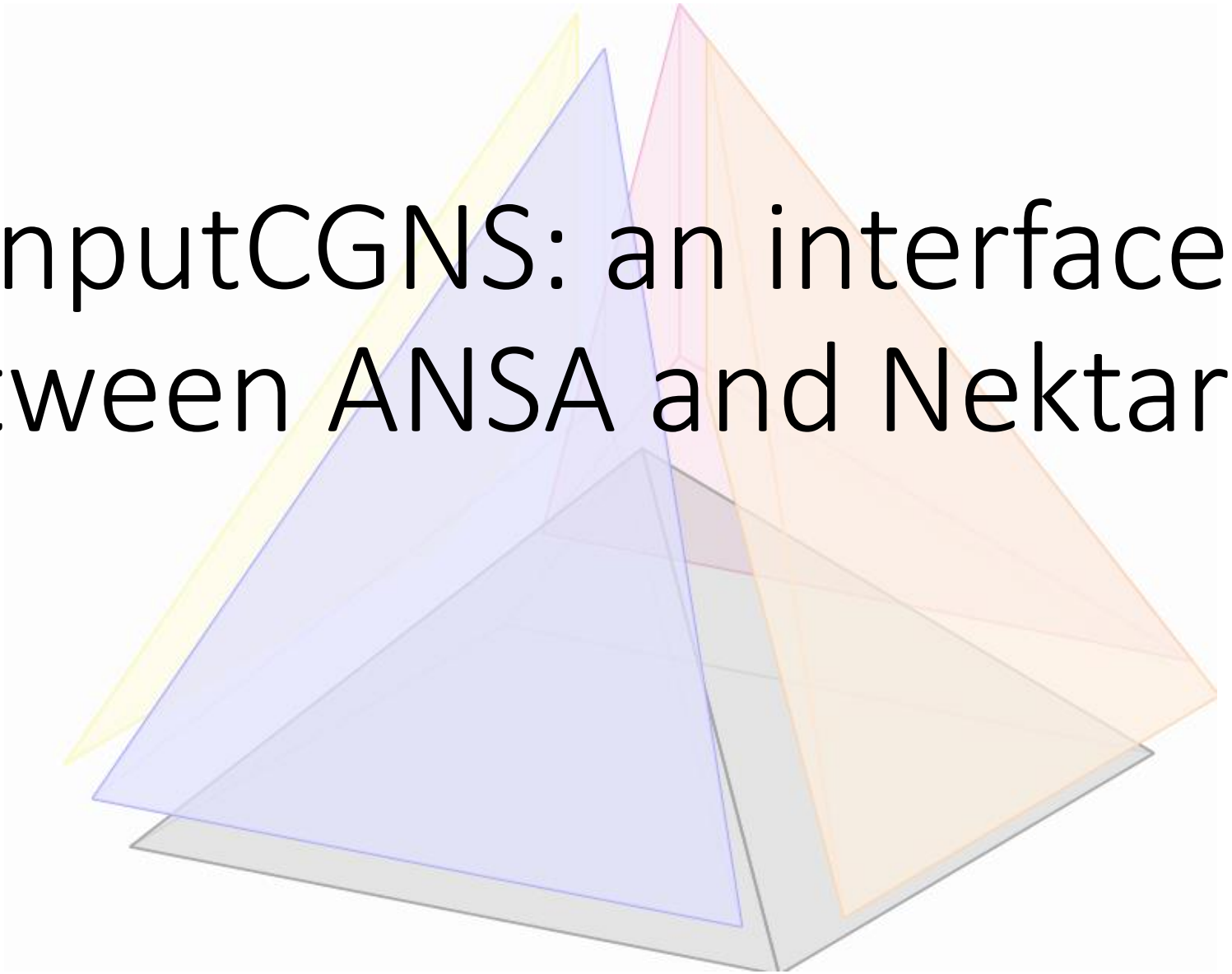
InputCGNS: an interface between ANSA and Nektar++



What?

- A NekMesh Input Module for .cgns files

```
./NekMesh /path/to/mesh.cgns /path/to/mesh.xml
```

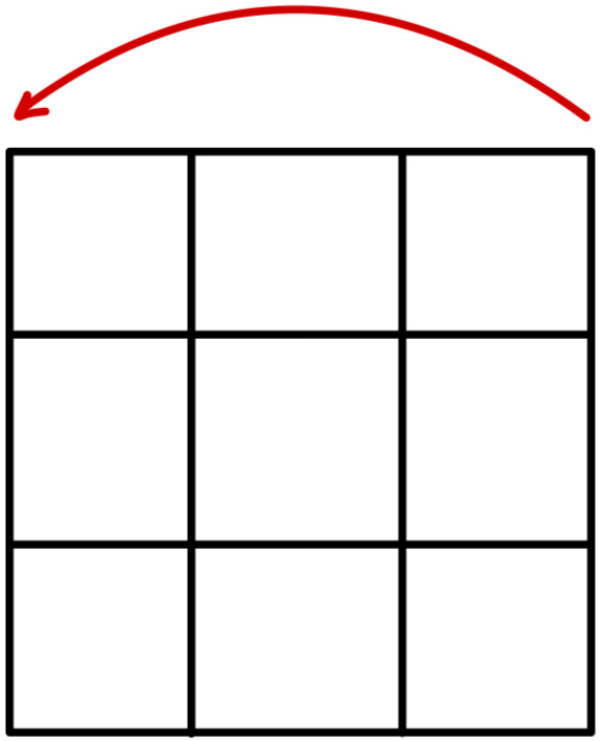
- Supports all 2D and 3D element types that ANSA can produce (Tri, Quad, Tet, Pyra, Penta & Hex, orders 1-4)
- Works for most* meshes

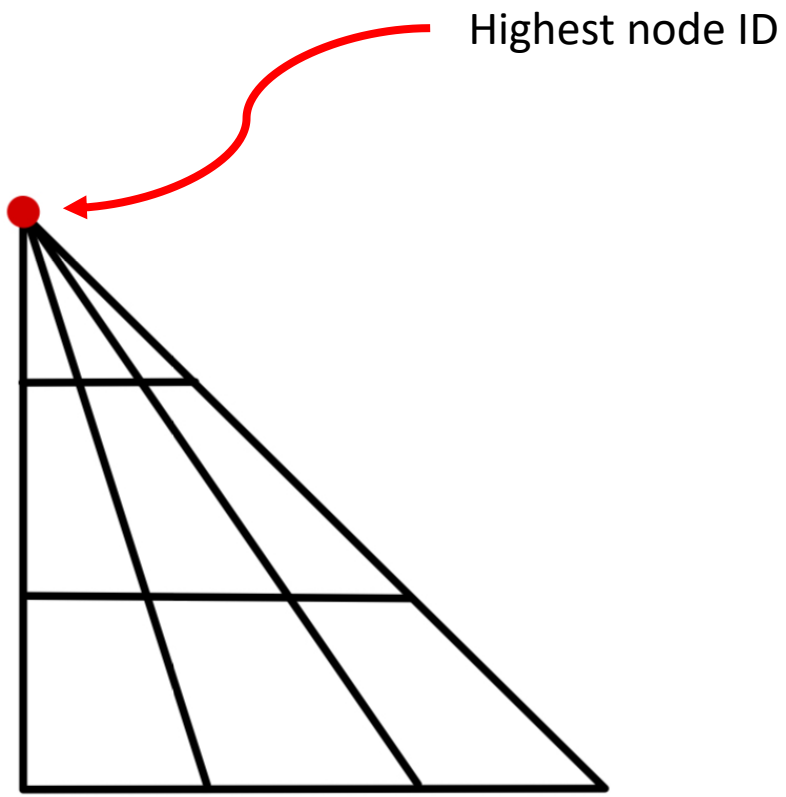
- (Plus developer docs for NekMesh and an expansion of InputCCP)

Key NekMesh Concepts:

- Collapsed points
- Interface, Prism and Pyra Rules
- Impossible cases

Collapsed points





Alternative Coordinate System (Natural coordinates)

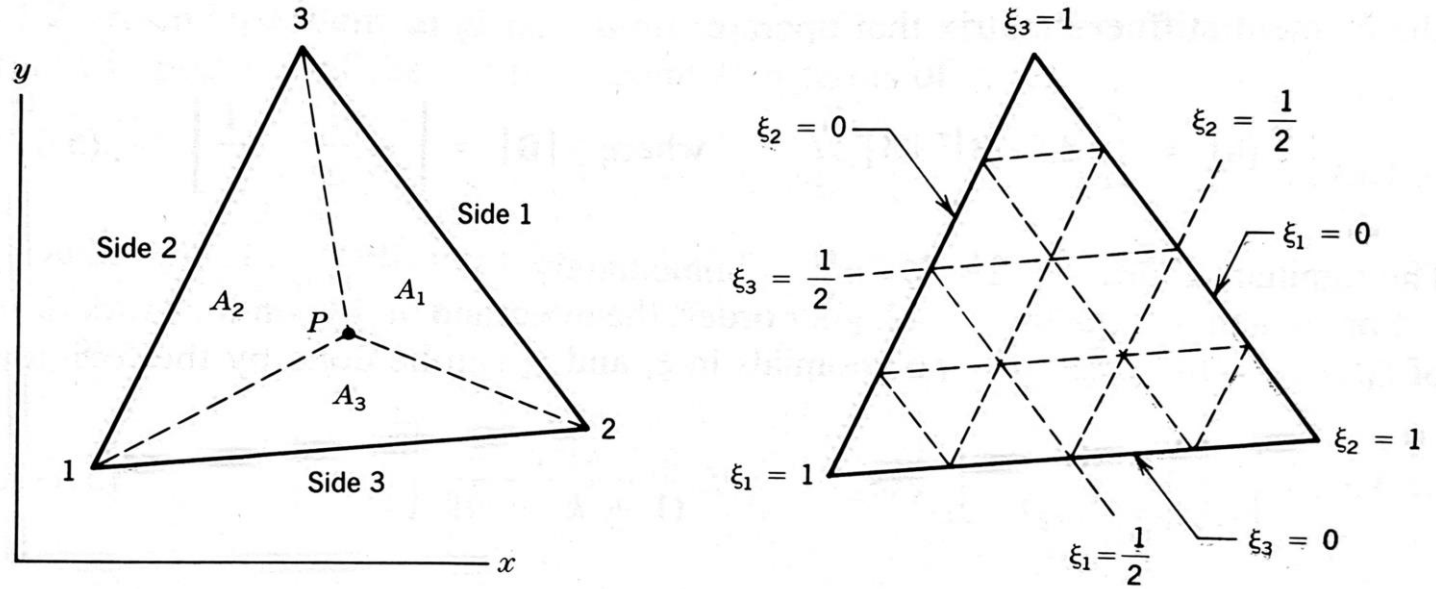
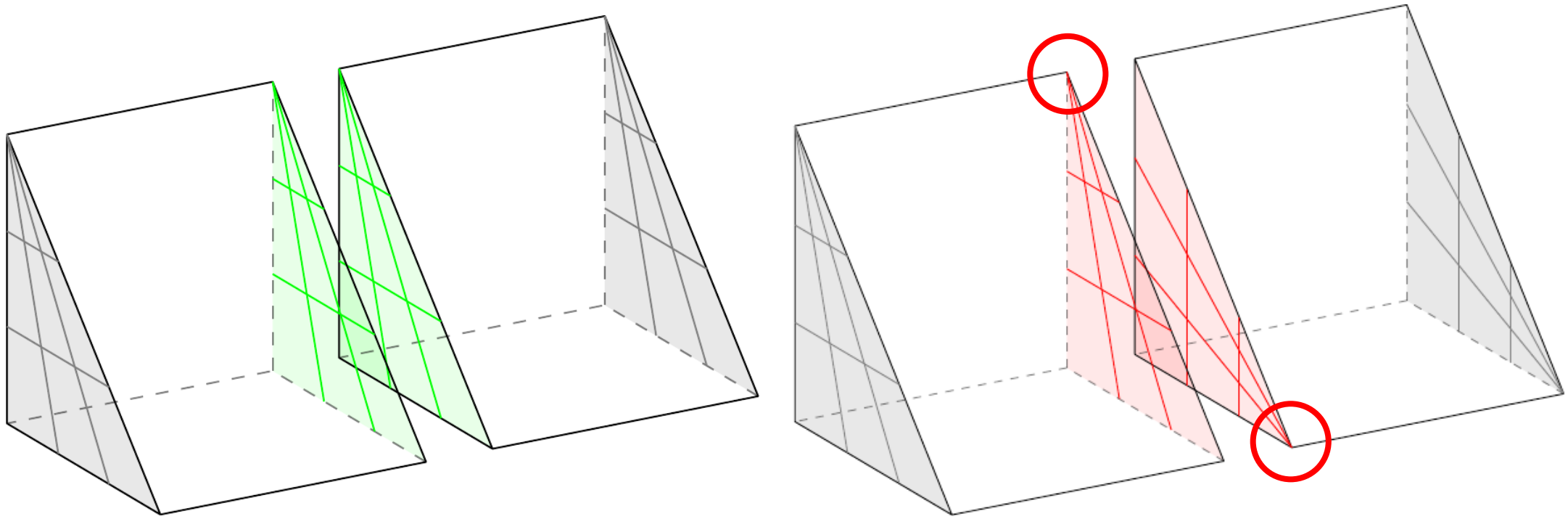


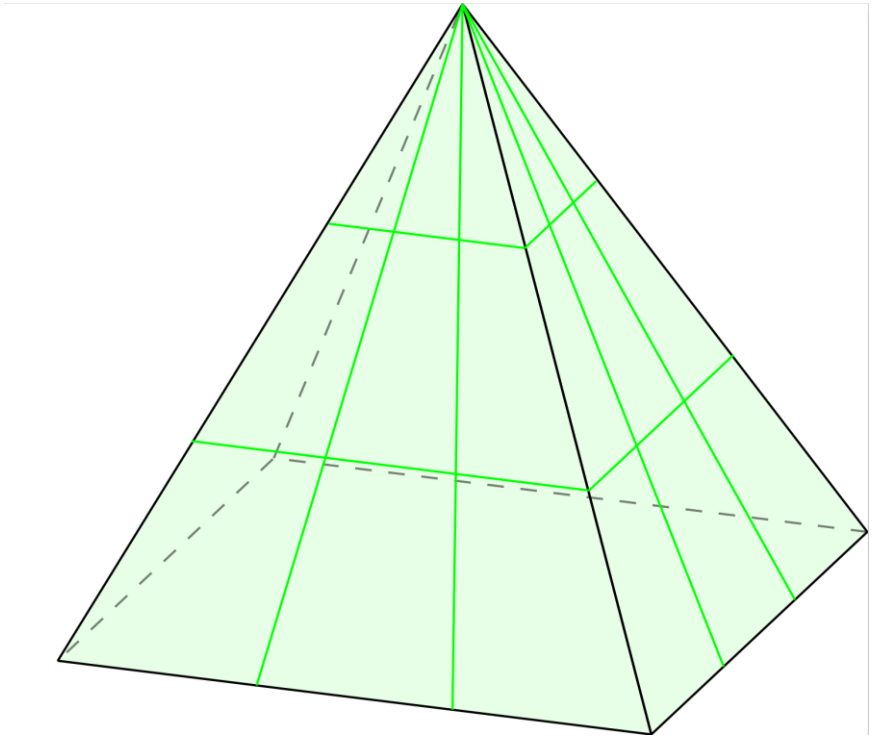
Figure 5.2-1. Natural (area) coordinates for a triangle.

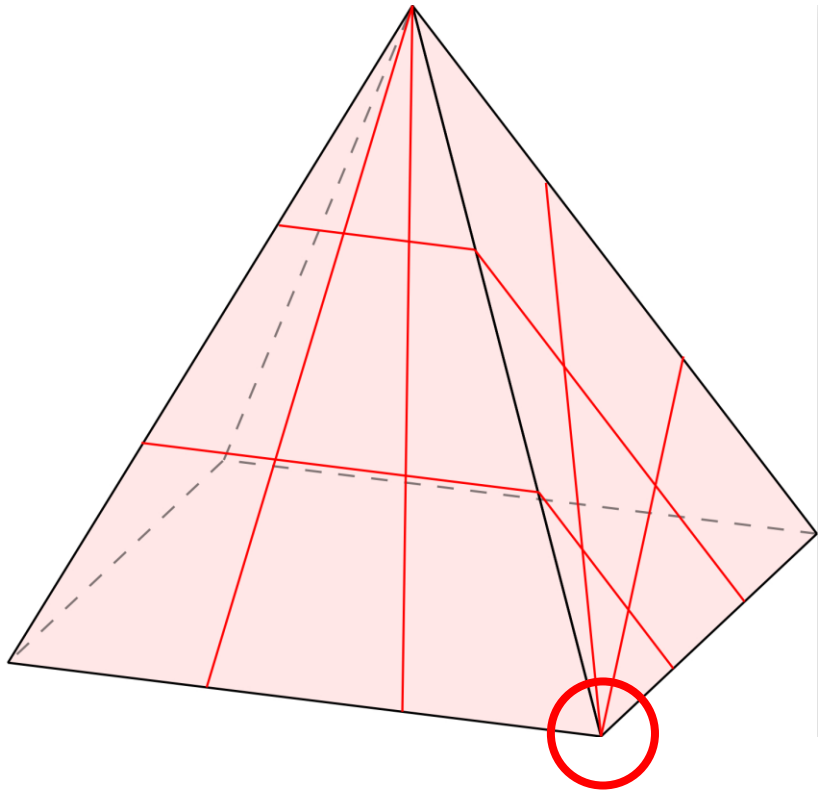
https://leancrew.com/all-this/2022/12/triangles-and-area-coordinates/

0: Triangular Interface Rule

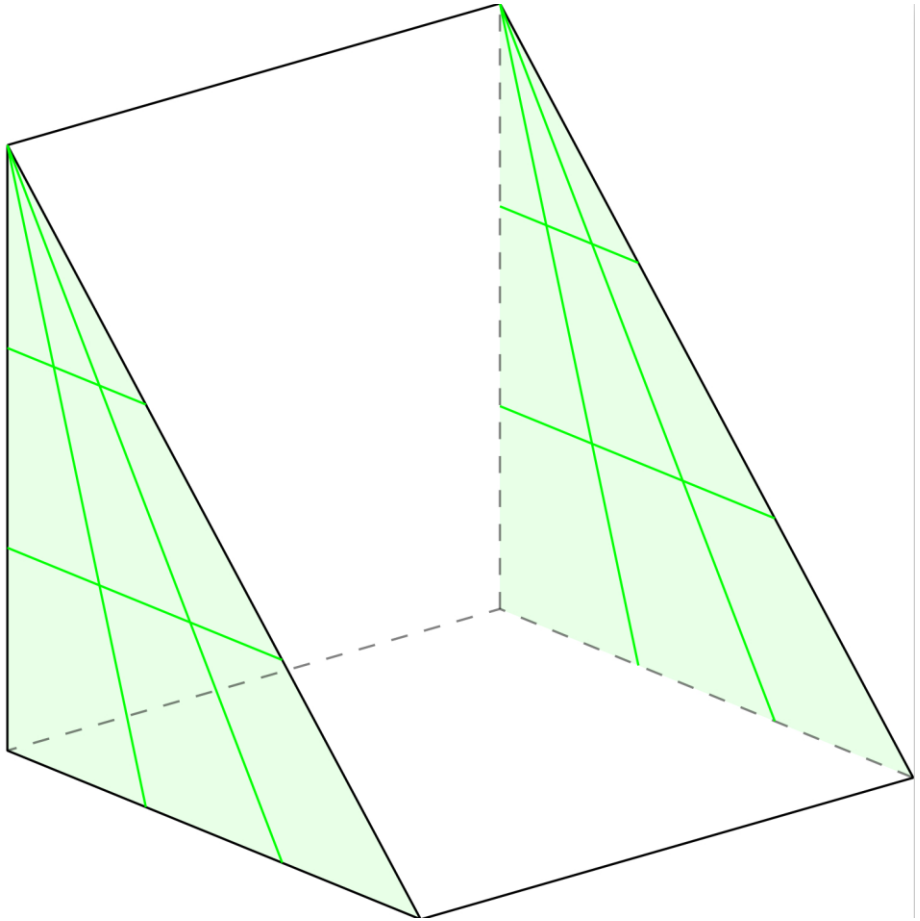


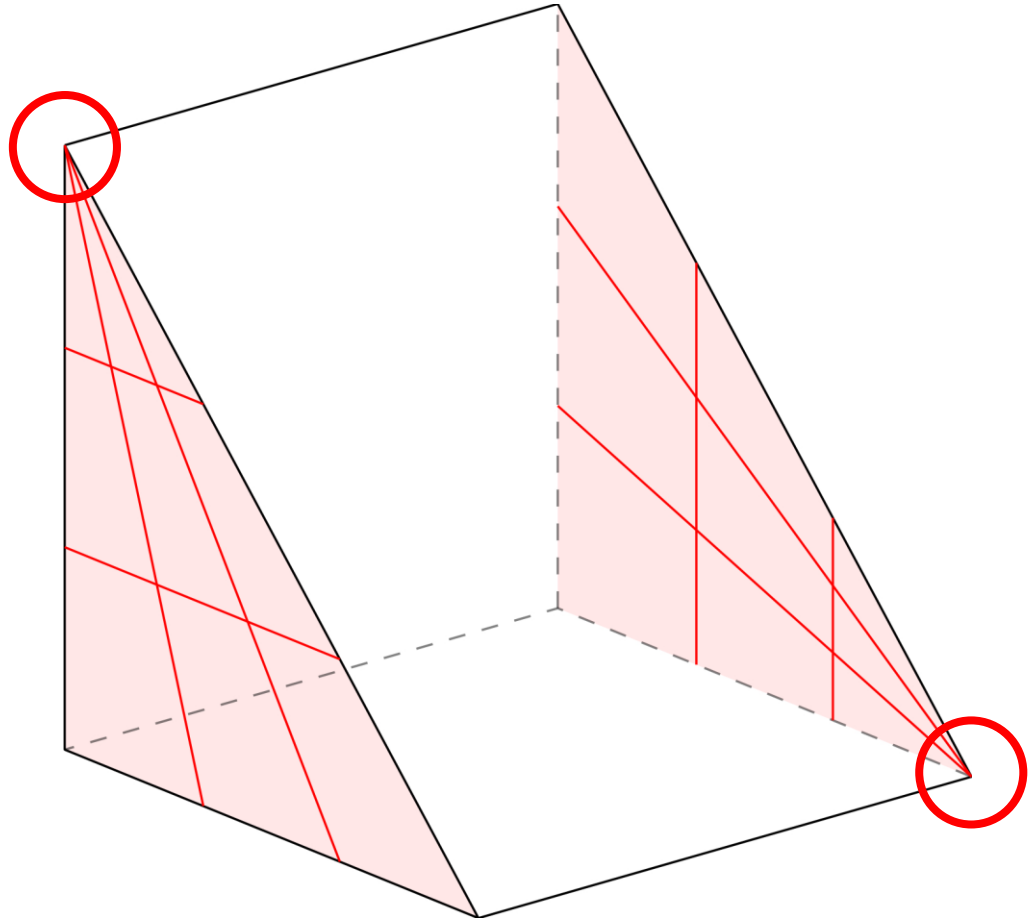
1: Pyramid Rule



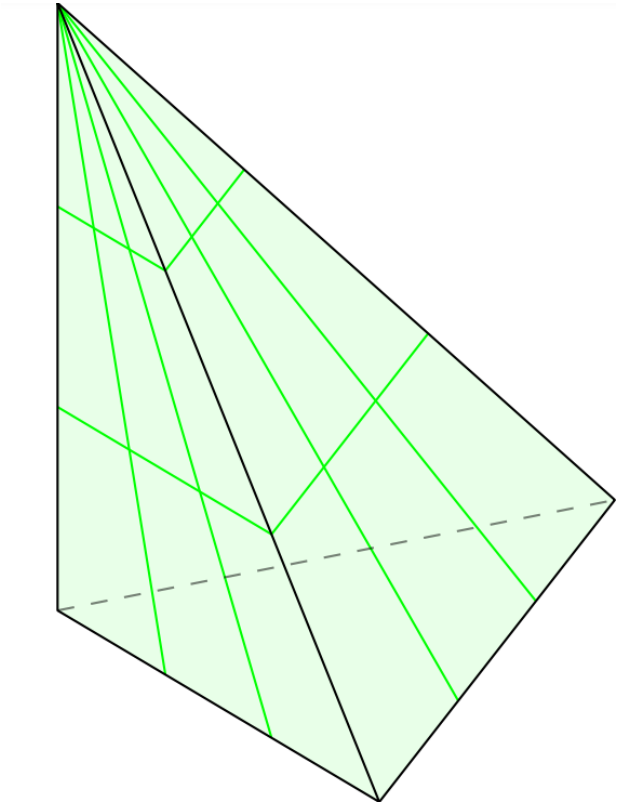


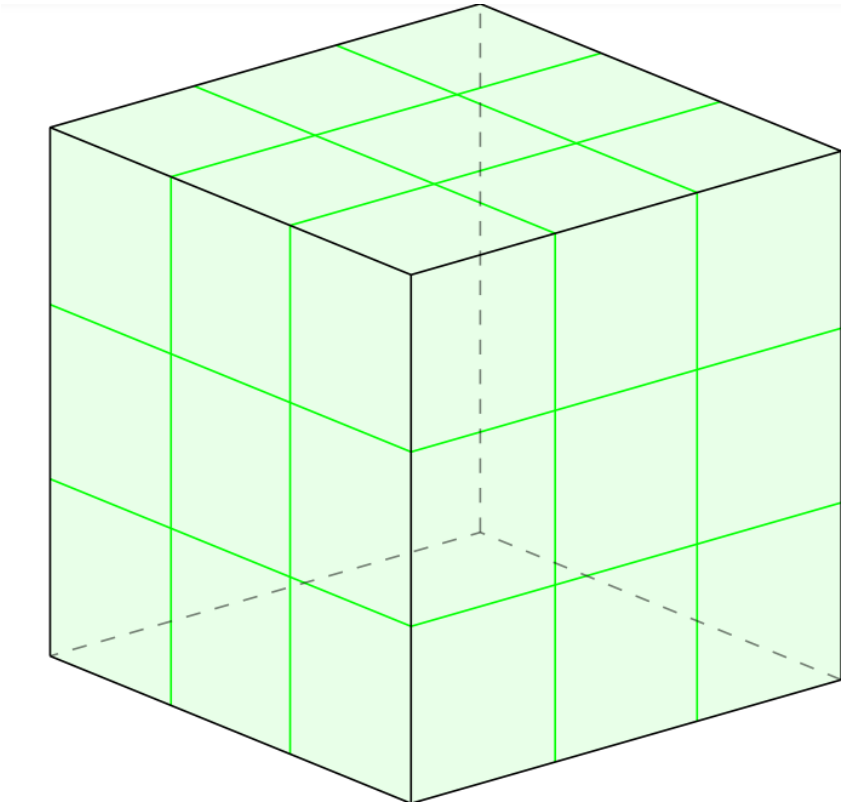
2: Prism Rule



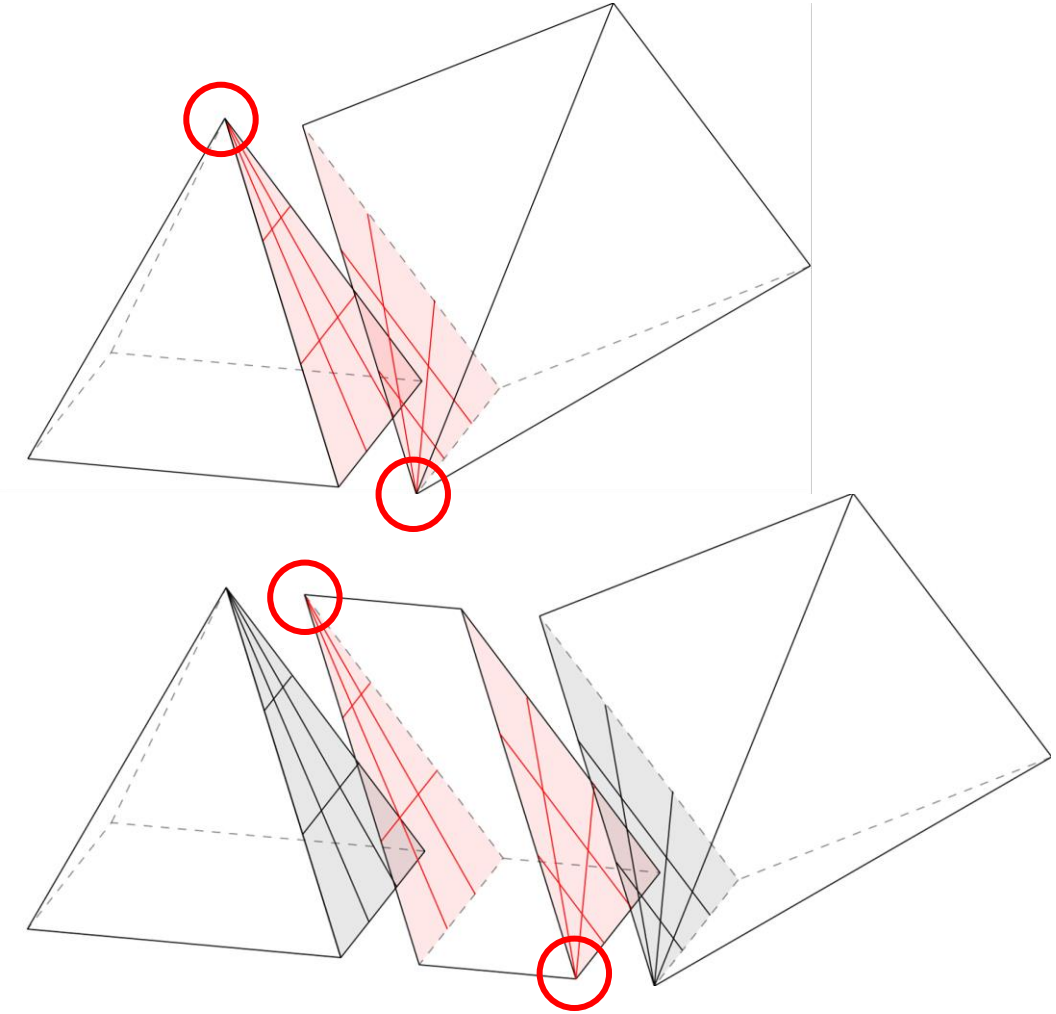


No node ordering rule for tets/hexes

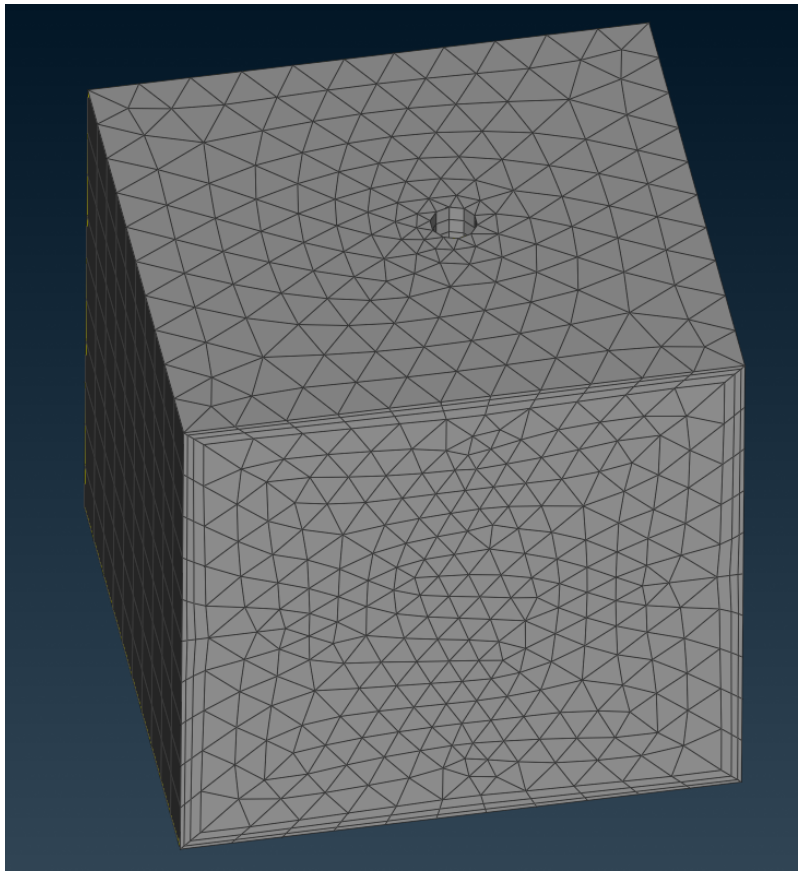


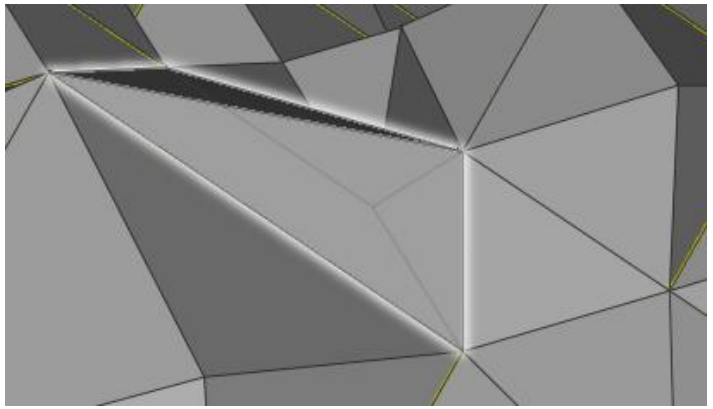


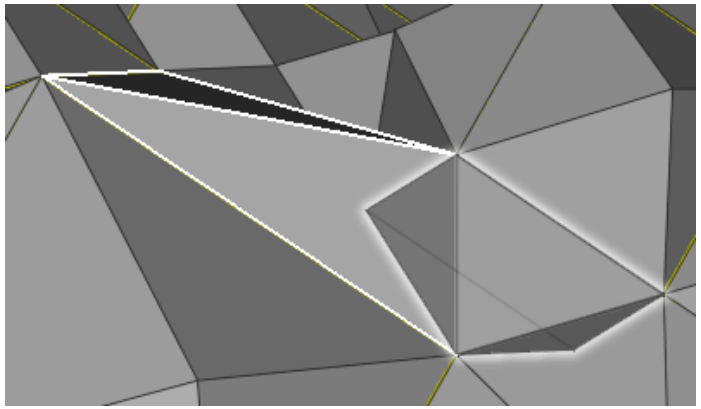
Impossible Cases



HiOrderSample_v23.cgns

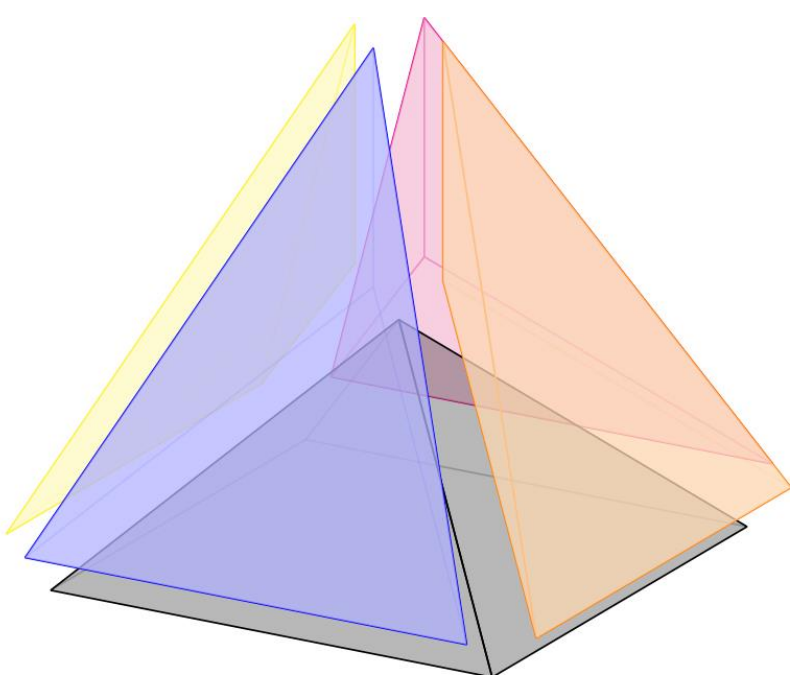


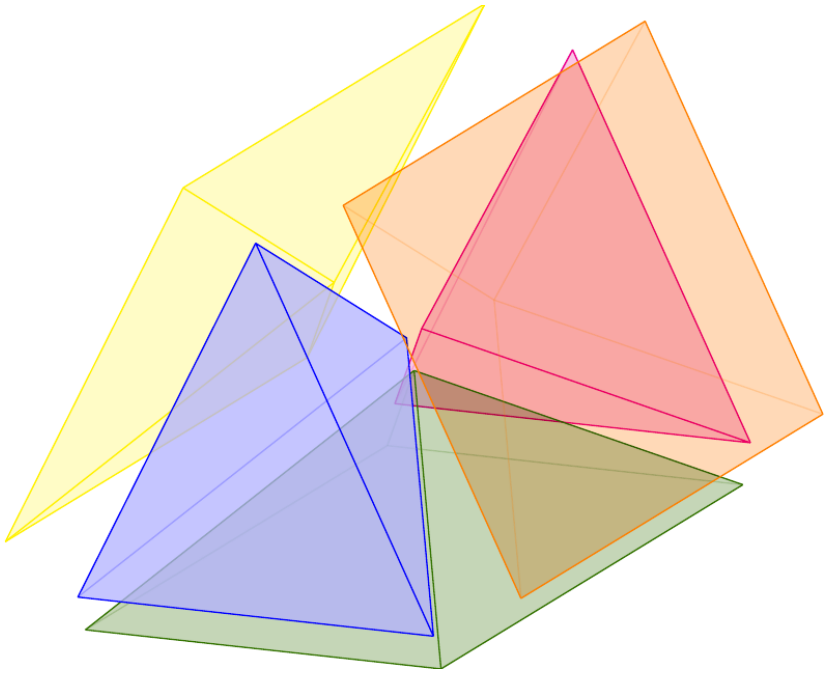




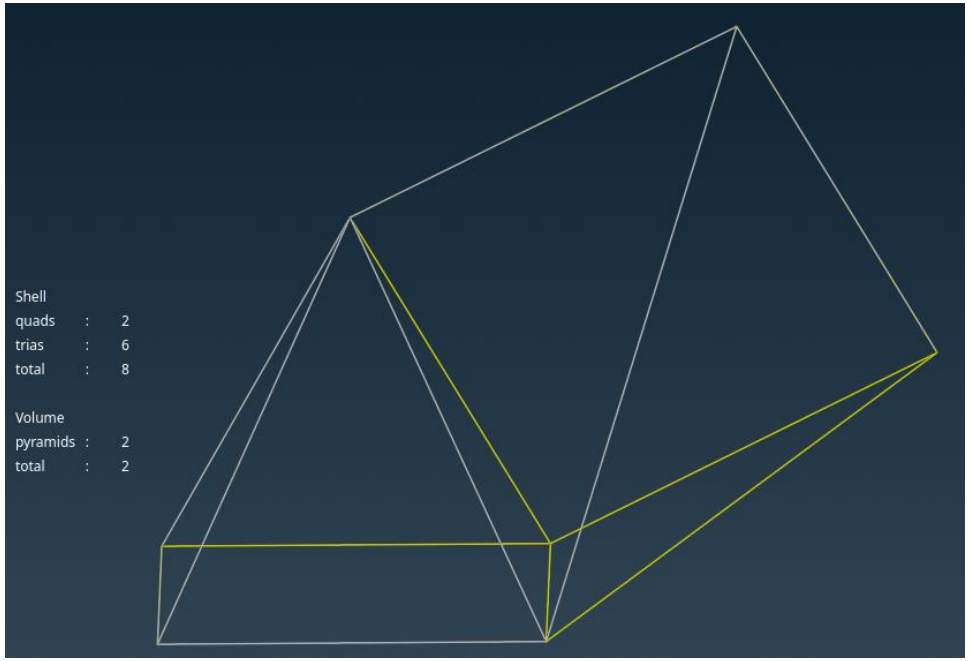
Solution?

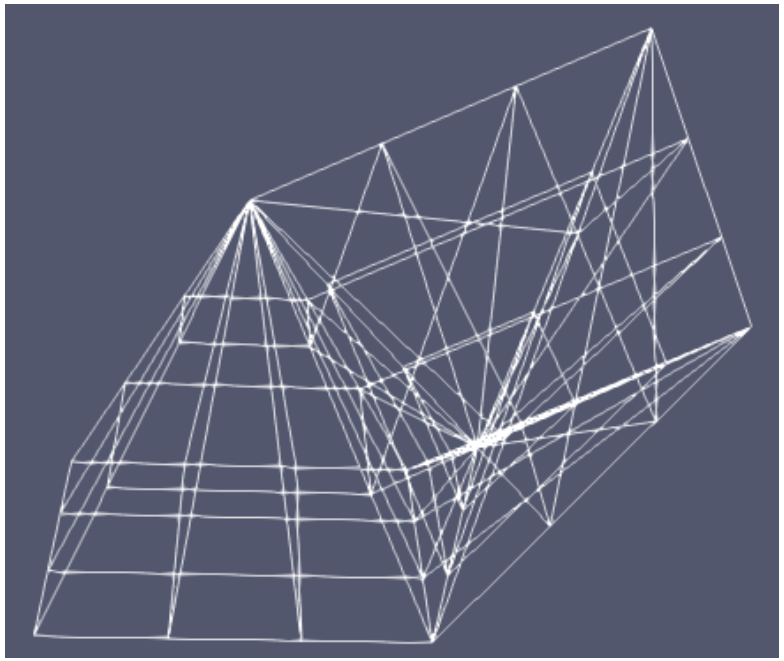
1. Algorithm to attempt the node ordering
2. Alter the mesh to eliminate impossible cases





Example implementation





Questions

- Can any of the ‘problem cases’ be guaranteed not to happen?
  - removes the need to alter the mesh
- Alternate solutions to the problem cases?
- Is HighOrderSample_v23.cgns a representative mesh? / What kind of meshes to expect?