Mesh and Computational Geometry
Master 2 Informatique ID3D + Centrale – 2025-26
Raphaëlle Chaine

TP1 – Data Structures for Meshes

Create a mesh data-structure in C++

1) Implement the triangulated mesh data structure with geometry and connectivity information.
- First, you model a mesh by a vector of its vertices and a vector of its faces. In this first model, the faces are not “attached” together. They are simply represented by the indexes of their 3 vertices.
- Then you write the data structure corresponding to the topological model based on vertices and sewn-together faces that we saw in class. In this model, the faces are attached together.

2) Construction of elementary meshes to check your data structures.
- A tetrahedron (be careful when attaching the faces together)
- A pyramid with a square base
- A 2D bounding box (composed of 2 triangles) whose edges are connected to an artificial “infinite” vertex at the back.

3) Write a routine to save a mesh in a file, using an OFF format :
```
OFF
Number of vertices s
Number of faces c
Description of the faces (sequence of indexes of the
vertices of the face, preceded by its number of
vertices).
```

4) Read and load, in your mesh data structure, a triangulated mesh written in an OFF format. This is not straightforward since the connectivity between the faces is not provided by the OFF format.

Ensure that you implement a careful software approach.

Open and visualize a mesh stored in a off file

You can use an existing viewer :
- Install the 3D model viewer meshlab.
- Visualize the mesh queen.off.

You can even find online viewer such as 3dviewer.net

You can develop your own viewer with an associated GUI using Qt. You can also use the Gkit library you use with JC Iehl.

For those who feel uncomfortable with C++ Programming

Getting started with C++ : Open and run a C++ example file

Open the file LaClasseStart.cpp and try to predict its behavior.
Compilation with the command

```
g++ -std=c++17 -Wall LaClasseStart.cpp -ovasy
```

Run the execution file ./vasy and understand the differences with what you expected.