

# Skeleton and level set for tubing

Cédric Galusinski, Université du Sud - Toulon - Var

Flow simulations in complex tubings oblige firstly to define the geometries in a simple and fast manner. Our goal is to define the geometry by a level set function. The applications are flow simulations in microchannel and blood vessels. For such applications, geometries are not simple tubes but junctions of tubes.

The mathematical notion of skeleton is well adapted to describe tubing. The skeleton is linked to the signed distance level set function describing the geometry, it is the set of points where the gradient of the distance function is singular.

Additional informations attached to each point of the skeleton allow to construct the level set function defining the geometry. Furthermore a natural velocity field (poiseuille-like flow) is easily defined from the skeleton. It allows to define boundary conditions for the flow. Diameter and skeleton's direction are the two main additional informations for such a construction of the geometry and the velocity boundary conditions.

Three points will be tackled:

- the skeleton construction from 2D view of a planar geometry, the induced 3D tubing construction, with different types of tube section.
- the skeleton shape optimization for 3D imagery of vessel reconstruction (PhD project).
- viscus flow simulations in complex tubing.