

## **An approach to LEM modeling: construction, collision detection and dynamic simulation**

### **Abstract**

This paper presents an approach to apply the long element method (LEM), a new method for physically based simulation of deformable objects, to a general polygonal mesh. The LEM is suitable for real time simulation and virtual environment interaction. The approach implements a static solution for elastic global deformation of objects filled with fluids based on Pascal's Principle and the volume conservation. The volumes are discretised into long elements, defining meshes several order of magnitudes smaller than tetrahedral or cubic meshes. We show how these volumes are constructed when the method is applied to a general mesh. We also propose a method for collision detection when two such objects interact. Finally, we show how we can perform dynamic simulation when the physics of the objects are modeled using bulk variables: pressure, density, volume and stress. This approach is particularly interesting for real time simulation of soft tissue undergoing small deformations.

**Keywords** — Computer simulation, deformation, mathematical models, numerical analysis, virtual reality.