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Physically realistic simulation of large deformations using LEM for interactive applications

Abstract

This paper presents the modification to LEM - Long Element Method to simulate large deformations. We are interested us deformable objects filled with some incompressible fluid By large deformations, we mean deformations such as stretching, bending and twisting which involves the entire body, in contrast to poking or pinching which relatively covers a small region of the deformable object. We make use of Pascals's Principle and volume conservation as boundary conditions to obtain a static solution due to an externally applied pressure. We believe that the state of such an object is a result from effects of the surface tension (generally in any direction) and the pressure of the internal fluid (normal to the surface). By allowing such liberty, large deformations such as stretching, bending and twisting can be simulated without much change to the initial formulation of the physical model. This approach is particularly interesting for real time quasi-dynamic simulation of well damped soft tissue. This paper presents the modification to LEM-Long Element Method to simulate large deformations. We are interested us deformable objects filled with some incompressible fluid By large deformations, we mean deformations such as stretching, bending and twisting which involves the entire body, in contrast to poking or pinching which relatively covers a small region of the deformable object. We make use of Pascid's Principle and volume conservation as boundary conditions to obtain a static solution due to an externally applied pressure. We believe that the state of such an object is a result from effects of the surface tension (generally in any direction) and the pressure of the internal fluid (normal to the surface). By allowing such liberty, large deformations such as stretching, bending and twisting can be simulated without much change to the initial formulation of the physical model. This approach is particularly interesting for real time quasi-dynamic simulation of well damped soft tissue.

Keywords — Boundary conditions, computer simulation, finite element method, interactive computer graphics, object recognition, real time systems