Digital Clay is currently being developed by the Schools of Mechanical and Electrical Engineering and the College of Computing at Georgia Tech as a novel input/output haptic device. The purpose of the project is to build a tabletop device, fluidically actuated, with an almost continuously variable surface that conveys shape and stiffness information between user and computer. The operative part of the Digital Clay is composed of a 3-D network of discrete actuators covered with a hyper elastic membrane. The membrane improves the appearance of the shape represented and smoothes or filters high spatial frequencies resulting from discrete actuator. In parallel to the building of the first physical digital clay prototype, the Controls group has in charge to create a model and to study control through it. This model should be scalable and adaptable to evolution in the physical prototype. The issue of the thesis is concentrated on the membrane and the study of its behavior and interaction with actuators. The goal is to generate a membrane model that would be included in the general device model. Using a finite element code, taking into account the specific type of material, hyper elastic and the non linearity of the behavior, the thesis would study the mechanical response and the filtering properties of the membrane.