Abstract

This paper proposes a new elastic deformation modeling, which is essential in accurate interaction between user and objects that indispensably arises in teleoperation or haptic systems. Also, an algorithm for an estimation of elasticity of a deformable object is proposed, which gives additional information on analysis of contacted objects. In order to acquire a deformation modeling of elastic objects, global analysis of the changes in position and shape of the whole object are needed which only leads to massive amount of calculation. However, recently proposed LEM(Long Elements Method) introduces a new way of analyzing object deformation with less calculation while still acquiring a physical model. Using LEM, we can organize an efficient deformation modeling from the relation between positional changes and forces. Also, from partial information on positional changes of object and exerted force, we can estimate the elasticity of the object. Considering that elasticity is a unique property of an object, deformation modeling and estimation of elasticity can improve efficiency and accuracy of teleoperation and haptic systems.

Moreover, the effectiveness of the proposed modeling and algorithm has been verified by the experiment results, acquired in a simple haptic
system composed of SNU ERC DD- Robot and a force- feedback joystick.

Keywords: haptic system, force-feedback joystick, elastic deformation modeling, elasticity estimation