

Accuracy in applying biomechanical model and finite element calculation for image based deforming organ registration needs to be continuously improved. In our early study, uncertainties in organ boundary points selection have been significantly reduced by applying an iterative optimization method based on consuming energy minimization. However, there still exist other uncertainties related to the knowledge of tissue mechanical properties. Orthotropic elasticity with 9 independent parameters is currently used in the biomechanical model. Predefined mean values of the tissue elasticity properties are used throughout the calculation by hypothesizing that the model and calculation are insensitive to the variation of those properties. This assumption is important since the inter- and intra- patient variations of tissue elastic property likely exist and cannot be assessed in the current clinical practice. In this study, we performed a computer simulation to examine the sensitivity for four organs (bladder, rectal wall, prostate and seminal Vesicle) manifested on 328 CT images. Subvolume displacements were calculated based on the mean values of tissue elasticity and denoted as the reference. These calculations were then repeated with respect to each of the elastic properties randomly selected from a uniform distribution with the maximum 30% variation around the mean value. We also segmented each organ into 5~10 parts. In each part, the property varies independently within $\pm 25\%$ of the mean value. The results demonstrate that such variations of tissue elasticity properties only cause at most 3.25% discrepancy for 95% of subvolumes relative to the maximum subvolume displacement.