P2-2-10-D

Laparoscopic surgery navigation system having automated anatomical name display function

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In this paper, we present anatomical name display function in a laparoscopic surgical navigation system. Laparoscopic surgery navigation system provides virtual laparoscopic views synchronized with the laparoscope motion using a 3D positional tracker and preoperative CT images. We implemented the anatomical name display function showing blood vessel names or manual annotations on the virtual laparoscopic views in the navigation system. We performed surgical navigation during laparoscopic gastrectomy. The proposed navigation system could display the virtual laparoscopic views with anatomical name of blood vessels in synchronization with the laparoscope position.

P2-2-11-D

Reconstruction of External Force and Deformation Based on Local Displacement Observation in Manipulating Elastic Objects

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The safety of robotic and endoscopic surgeries could be improved if the physical state of organs were evaluated quantitatively during procedures. Although force measurement systems have been investigated, understanding the intraoperative state of an organ remains problematic. We propose a method to reconstruct external forces and the whole deformation field of elastic bodies using local displacement observations. We introduce an L1-norm minimization approach into the finite element analysis to solve the ill-posed problem. Our experiments show that the position and magnitude of the applied force can be reconstructed from 20–30% surface area of the deformed shape.

P2-2-12-D

Multilayer Softness Model for Tactile Display

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Presentation of various softness feeling of complicated multilayer anatomical structures has been required for the medical robots. However, it has not yet been realized, because the model of a physical and physiological multilayer softness has not been made. In order to build the physical model, it is necessary to measure the contact area, the pushing depth, and the reaction force. In order to measure them, subjects’ finger touched hard or soft single-layer jellies and touched the double layer jellies of which upper layer was soft or hard, respectively in this experiment. The results showed that the three parameters’ relationships were different from each four jellies’ ones.