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The application of interactive dynamic virtual surgical simulation visualization method

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Abstract. In this paper, an interactive dynamic simulation method is proposed to solve computational models of soft tissue undergoing large deformation, collision detection, and volume conservation in medical surgical simulation visualization. During the process of implementation of the interactive dynamic simulation method, the point-based method is used to simulate the elastic solids undergoing large deformations and the position-based method is used to simulate the objects collision, friction and volume conservation. Numerical results demonstrate that the proposed method improves the efficiency and stability of the response of heterogeneous soft tissue undergoing contact or even the multi-organs interactions, and it can be extended to interactive biopsy and cutting simulation.

In this paper, an interactive dynamic simulation method is proposed to solve computational models of soft tissue undergoing large deformation, collision detection, and volume conservation in medical surgical simulation visualization. During the process of implementation of the interactive dynamic simulation method, the point-based method is applied to reproduce biomechanical response of human organisms in the process of interactions and the position-based method is used to simulate the objects collision, friction and volume conservation. It can improve the efficiency and stability of the response of heterogeneous soft tissue undergoing contact or even the multi-organs interactions.

Keywords: Interactive dynamic simulation, Virtual surgical simulation, Soft tissue deformation

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Haptic Telepresence System for Individuals with Visual Impairments

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Abstract. This paper proposes a novel video conferencing system for individuals with visual impairments by using an RGB-D sensor and haptic device. The recent improvement on RGB-D sensors has enabled real-time access on 3D spatial information in the form of point clouds. However, the real-time representation of this data in the form of tangible haptic experience has not been challenged enough, especially in the case of telepresence. Thus, the proposed system addresses the telepresence of remote 3D information using an RGB-D sensor through video encoding and 3D depth-map enhancement by utilizing both 2D image and depth-map. In our implemented system, the Kinect sensor from Microsoft is an RGB-D sensor that provides depth and color images at a rate of approximately 30 fps. The Kinect depth data frame is buffered, projected into a 3D coordinate system with resolution 640 by 480, and then transformed into a 3D map structure.

To verify the benefits of the proposed video content adaptation method for individuals with visual impairments, this paper conducts 3D video encoding and user testing. In conclusion, the proposed system provides a new haptic telepresence system for individuals with visual impairments by providing an enhanced interactive experience.

Keywords: Haptic telepresence, Individuals with visual impairments, Video streaming