Development of a High Definition Haptic Rendering for Stability and Fidelity

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Résumé en anglais	In this study, we developed and evaluated a 10kHz high definition haptic rendering system which could display at real-time video-rate (60Hz) for general VR applications. Our proposal required both fidelity and stability in a multi-rate system, with a frequency ratio of approximately 160 times. To satisfy these two criteria, there were some problems to be resolved. To achieve only stability, we could use a virtual coupling method to link a haptic display and a virtual object. However, due to its low coupling impedance, this method is not good for realization of fidelity and quality of manipulation. Therefore, we developed a multi-rate system with two level up-samplings for both fidelity and stability of haptic sensation. The first level up-sampling achieved stability by the virtual coupling, and the second level achieved fidelity by 10kHz haptic rendering to compensate for the haptic quality lost from the coupling process. We confirmed that, with our proposed system, we could achieve both stability and fidelity of haptic rendering through a computer simulation and a 6DOF haptic interface (SPIDAR-G) with a rigid object simulation engine.

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