

Development of GPU-Based Haptic Technology in Augmented Reality

Haptic device is a human computer interaction (HCI) technology recently developed. It generates the sense of touch in physical modeling. Haptic technologies have found successful applications in gaming industry, product design, manufacturing, medical and rehabilitation engineering. Haptic programming normally involves heavy computation loads, since both visual and tactile information need to be instantly updated in user interaction. This may cause performance deterioration of a haptic application and thus limits its practical use. On the other hand, augmented reality technologies provide a new experience of user interaction by integrating virtual objects with real scenes. However, haptic applications in the augmented reality environment are still lacking. This proposal presents a collaboration work between Zillians Inc. and NTHU. The company owns good development capabilities of GPU-based parallel processing, with a focus on 3D gaming and cloud computing. The NTHU team has years of experience in augmented reality and advanced HCI technologies. The goal of this work is to develop a pioneering HCI technology based on haptic force feedback by integrating Microsoft Kinect™ and PHANTOM Omni™ haptic device. Kinetic™ will continuously generate video stream of a real scene in the technology. It also provides the range data of objects in the scene that drives generation of the feedback force. Users can virtually feel the objects in the video stream by the sense of touch. In addition, GPU-based parallel processing is incorporated to accelerate the computation process of 3D collision detection and ensures the real-time performance of the technology. The research and development capability of Zillians Inc. will be improved through this collaboration. More importantly, the novel HCI technology will serve as the core competence in the next generation game products developed by the company.

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