

Abstract

A low-cost approach towards non-haptic medical training

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As *Virtual Reality Training Systems* (VRTS) become more advanced, they are increasingly being regarded as valuable facilities for the acquisition of dextrous clinical skills among medical doctors and anesthetists. This work explores the possibilities that are provided by introducing a *3D mouse* as an exploration tool in VRTS, such as the Haystack simulator for *Ultrasound guided Peripheral Nerve Blocks*. This was done in order to research a low-cost approach which is different from popular haptic solutions, which are very costly.

After providing information about related work in virtual training simulation and surgical planning, different haptic and non-haptic devices, such as game controllers, gloves and wands are compared and briefly discussed. After that, the *SpaceNavigator* device by 3Dconnexion is described. It was used for a usability study which is documented at the end of this Research Paper. Different kinds of simple motion constraints have been designed and a simple collision detection technique was developed and implemented. The collision detection and displacement techniques employed in Haystack are briefly described, to provide a general idea of the differences between haptic and non-haptic interaction. Whereas force feedback is generated when strain is induced, collision detection only is necessary in the non-haptic environment.

The implemented system, which is an addition to Haystack, has been tested by a group of medical trainees and experts at *Cork University Hospital*. The results of the user tests show that low-cost non-haptic solutions using off-the-shelf devices are reasonable when well defined constraints and guidelines are applied. As positive conclusions about the usability and the usefulness of such a non-haptic solution could be drawn from the study, future research in this area becomes more important.