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A Review on Haptic Technology: The Future of Touch in Human-Computer Interaction

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Abstract: Haptics is an emerging technology that allows touch-enabled interaction with virtual objects. The word haptic, means pertaining to the sense of touch. Haptic interfaces allow the user to feel and to see virtual objects on a computer, giving illusion of touching surfaces, shaping virtual clay or moving objects. The sensation of touch is the brain's most effective learning mechanism and thus is used in haptic technology —which is why the this new technology holds so much promise as a powerful tool in large number of applications.

Haptic technology is like exploring the virtual world with a touch. The computer communicates tactile or kinesthetic sensations through a haptic interface –a stick, scalpel, racket or pen that is connected to force-exerting motors. These motors form part of haptic devices --PHANTOM, Cyber Grasp etc.—and operate on principle of force feedback mechanism. With this technology we can now sit down at a computer terminal and touch objects that exist only in the "mind" of the computer. By using special input/output devices (joysticks, data gloves, or other devices), we can receive feedback from computer in the form of felt sensations in the hand or other parts of the body.

In this paper we explicate how sensors and actuators are used for tracking the position and movement of the haptic device moved by the operator. We also cover main building blocks of haptic technology which are force feedback mechanism, tactile and kinesthetic devices, haptic interfaces, haptic devices-PHANTOM and Cyber Grasp, high precision computers, robots. Then, we move on to applications of Haptic Technology in various fields such as medical science (tele-surgery), entertainment, education, and astronomy, social. Haptics has proved its importance in social fields by providing imaginary world (virtual reality) for blind people and for museums. Finally we conclude by mentioning future developments.

Keywords: Haptic, tactile feedback, virtual reality, human-computer interaction, force feedback

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