**Haptic technology**

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|  | Abstract: Haptic technology, or haptics, is a feedback technology which takes advantage of a user's sense of touch by applying forces, vibrations, and/or motions upon the user. This mechanical stimulation may be used to assist in the creation of virtual objects (objects existing only in a computer simulation), for control of such virtual objects, and for theenhancement of the remote control of machines and devices (teleoperators). It has been described as "(doing) for the sense of touch what computer graphics does for vision" . how ever computer scientists have had great difficulty transferring this basic understanding of touch into their virtual reality systems without a mistake . this seminar describes how Haptic technology works and future expectation about Haptic technology   How haptic technology works In the real world, persons receive and disseminate information in three-dimensional space. In a virtual world, the user can access information by imitating that three-dimensional space. To incorporate the sense of touch (the haptic sense), a device is created that allowed the user to interact with a computer by receiving tactile feedback. A haptic device achieves this feedback by applying a degree of opposing force to the user along the x, y, and z axes. While there is now some haptic software, much of the design is algorithmic.  However, to create a force feedback device still requires a great deal of math and engineering as well as computer graphic and computer language skills. In the Force Feedback Data Glove, for example [http://www.caip.rutgers.edu/~bouzit/lrp/glove.html] the principle of a force feedback is simple[states the engineers.] It consists of opposing the movement of the hand in the same way that an object squeezed between the fingers resists the movement of the latter. The glove, in the absence of a real object must be capable of recreating the forces applied by the object on the human hand with the same intensity and the same direction. The mechanical structure created was made up of five fingers and had 19 degrees of freedom, five of which were passive. The mechanical structure adapted to different sizes of human hands and had a physical stop to offer security to the operator. The glove is controlled by 14 torque motors with continuous current equal to 1.4Nm. The global scheme has two command loops. Man is considered as a displacement generator while the glove is considered as a force generator.(link to video presentation in power point) Another example of multiple disciplines contributing to the knowledge to create a haptic device is shown in the research at MIT to create a simulator for a mastoidectomy. [http://www.crs4.it/vic/data/papers/presence-2003.pdf] A real-time haptic and visual implementation of a bone-cutting burr is being developed. The current implementation, directly operating on a voxel discretization of patient-specific 3D CT and MR imaging data, is efficient enough to provide real-time feedback on a low-end multi-processing PC platform. [13] In the experiment, the simulator worked fine, but the researchers would like to have data of actual drilling samples [non-simulated]. Advantages and Disadvantages of haptic technology Advantages include that communication is centered through touch and that the digital world can behave like the real world. When objects can be captured, manipulated, modified and rescaled digitally, working time is reduced. Medical field simulators allow would be surgeons to practice digitally, gaining confidence in the procedure before working on breathing patients. With haptic hardware and software, the designer can maneuver the part and feel the result, as if he/she were handling the physical object.  Disadvantages include debugging issuesâ€these are complicated since they involve real-time data analysis. Links in telemedicine must have 0% fault rates for extended periods of time. The precision of touch requires a lot of advance design. With only a sense of touch, haptic interfaces cannot deliver warnings.  Future All of the research studies and papers stated that more research is needed. From the original gaming, so much has come about in less than 10 years. It is exciting to think what might happen in the next 10 years. Researchers at SUNY have completed experiments where they were able to transmit, from one person to another over the Internet, the sensation of touching a hard or soft object. Medical researchers at Rutgers filed a patent application for a new, PC-based virtual reality system that provides stroke patients with virtual hands. Artists and researchers at USC have developed a technology that will let individuals feel what a sculpture feels like at an art exhibit at a Haptic Museum Virtual reality systems are also making headway into training for manned space operations. There is a call for papers for a March/April 2004 conference on Haptic Renderingâ€Beyond Visual Computing. Haptics presents new challenges for the development of novel data structures to encode shape material properties, as well as new techniques for data processing, analysis, physical modeling, and visualization. |
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Reference: <http://www.seminarprojects.com/Thread-haptic-technology#ixzz1S3ViMRN3>