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Haptics Technology - World of Sense

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Abstract - *Haptic technology changes the way of sensing things and feelings thing in virtual simulation. This technology is widely using in medical, education, training, etc. This technology is helping gamers to get batter experience. In military this technology is used for giving obstacle training to the soldiers. By using full haptic set-in military for giving war experience to the army soldiers. Haptics is widely used in tanning area. Haptic make education and training more interesting. Haptic changes the world of gamers, it gives totally different feel to play using haptic devices. It feels like we are touching or sensing real-world things. Haptic is also widely used in medical field for many purposes. Haptic is upcoming technology which is going to used widely in education, training, medical and in military field.*

Key Words: Haptic, tactile, cutaneous, virtual Reality, haptic rendering, haptic perception.

1. INTRODUCTION

Haptesthai is the Greek word from which haptic has been derived which means 'to touch or to feel'. Haptic can be defined as "science of applying tactile sensation to human interaction with computers." It authorizes a manual interaction with real virtual and remote environment. Haptics enables to sense and manipulate three dimensional virtual objects with respect to such features as shape, weight, surface textures, and temperature.

In our paper we explain basic concepts of haptic technology and its application in medical, education, training and in military field. Haptic technology help user to experience force, vibration, motion, etc. Haptic technology used in education field for understanding things in better way. Haptic technology is widely used in medical field for getting hands-on training to medical student, haptic technology also used in military for training soldiers and giving them best environment to improve their skills. By using haptic we can sense the virtual objects easily.

1.1 Haptics Technology:

Haptics is the science and technology of communicate and recognize information through touch. Simply haptics means anything related to sense of touch. Haptics is actually an extensive category that encloses both haptic technology and haptic feedback, together with the physiology and neuroscience of touch. Haptic technology, also known as kinaesthetic communication or 3D touch, which refers to any technology that can create an experience of touch by applying forces, vibrations, or motions to the user. Haptic technologies can be used to design virtual objects in a computer simulation, to control virtual objects, and to raise remote control of machines and devices. Haptic devices may include tactile sensors which can measure forces applied by the user on the interface. Haptic technology ease study of how the human sense of touch works by granting the designing of controlled haptic virtual objects.

1.2 Cutaneous:

Cutaneous means associating with or involving the skin. It contains sensations of pressure, temperature, and pain.

1.3 Tactile:

Tactile means pertaining to the cutaneous sense, but more particularly the impact of pressure rather than temperature or pain.

1.4 Kinesthetic:

Kinesthetic means connecting to the feeling of motion. It is connected to sensations originating in muscles, tendons, and joints.

1.5 Force Feedback:

Force Feedback is connecting to the mechanical production of information that can be sensed by the human kinesthetic system.

1.6 Haptic communication:

Haptic communication means by which humans and machines communicate via touch. It mainly covers networking issues.

1.7 Haptic device:

Haptic device is a manipulator with sensors, actuators, or both. A variation of haptic devices has been evolved for their own intention. The most approved are tactile based, pen-based, and 3 degree-of-freedom (DOF) force feedback devices.

1.8 Haptic interface:

A haptics interface is a system that authorized a human to connect with a computer through bodily sensations and movements. Haptic interface includes a haptic device and software-based computer control mechanisms. By manipulating a haptic interface, anyone can not only feed the information to the computer but can also obtain information or feedback from the computer in the form of a physical sensation on some parts of the body.

1.9 Haptic rendering:

Haptic rendering is the statistical model that permits the formation of reaction force between the virtual tool being used by the user and the physics-based object. It includes sampling the position sensors at the haptic device to gain the user's position within the virtual environment.

1.10 Haptic perception:

Haptic perception is the action of accepting objects through touch. It involves a union of somatosensory perception of patterns on the skin surface (e.g., edges, curvature, and texture) and proprioception of hand position and conformation.

1.11 Sensors and Actuators:

A sensor is responsible for sensing the haptic information applied by the user on a certain object and sending these force readings to the haptic rendering module. The actuator will read the haptic data sent by the haptic rendering module and modify this information into a form perceivable by human beings.

1.12 Tele-presence:

Tele-presence is the condition of recognizing sufficient information regarding the remote task environment and communicating this to the human operator in a way that is enough for the operator to feel physically present at the remote site.

1.13 Tele-haptics:

Tele haptics is the field of communicating haptic sensations from a remote explored object or environment, manipulating a network such as the Internet, to a human operator.

1.14 Virtual reality:

Virtual Reality (VR) is the use of computer technology to create a simulated environment. Far from standard user interfaces, virtual reality points the user inside an experience. Rather of watching a screen in front of them, users are immersed and free to interact with 3D worlds.

Fig-1.Virtual Reality

1.15 Virtual Environment:

Virtual environment is an immersive virtual reality that is simulated by a computer and essentially involves audiovisual experiences. For all the reality that the terminology is advancing, a virtual environment is mostly bothered with defining interactive and virtual image displays.

2. WORKING OF HAPTICS

A typical Haptic Technology System is an convention of various sub-blocks that is:

1. Touch screen device with capacitive buttons
2. Processor
3. Driver circuit
4. Actuator

The input to the Haptic Technology System may be a touch, a press on the capacitive buttons on the touchscreen. This obey as an input or the trigger signal which is convey to the touch screen controller. The sensors in the device recognize the change in the sum of force applied, change in the angle of the input and forward the details to the processor.

The details are further processed producing a waveform which could be either analog or digital which acts as an input to the driver circuit and particularly instructions are given to actuator to generate a pattern that creates a vibration. This feedback from actuator which is given back to the touchscreen device acts as a force feedback. The user thus feels this force feedback virtually.

3. APPLICATION OF HAPTIC TECHNOLOGY

Haptic technology is used in every field such as education, training, medical, military, etc.

1. Education:

Haptic is used in education for making it more interesting and making education easy. Haptics used in medical training, chemistry, manipulating molecule, physics and engineering, etc. Medical students get hands on training by use of haptics in medical training.

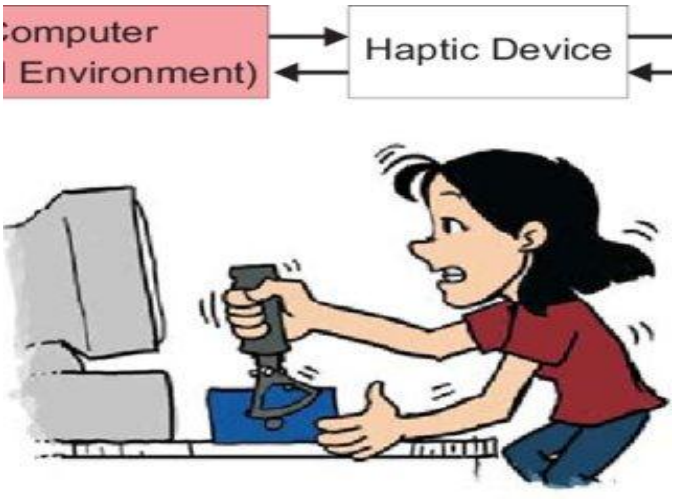

Fig-2 Haptic in Education

2. **Training:** Haptic technology is used very widely in training field. Haptic help user to get best feel of training. Many simulators are created in which haptic is implement which make the user to feel it like real. Simulations like, airplane, fire fighter training, car driving, etc.

Fig-3. Haptics in Training

3. **Military:** Haptic technology has been used from long time in military field. Many simulation are made using haptics in military. Using haptics in military reduces damage and help them to develop there skills better.

Fig-4. Haptics in Military

4. **Medical:** Haptic used in medical filed for training medical students to understand more deeply human body parts. It helps doctor to train in better way. Now a days in some university this technology is used more for training doctors for operations. Simulators are created for trainers.

Fig-5. Haptic in Medical

4. CONCLUSIONS

We conclude that haptic technology is the only solution which will gives high range of interaction that cannot be provided by virtual reality. Haptics is upcoming and most demanding technology in medical as well as in education sector. In military this technology will reduce the damage, and help soldiers to train better. No one need to go outside for training they can get same feel by doing training on simulator in which haptic is implemented. Haptic totally change the world of gaming. Now a days gamers experienced for thrill and enjoy more games because of haptic and in future it will be more better.

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