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A review paper on Haptic technology applications

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ABSTRACT

Haptics or Haptic technology based on touch and feel, by tactile sensation and simulation. The user can interface using various haptic devices which not only give user proper information but with feel and sensation that is, the feel of shape, weight, surface textures and temperature, the user gets to deal with the realistic world from the virtual one. The varied and wide applications of this field in computer science have made the user the part of the technology itself. The changing world having various applications in which include surgical devices, automobiles field, digitization, robotic science etc. The Computer haptics has a visually based application of technology which uses computer graphics. Haptics not only has developed one technology but is technology which is yet to be explored more and will have wide development in the field of computer science and the mechanical world itself.

Keywords— *Haptics, Haptic technology, Virtualise, Machine haptic, Computer haptics*

1. INTRODUCTION

The Greek word 'Hapthesthai' meaning manipulation to objects and touch, the Haptics is the term based on the same. Haptics is widely increasing technologies which have the human-machine interaction. The creation of a virtual environment is possible due to the use of haptic devices and computer use. It gives humans the proper information with the use of haptic input and output devices. Haptics is the science which deals with the application of touch and control on virtualising. The Kinaesthetic technology and recreation of tactile feedback are the terms.

Considering the example of people with disabilities the use of Haptics has proved one of the important technologies helping those. If a person doesn't have an arm and wanted to take the glass of water, then the 'Robotic Arm' is one of the aids to it.

The Robotic Arm is one of the latest innovation in Haptics. The most common use of haptics is in automobiles that are in car controller, Haptics gives a feeling sensation of driving on steering wheels, humming and shivering of the controller and enjoying the vibration, this is also the innovation in Haptics. The development in digitization and gaming has wide use of haptics in it. Haptics provides a thrilling and realistic experience in gaming and that's the reason it has the highest probability in bringing the virtual gaming in reality, in future. The digital techniques have a bit changed the term haptic interfaces by providing better functions. The uses of Haptics in surgical practices have led to the development of surgical practices by giving the realistic feel, ultimately the development in the medical field. There are various applications of haptics in medical and surgical purposes, one of it is in the field of peoples with visual impairments, Haptics can help to provide the abundant information to a person with visual impairments using Haptic application.

The Haptics are categorized into three types as follows:

(a) Human Haptics: Related to human sense and control via touch
(b) Computer Haptics: Software and algorithm based on the generation of touch to feel for virtual objects.
(c) Machine Haptics: Use of machines in touch.

Haptics is totally sensors-based technology. If the taken example of the human body the eyes are one from senses. The eyes see an object, sends a message to the brain and then the brain sends a message to hands and then hands perform the intended task. The Haptics is having the same working which includes human as well machine part. The human part includes brain, muscles, skin sensors with contact forces, tactile and kinaesthetic information and motions along with the end effector and the machine part includes sensors, computers, actuators and brakes with includes motion, position information, force data, forces.

2. LITERATURE REVIEW

Implementation of Haptics for pressure sensitive keyboards:

A. Use of haptics in pressure sensitive keyboards that is, variable pressure keyboard be replaced by variable pressure haptic effects. So that user with haptic vibrations can understand the rate of pressure he's giving at a time on key. The real-time changes may vary according to coordination with the user.

B. Method of providing Audible feedback on a touch sensor using haptics: To provide Audible feedback and tactile feedback with the use of touch sensors the information is gained about the nature of the contact. It is rather operating system independent but is integrated with the touch sensor system.

C. Emotions Mediated Through Mid-Air Haptics: Varied emotions are known with the touch and feel like anger, happiness, sad etc., with the use of Mid- Air haptics the emotions are mediated. The emotions are created by one group (anger, sadness, happiness etc.) and another two groups will review and validate these. The various parameters like directional, forces etc. will be taken as a consideration.

D. Mobile device with motion controlling haptics: The haptically enabled device and an output device which is used to control the motions. The effect is generated with a reply to the motion using haptics by determining the desired motion.

E. Energy saving mode for silent haptics: Processor traces the haptic track which includes the instructions. The track is analysed to determine zero-force interval presence known as silent haptics, if the interval becomes greater than the pre-defined then the system enters energy savings and terminated when the interval is less then overhead time.

3. APPLICATIONS

3.1 Medical Purposes

For surgical practices, the haptics provides a realistic environment which gives the more detailed and practical study experience. The proper feel and texture of the body parts give more realism in operating. The use of robotic arms helps disable peoples to gain the ability. Certain applications help in providing proper information to peoples with visual impairments. There are vast applications of haptics in Science and medical purposes which is ultimately human health benefits.

3.2 Military purpose

The use of flight simulators is used for the practice of soldiers to get the real battlefield experience. Some heavy armoured strikers and tanks driving experience can be made and many more devices.

3.3 Cultural

The museum has vast use of haptics which gives the visitors and scholars more realistic experience and keeping them busy. The fragile parts can be prevented due to the computation of haptics.

3.4 GUI

Today's most developing technologies deal with Graphics which provides the user-friendly environments for interfacing with the system. The use of haptics has given the new path to Graphics and digitization world. The varied use of Haptics in gaming has provided more realistic gaming with the more thrilling and realistic encounter. It is having a bright future in the computer and gaming world.

3.5 Education

The use of haptics has great use in the education system and is so effective than existing methods. The pre-defined procedures can be replaced with this alternative method using haptics which gives the practical experience rather theoretical education. Students will able to understand the subjects more practically and with fun.

4. HAPTICS DEVICES

(a) **Phantom:** Is the most commonly and widely used haptic device controlled by the fingertips.

(b) **Haptic Glove:** The glove is one from Haptic as wearable technology; it has microcontroller, servomotors and ultrasonic sensors.

(c) **Force feedback gaming joystick:** Its alike gaming joystick but with the use of haptics proving more thrilling and realistic experience.

(d) **Robotic arm:** It is wearable Haptic technology devices mainly used in medical purposes and in surgical purposes.

(e) Some of the low-cost haptic devices:

Sen sable's Omni Phantoms
Haptic Paddles Haptic knobs

5. DISADVANTAGE

Haptics is one from vast and modern technology providing the various advantages and improvements in various fields, but it is also from those technologies which are yet to be explored well. It deals with the drawback of debugging and with providing the proper feedback to the user. The initial technical as a well financial investment is one from its drawback.

6. CONCLUSION

The system provides a physical link between people separated by distance, unattainable with current interpersonal communication technology. We believe that InTouch suggests a new pathway for the application of haptic technology which has the potential to enrich intimate interpersonal communication across distance.

Fig. 1: Sample picture of Haptics

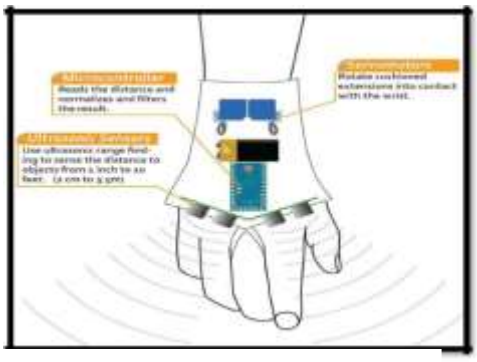

Fig. 2: Use of haptics sensors

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