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SENSING THE SIXTH SENSE TECHNOLOGY

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ABSTRACT: The paper covers a brief introduction of the sixth sense technology which is the revolution in the field of technologies.

A number of new applications that have been developed or are being developed for the sake of welfare of the human being using this technology have been discussed here. The simple prototype for the sixth sense technology and the other technologies that are related to the sixth sense devices is also discussed.

Keyword: Sixth sense technology, hand gestural interface, wearable gestural interface, WUW.

1. INTRODUCTION

1.1. Sixth Sense Technology

We are very familiar with the term "Six Sense", the six senses include the eye, ear, nose, tongue, body, and mind and we humans are totally depend on it.

Can there be any Technology which functions related to the eye, ear, nose, tongue, body, and mind. So far we were using computers by just sitting in front of our computer and in the use of few senses. The answer is yes. After the introduction of the "Sixth Sense Technology", a computer can sense any sorts of feelings it gets in its surroundings.

Basically, the Sixth Sense is a wearable gestural interface device that augments the physical world with digital information and let's people use natural hand gestures to interact with that information.

It was developed by Pranav Mistry, originally from Palanpur, situated in northern Gujarat in India. He is an research assistant and a PhD candidate at MIT Media Lab. Before joining MIT he worked as a UX Researcher with Microsoft. He received Master in Media Arts and Sciences from MIT and Master of Design from IIT Bombay. He has completed bachelors' degree in Computer Science and Engineering. Sixth Sense has recently attracted global attention. He has earned his fame as the main person behind Sixth Sense. Mistry has been called "one of the two or three, most, best inventors in the world right now" by Chris Anderson."

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According to him, he calls this technique as Wear Ur World (WUW).

Sixth Sense was awarded the 2009 Invention Award by Popular Science. He was also named to the MIT Technology Review TR35as one of the top 35 innovators in the world under the age of 35. In 2010, he was named to Creativity Magazine's Creativity 50. Mistry has been called "one of ten, best inventors in the world right now" by Chris Anderson. Mistry has been listed as one of the 15 Asian Scientists To Watch by Asian Scientist Magazine on 15 May 2011.

1.2. The Protoype

The WUW (Wear Ur World), Sixth Sense prototype is comprised of:

- a pocket projector.
- a mirror.
- a camera.
- colored marker.

The camera, mirror and projector is connected wirelessly to a blue tooth smart phone device that can easily fit into the user's pocket. A software then processes the data that is collected by the capturing device and produces analysis. The software that is used in sixth sense device is open source type.

Camera: It captures the image of the object in view and track the user's hand gesture. The camera recognizes individuals, images, pictures, gestures that user makes with his hand. The camera then sends this data to a smart phone for processing. Basically the camera forms a digital eye which connects to the world of digital information.

Coloured Marker: There are colour markers placed at the tip of users finger. Marking the user's fingers with red, yellow green and blue coloured tape helps the webcam to recognize the hand gestures. The movements and arrange-ment of these markers are interpreted into gestures that act as a interaction instruction for the projected application interfaces.

Mobile Component: The Sixth Sense device consists of a web enabled smart phone which process the data send by the camera. The smart phone searches the web and interprets the hand gestures with help of the coloured markers placed at the finger tips.

Projector: The information that is interpreted through the smart phone can be projected into any surface. The projector projects the visual information enabling surfaces and physical objects to be used as interfaces. The projector itself consists of a battery which have 3 hours of battery life. A tiny LED projector displays the data sent from the smart phone on any surface in view-object, wall or person. The downward facing projector projects the image on to a mirror.

The hardware components are coupled in a pendant-like mobile wearable device. Both the projector and the camera are connected to the mobile computing device in the user's pocket. The device projects visual information, enabling surfaces, walls and physical objects around the wearer to be used as interfaces; while the camera recognizes and tracks the user's hand gestures and physical objects using computer-vision based techniques.

The usage of a mirror is important as the projector dangles pointing downwards from the neck. The mirror reflects the image on to a desire surface. Thus finally the digital image is freed from its confines and placed in the physical world.

The software program processes the video stream data captured by the camera and tracks the locations of the colored markers (visual tracking fiducials) at the tip of the user's fingers using simple computer-vision techniques. The movements and arrangements of these fiducials are interpreted into gestures that act as interaction instructions for the projected application interfaces. Sixth Sense sense also supports multi-touch and multi-user interaction.

2. TECHNOLOGIES THAT ARE RELATED TO SIXTH SENSE DEVICES

2.1. Augmented Reality

The augmented Reality is a visualization technology that allows the user to experience the virtual experience added over real world in real time. With the help of advanced ARtechnology the information about the surrounding real world of the user becomes interactive and digitally usable. Artificial information about the environment and the objects in it can be stored and retrieved as an information layer on top of the real world view. When we compare the spectrum between virtual reality, which creates immersive, computer-generated environments, and the real world, augmented reality is closer to the real world.

Augmented reality adds graphics, sounds, haptic feedback and smell to the natural world as it exists. Both

video games and cell phones are driving the development of augmented reality. The augmented systems will also superimpose graphics for every perspective available and try adjust to every movement of the user's head and eyes.

The three basic components of an augmented reality system are the head-mounted display, tracking system and mobile computer for the hardware. The main goal of this newtechnology is to merge these three components into a highly portable unit much like a combination of a high tech Walkman and an ordinary pair or eyeglasses. The head-mounted display used in augmented reality systems will enable the user to view superimposed graphics and text created by the system. Another component of an augmented reality system is its tracking and orientation system. This system pinpoints the user's location in reference to his surroundings and additionally tracks the user's eye and head movements. Augmented reality systems will need highly mobile computers. As of now many computers aren't there to satisfy to provide this option.

2.2. Gesture Recognition

It is a technology which is aimed at interpreting human gestures with the help of mathematical algorithms. Gesture recognition technique basically focuses on the emotion recognition from the face and hand gesture recognition. Gender recognition technique enables humans to interact with computers in a more direct way without using any external interfacing devices. It can provide a much better alternative to text user interfaces and graphical user interface which requires the need of a keyboard or mouse to interact with the computer. Interfaces which solely depends on the gestures requires precise hand pose tracking.

In the early versions of gesture recognition process special type of hand gloves which provide information about hand position orientation and flux of the fingers. In the Sixth Sense devices coloured bands are used for this purpose. Once hand pose has been captured the gestures can be recognised using different technique's. Neural network approaches or statistical templates are the commonly used techniques used for the recognition purposes. This technique have an high accuracy usually showing accuracy of more than 95%. Time dependent neural network will also be used for real time recognition of the gestures.

2.3. Computer Vision

Computer vision is the technology in which machines are able to interpret/extract necessary information from an image. Computer vision technology includes various fields like image processing, image analysis and machine vision. It includes certain aspect of artificial intelligence techniques like pattern recognition. The machines which implement computer vision techniques require image sensors which detect electromagnetic radiation which are usually in the form of ultraviolet rays or light rays. The computer vision find itself applicable in varies field of interest. One such field is bio medical image processing. It's also used in autonomous vehicle like SUV's. The computer vision technique basically includes four processes.

3. APPLICATION

The Sixth Sense prototype contains a number of demonstration applications.

- The map application lets the user navigate a map displayed on a nearby surface using hand gestures to zoom and pan.
- The drawing application lets the user draw on any surface by tracking the fingertip movements of the user's index finger.
- Sixth Sense also implements Augmented reality; projecting information onto objects the user interacts with.

  The system recognizes a user's freehand gestures as well as icons/symbols drawn in the air with the index finger, for example:
- A 'framing' gesture takes a picture of the scene. The user can stop by any surface or wall and flick through the photos he/she has taken.
- Drawing a magnifying glass symbol takes the user to the map application while an '@' symbol lets the user check his mail.
- The gesture of drawing a circle on the user's wrist projects an analog watch.

4. COST

The current prototype system costs approximately $350 to build, not including the computer but the micro-projector. Mistry had announced in Nov 2009 that the source code will be released under Open Source. On September 5, 2011, Mistry added a link to the Sixth Sense page on his personal website to a Google Code Sixth Sense project. Many products based on this technology are available in the market. According to the recent research, the sixth sense technology is the next big thing which will create sensation.

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