THE SIXTH SENSE TECHNOLOGY

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Abstract

"We have five senses in which we glory and which we recognise and celebrate, senses that constitute the sensible world for us. But there are other senses -- secret senses, sixth senses, if you will -- equally vital, but unrecognised, and unlauded. These senses, unconscious, automatic, had to be discovered." — Oliver Sacks. This paper discusses a technology which is amazing everyone worldwide in today's time, which is "Sixth Sense Technology". All human beings are aware of the five basic senses i.e. Sight, Hearing, Taste, Touch, Smell. Sixth Sense technology was developed by a man named Pranav Mistry, a Ph D student. 'Sixth Sense Technology' is used to build bridge between the digital world and the physical world, bringing impalpable, digital information out into the palpable world, and allows us to interact with this information using natural hand gestures. The paper showcases the possible applications and opportunities of Sixth Sense. Furthermore, the implementation approaches are compared and the pros and cons of each approach are explored. Most importantly, technical challenges and open issues regarding each implementation approach are brought out. Furthermore, predictions are made on which approach is expected to succeed in the coming years. Finally, solutions are discussed to improve the Sixth Sense Technology with regards to its implementation approaches to insure new and better ways of human-computer interaction.

Keywords— *Sixth Sense Technology; Augmented Reality; Computer Vision; Human-Computer Interaction; Image Processing*

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1. INTRODUCTION

Computer's use by human beings began from last few decades. Rapid advancements in technology makes every decade different from the previous one. People started using computers in almost every area like schools, hospitals, offices and many more places. Just thirty years ago or less, majority of people had no idea what a touch screen was and could not even imagine a device responding to simple finger touches, which we use daily and see everywhere around us in today's time[13]. Such advancements have lit the world, provided basic needs, made life easier and better, helped business to grow, opened easy ways of communication, helped make learning interesting, and boosted scientific research. Not only is technology advancing, but people are also keen on using the latest technologies as soon as the products are brought out.

Recently, many new technologies have been introduced. Steve Mann is considered as the father of Sixth Sense Technology who made wearable computer in 1990. He implemented the Sixth Sense Technology as the neck worn projector with a camera system (which Mann originally referred to as "Synthetic Synesthesia of the Sixth Sense"). Few years later, Pranav Mistry introduced this Sixth Sense Technology to the public in 2009. Sixth Sense technology is categorized under AR, but its wide range of applications and its capability to change the way people interact with devices opens the chances for it to become the future mass medium [14].

Fig1. Six Senses

2. SIXTH SENSE TECHNOLOGY

Sixth Sense Technology can be defined as that technology that can be used to take the real world objects into the digital world with higher accuracy and minimum efforts.

Sixth Sense Technology uses hand gestures. This is done in such an intelligent manner that even slight gestures by a user can be interpreted by the Sixth Sense device and following actions like taking a picture, making a call, drawing and getting information are done. The main motive of this technology is to change the way people interact with devices and bridge the gap between the physical and digital world [3]. Devices used in Six Sense Technology design are projector, camera, mirror, cell phone which acts as computer and connect to the cloud, here all the information stored on the web. The projector is used to project images/videos on the wall or on any surface; the mirror helps to position these projections in front of the user who then interact by hand

gestures through coloured markers attached to each finger. These interactions made by fingers are detected by the camera, and then passed on the mobile phone for processing and performing required actions for the user.

This simple arrangement of devices and working has been introduced in a new way to interact with. With this Sixth Sense device, a user can check the time on a palm watch that only appears when time is need to be checked, can dial a phone number using the hand as keypad.

With this technology, a new form of human-computer interaction is introduced. The role that image processing and computer-vision can play in our life is presented in such technology. However, the Sixth Sense technology still remains a prototype that has not been introduced in the market. In spite of being a unique technological idea, it has many different ways of implementation. Each approach has its pros and cons, as will be discussed in the following sections by looking at other built prototypes or products:

2.1 Mouse Movement through Finger by Image Grabbing using Sixth Sense Technology

This design (or more precisely, prototype), built by Prateek Agrawal and Kunal Gupta [1], present a unique way of implementing the Sixth Sense Technology. It is very similar to the one introduced by Mistry in 2012. In this design, three devices of Sixth Sense are used i.e. Camera, Coloured Caps and MATLAB installed in Laptop. The camera takes the live video continuously and sends it to the laptop, and MATLAB installed in the Laptop processes the input and recognizes the colours at the finger tips of the user. The sent video is divided into images and processed. These images are sent to the projector and then the mirror projects the image in front of the user. In this design, user's hand acts as the mouse cursor. The image processing and colour recognition was simulated in the MATLAB to process the image from the live video from camera to obtain the final image showing required colours only.

2.2 Google Glasses

Sixth Sense Technology is also used in Google Glass Design. Google Glasses can be considered as a measure for the success of Augmented Reality technology. Google Glasses can be classified as an AR technology, with an Optical Head–Mounted Display (OHMD). As Starner[5] quotes from the Google CEO, "Our goal was to reduce the time between intention and action".

2.3 Virtual Class room using sixth sense Technology

Virtual Class Room design discusses ways of implementing Sixth Sense in the educational sector and how a virtual classroom, can be conducted anywhere, anytime with the help of six sense technology. The hardware of this Sixth Sense Technology includes camera, projector, mirror, mirror component and coloured markers all these components are coupled in pendant like wearable device. Technologies used in Sixth Sense Technology are Head Mounted Display, Hand Held Display, Gesture Recognition and Radio Frequency Identification. This design provides application of Zoom In/Zoom Out i.e. the contents of books can be Zoomed In or Zoomed Out to focus more light on it simply by using hand movements. Also used in calculating as a keypad is projected on our palm where the numbers will be available on the finger which eradicates the need for students to bring calculators, viewing videos displayed on magazines/articles, Video Conferencing and call making, taking pictures by simple hand gestures and converting white papers into digital notes. Thus, implementation of Sixth Sense Technology will eradicate the use of black and white teaching board with the smart board in the coming future.

3. IMPLEMENTATION APPROACHES OF SIXTH SENSE

Table I. Comparing All Approaches [14]

Category	Differences and Similarities		
	Description	Pros	Cons
A: Similar to Pranav"s approach	Components mainly are projector, mirror, camera, portable processing device (like mobile phone) and colour markers	Simple working technique, became publically known	coloured markers not practical, big size, projecting surface needed, affected by light and moving background
B: Google glasses	Recognises hand, sound, touch; Eye-worn;	Reduced size, no projecting surface needed; no coloured markers or problems with light or moving environment	Design of glasses needs improvement; needs further testing
E: Handheld Devices	limited to the screen; depends entirely, in terms of hardware requirements, on the handheld device	Many improvements are recently coming w.r.t hardware and software	limits the application range of SS; lots of improvement is needed in the digital world; least favourable approach

4. CHALLENGES OF SIXTH SENSE TECHNOLOGY

The Sixth Sense Technology has yet not came out into market due to many reasons, some are as follows:

- Real Implementation of Sixth Sense Technology is still not done.
- As this technology emits high wave radiations which may cause severe diseases, that's why it cannot be worn all the time.
- It requires charging devices and the complete kit has to be recharged at continuous intervals. This cannot be used for long period of time as it has less battery backup.
- Cost of this technology is really very high.
- Sixth Sense Technology also has security concerns as a person could even obtain information about a stranger in public through the face recognition ability of the device.
- There is no way to repair the device if it is broken.
- The device cannot be projected on hard surface.
- Software does support the ability to use real time video streams in order to produce augmented reality

5. FUTURE OPPORTUNITIES OF SIXTH SENSE TECHNOLOGY

Sixth Sense Technology can be combined with other technologies and devices to invent new devices, such as

- In Interactive advertisements
- In True 3D print media
- In 3D Visualization
- In Solar batteries via small solar panel
- In Camera can act as a eye for the blind person [15].

6. CONCLUSION

Sixth Sense Technology finds its applications in many fields. Sixth Sense may bring about a drastic change in the coming future which will change perceptions of peoples of using digital devices. Although it has some issues regarding software and hardware but these issues can be overcome in this hi-tech world and Sixth Sense Technology will rule the world in the coming future.

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