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Review Paper on "Sixth Sense Technology"

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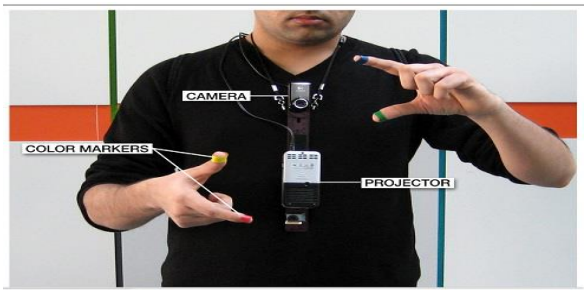
Abstract - *The Sixth Sense also known as 'A Clairvoyance (Extrasensory) Perception' has emerged as 'The Sixth Sense Technology' in the past few years. Human beings have evolved over millions of years to sense the world that exists around us with the help of our five natural senses which is used to perceive the information whenever we come across a thing, a person or a place. That information helps us to make judgments and instigate the appropriate action which is required to be taken. This paper focuses on a wearable gestural interface (a device) consisting the idea of the same above mentioned Sixth Sense Technology that links the informational and data-oriented knowledge not cognoscible naturally by the five senses from the physical world around us, with the digital information and allows us to use our natural hand gestures to communicate with the digital information, comprising of various applications along with different kinds of components, making the information available on our finger-tips at lightning speed.*

Key Words: **Sixth Sense Technology, Gestural Wearable Device, Sixth Sense Glass, the Leap, Kinect, Laser 3D Projector**

1. INTRODUCTION

"Sixth Sense Technology", it is the newest jargon that has proclaimed its presence in the technical arena. This technology which has emerged has its relation to the power of these six senses. Our ordinary computers will soon be able to sense different feelings accumulated in the surroundings. It frees information from its confines by seamlessly integrating it with reality, and thus making the entire world your computer.



It's a wearable gestural device that can turn any surface into a touch screen for computing, controlled by simple hand gestures. The device, consisting of components like LED projector, cell phone, camera, mirror and some different coloured tapes to get the gestures recognized, are connected together through Bluetooth or Wi-Fi with each other. The technology is mainly based on hand pattern recognition, image capturing, processing and manipulation, etc. The software of the technology uses the captured video stream, which is captured by the camera, and also tracks the location of the tips of the colored markers rolled on fingers to recognize the gestures by using computer vision techniques. This paper makes us cognizant how the sixth sense technology provides an integration of the digital world with the real world by vanquishing the five natural senses.

2. HISTORY OF SIXTH SENSE TECHNOLOGY

Idea behind this marvellous technology was started late in 1990's by Steve Mann at MIT who actually proposed first wearable computer. Initially it was proposed as a head worn projector and camera back in 1994, thereafter he developed it and proposed it as a neck worn projector and camera in 1998. It was further developed and prototyped by Pranav Mistry, a PhD student in the Fluid Interfaces Group at MIT lab a as part of his research curriculum. But, we can still consider Steve Mann as the "father of emergence Sixth Sense" technology. The first archetype of the sixth sense developed by Pranav Mistry was very much bigger and was not a functional model so they came out with a modified neck worn type device which was like a pendant.

The first article by Arjun KR says that they started working with a big projector mounted on a helmet but that proved cumbersome if someone was projecting data onto a wall and then turned to speak with a friend then data will project on friend's face thus he switched up with a smaller projector and created the pendant prototype to be worn around the neck. The archetype was built from an ordinary webcam and a battery-powered 3M projector, with an attached mirror and all connected to an internet-enabled mobile phone here.

He says that the movies "Robocop" and "Minority Report" gave him the inspiration to create his view of a world where computers and other digital devices enhance people's enjoyment of the physical world and not dominated by computers, digital information and human robots.

3. WORKING WITH SIXTH SENSE TECHNOLOGY

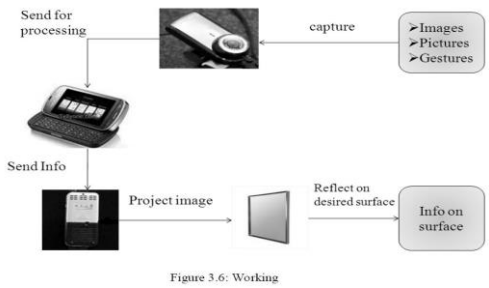


Figure 3.6: Working

The device consist of components like a camera, a mirror and a projector connected wirelessly to a Bluetooth smart phone that can slip comfortably into one's pocket. The camera recognizes individuals, images, pictures, gestures one makes with their hands with the help of the coloured markers. The data caught by the camera is then analysed by a software program and tracks down the location of the markers with the help of single vision technique. This software recognizes 3 kinds of gestures: - Multi-touch, freehand and iconic.

Information is then processed by the smartphone after which the downward- facing projector projects the output image on to the mirror which in turn reflects image on to the desired surface. Thus, digital information is freed from its confines and placed in the physical world.

4. VARIOUS APPLICATIONS

The various applications of Sixth Sense exhibiting the efficiency, viability and flaccidity of the system are:

- **Make a Call** by just bringing the hand in front of the device and dialling it on a virtual keypad on your palms.
- **Get Flight Updates** by getting the details of flight timings.
- **The Map** application that allows the user to navigate a nearby map.
- **3D Drawing Application** lets the user draw on any surface by tracking the tips movements of the user's index finger.
- **The Clock** lets the user to just draw a gesture a circle on his wrist and showcases a clock on his wrist.
- **Motion Capture** lets you capture photos using fingers and allows to share it with people.
- **Video Newspapers** allows the user to retrieve the latest related stories or interview videos streamed from internet.
- **Book Information** lets the user get the details of the book such as ratings, next page preview and some other additional information. Likewise, for some other products as well.

4. CHALLENGES AND VARIOUS THREATS

A) Software Limitations includes dependency on Microsoft code libraries; image processing challenges and accurate positioning along with timing difficulties with synchronization are the main obstacles before implementation.

B) Implementation Limitations includes conversion into a final product as no live demos are given, only recorded videos of the application are available.

C) Security and Privacy Issues includes hacking information from Facebook, taking pictures in public, obtaining information about a total stranger in public due to the face recognition algorithm of the device as some of the many security issues that can occur.

D) Health and Safety Concerns such as brightness of projector on user's eyes; safety concerns with regards to wearing the device while driving are the main ones.

E) Away from Reality detaches the user from reality and pulls them away from the feel of the physical touch.

5. WHY SIXTH SENSE? (ADVANTAGES)

- The digital information and its objects are integrated into the physical world with the help of the Sixth sense interface, hereby making the entire world as our own computer.
- Sixth Sense makes machines like computers to adapt to human needs and not the other way round.
- Apart from hand gestures that are used to communicate with digital information, Multi-touch and multi-user interaction is also supported.
- Data from machine is directly accessed into real time. It is an open source, cost effective idea that can be minded anywhere.
- All the relevant information is provided by the gesture controlled wearable computing device that manipulates any surface into a display.
- It is portable.
- Easy to carry as it can be worn on our neck.
- Even a novice with little or no knowledge of mouse and computer can use this device.
- Need to carry a camera no longer persist.
- The total cost invested for the making of the sixth sense technology proto type is exceptionally low. A basic sixth sense device sums up to approximately $350.

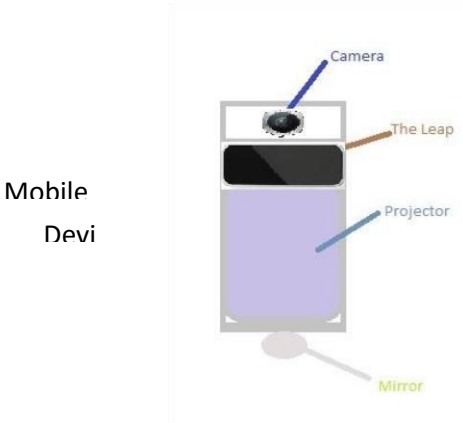
6. LATEST ALTERNATIVE TECHNOLOGIES PROPOSED

1. **LASER 3D PROJECTOR**
   Currently, in latest version of the interface the projector used is not very efficient. The batteries of the projector used lasts only for 3 hours, as reported by an article. Also, as the device is been worn by the user, eventually it leads to a lot of focus problems.

So to overcome these problems we can use laser projector with a laser diode inside capable of projecting on any surface. Technically the interesting thing about laser projector is that it never goes out of focus. Since the application suggested in the interface requires user to wear projector on their body, a laser projector becomes more advantageous as it does not requires to adjust focus.

2. NEW CONCEPT OF SIXTH SENSE GLASS

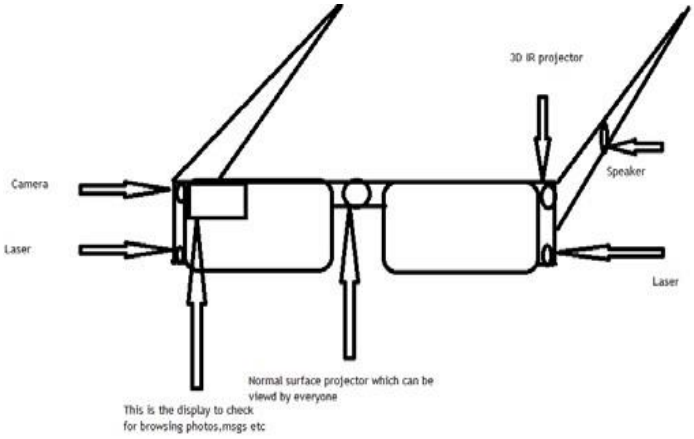
There are some loopholes in present sixth sense design and that is there is no privacy when you are browsing your data. In this concept we can use laser filter glass having an interface between digital and real world. This glass has gesture recognition infrared camera, infrared 3D laser projector and 2 lasers fitted at both the ends of the glass and also acts as a small display and normal projector at centre. Concept of privacy is maintained. Display is made up of optical glass and have a prism layer and a mini projector which will directly project on optical nerve of eye making it seem as if your eye is projecting information.



It will also include microphone which is used for sound recording and browsing of data using voice. This glass will connect with computing device with the help of Bluetooth and the glass will work on battery. Using this glass we can click photos, record video, browse data, check for direction, send message verbally, dial a call by just uttering their name, send message if number are saved or else you can simply dial the number in air.

Assuming that we are using Infrared projector, the projected things can only be seen through laser filter glasses which will protect the privacy of the user. In case of using normal projector the projector will project the information on surface which will be visible to other person. Using 3D infrared laser one can interact with 3D objects and changes can be made just like a 3D workspace. Small display in front of the glass will display the photos; messages etc. Whilst the user can interact with it. Laser will detect the gesture and accordingly pass the signal to computing devices.

There will also be an application in computing device if user is in private browsing mode. Thus the augmented reality have gone into a different dimension where it can also be used as a night vision device and can be used by militaries. Apart from it, it can also act as a fifth sense for the disable people. Thus not only economically but it can also be used for well-being of humans.



ABOVE FIG.:- Rough hardware of Sixth Sense glass

7. ENHANCEMENTS

Searching the alternative for the colour markers would be another asset of this device. Kinect and The Leap have shown that it is possible. Enhancing the device to be practiced in various fields like gaming, education systems, entertainment fields will generate wide range of customer. Extra speaker can be added or mobile computing device with inbuilt speaker can be used to prepare this device. This allows developers to develop an application that can translate the gesture into sound. Integrating camera and projector in the mobile computing device would be an infallible idea as the devices like The Leap, Kinect have inbuilt sensors to recognize the gesture which could solve the limitation of camera algorithm, if the camera is been replaced by any one of these devices.

The Leap is a device that tracks movement of both hands and all 10 fingers through an open space between a user and user's computing device. It operates using LED lights and camera sensors. The software detects user's hands and fingers and translates the data into information for the device (Leap Motion 2013.)

The suggestion for the enhancement of the device would be first to finish porting the code in JAVA and to adjust it

for Android also. Eventually, phones with projector can be used with little modifications like adding The Leap just below the camera section and adding the mirror right below the projector. After the modification, shaping the device as wearable is not really a problem. This modification provides multiple options to the users. They can use the phone by touching the front screen or use it by gestures and images by operating it from back side. By adding speech integrated circuit, the device can be built useful for the users with disabilities. The devices like Samsung i7410 for the Android version, LG EXPO (GW820) for the Windows version or components like monolith for iPhone version codes are benefit for the enhancements. (Samsung 2009; LG 2009)

FUTURE (SUGGESTED) ENHANCEMENTS

- To get rid of colour markers and hand use, easily used by voice recognition.
- Interactive advertisement.
- Sixth sense with holographic visualizes the better world.
- True 3D print media.
- 3D visualization and gesture tracking.
- Camera can act as an eye for blind people as a fifth sense for them.
- It is almost like setting up a digital system into our body and making use of it.
- In the given concept, the computing device has inbuilt microphone and speakers in it so the user can use that feature to connect to the external devices as well.

8. CURRENT STATUS

Despite of its wide press coverage in 2009, no commercial product of the Sixth Sense technology had been achieved. Also in September 2013, the open source code which was published has not been updated since October 2012 and the Java development branch of the project was similarly stalled. With many users encountering difficulties compiling and running the source code, the technology itself has not spread as widely as its media coverage. Pranav Mistry hinted at several reasons for not able to deliver the technology so far, including the need to incorporate newer hardware's and to remove the dependencies on proprietary Microsoft code libraries.

9. FUTURE SCOPE

- ✓ Further development in this technology will lead to evolvement of new markets. Hardware used in the current technology can be perfected as it plays an important role in this technology by interacting with the user.
- ✓ Security of the current technology can further be improved and more accuracy could be aimed.
- ✓ Enhancements could be made so that visually impaired people can use this technology.
- ✓ The current technology is a little bulky to carry around, so few improvements can make it user friendly.

10. CONCLUSIONS

The insightful use of gesture movement and speech integrated circuits has made sixth sense technology a progressive and developing innovative idea. It provides us a smooth access to information that may help us to make crucial decisions. The ultimate power of Sixth Sense lies within the potential it holds is to connect Internet with the real world and superimposing the data on the real-world itself. Although upcoming technologies like 5 pen PC technology allow us to carry computers alongside with us in our pockets, a link between the digital devices we can carry and its interactions with real world, also our speech, has not yet been found. The masterstroke here is that Sixth Sense identifies the objects around oneself, lets us access the information in the way we want and displays that information as well, all this in the most simplest of the ways. Felicitous awareness of this technology will point to even further development and use of this technology, which in-turn will aid in obtaining information and operating any type of function practically at any time, simply by using gestures and commands.

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