



Review Paper on “Sixth Sense Technology”

Vimal Kumawat¹, Dr. Vikas Bansal²

¹Student, Mechanical Engineering Department, RTU Kota, Rajasthan, India

²Associate Professor, Mechanical Engineering Department, RTU Kota, Rajasthan, India

ABSTRACT

Sixth Sense Technology is a mini-projector coupled with a camera and a cellphone—which acts as the computer and connected to the Cloud, all the information stored on the web. Sixth Sense can also obey hand gestures. The camera recognizes objects around a person instantly, with the micro-projector overlaying the information on any surface, including the object itself or hand. Also can access or manipulate the information using fingers. make a call by Extend hand on front of the projector and numbers will appear for to click. know the time by Draw a circle on wrist and a watch will appear. take a photo by Just make a square with fingers, highlighting what want to frame, and the system will make the photo—which can later organize with the others using own hands over the air. And The device has a huge number of applications , it is portable and easily to carry as can wear it in neck.

1. INTRODUCTION

We have evolved over millions of years to sense the world around us. When we encounter something, someone or some place, we use our five natural senses which includes eye, ear, nose, tongue mind and body to perceive information about it; that information helps us make decisions and chose the right actions to take. But the most useful information that can help us make the right decision is not naturally perceivable with our five senses, namely the data, information and knowledge that humankind has accumulated about everything and which is increasingly all available online.

Sixth Sense is a wearable “gesture based” device that augments the physical world with digital information and lets people use natural hand gestures to interact with that information. It was developed by Pranav Mistry, a PhD student in the Fluid Interfaces Group at the MIT

Media Lab. A graduate student with the Fluid Interfaces Group at MIT, he caused a storm with his creation of Sixth Sense.

We can get information on anything we want from anywhere within a few moments! We will not only be able to interact with things on a whole new level but also with people! One great part of the device is its ability to scan objects or even people and project out information regarding what you are looking at.

2. EVOLUTION

Earlier Sixth Sense Prototype:



Figure 1: Earlier Device

Group of seven graduate students in MIT, were thinking about how a person could be more integrated into the world around them and access information without having to do something like take out a phone. They initially produced a wristband that would read a Radio Frequency Identification tag to know, for example, which book a user is holding in a store.

They also had a ring that used infrared to communicate by beacon to supermarket smart shelves to give you information about products. As we grab a package of macaroni, the ring would glow red or green to tell us if the product was organic or free of peanut traces — whatever criteria we program into the system.

They wanted to make information more useful to people in real time with minimal effort in a way that doesn’t require any behavior changes. The wristband was getting close, but we still

had to take out our cell phone to look at the information.

Recent Prototype:



Figure 2: Present Device

Now they have switched to a smaller projector and created the pendant prototype to be worn around the neck.

The Sixth Sense prototype is composed of a pocket projector, a mirror and a camera. 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.

We can very well consider Sixth Sense Technology as a blend of the computer and the cell phone. It works as the device associated to it is hung around the neck of a person and thus the projection starts by means of the micro projector attached to the device. Therefore, in course, you turn out to be a moving computer in yourself and the fingers act like a mouse and a keyboard. The prototype was built from an ordinary webcam and a battery-powered 3M projector, with an attached mirror — all connected to an internet-enabled mobile phone. The setup, which costs less than \$350, allows the user to project information from the phone onto any surface — walls, the body of another person or even your hand.

Mistry wore the device on a lanyard around his neck, and colored Magic Marker caps on four fingers (red, blue, green and yellow) helped the camera distinguish the four fingers and recognize his hand gestures with software that Mistry created.

3.COMPONENTS

The hardware components are coupled in a pendant like mobile wearable device.

- Camera
- Projector
- Mirror
- Mobile Component
- Color Markers

Camera: webcam captures and recognizes an object in view and tracks the user's hand gestures using computer-vision based techniques. It sends the data to the smart phone. The camera, in a sense, acts as a digital eye, seeing what the user sees. It also tracks the movements of the thumbs and index fingers of both of the user's hands. The camera recognizes

objects around you instantly, with the micro projector overlaying the information on any surface, including the object itself or your hand.

Projector: Also, a projector opens up interaction and sharing. The project itself contains a battery inside, with 3 hours of battery life. The projector projects visual information enabling surfaces, walls and physical objects around us to be used as interfaces. We want this thing to merge with the physical world in a real physical sense. You are touching that object and projecting info onto that object. The information will look like it is part of the object. A tiny LED projector displays data sent from the smart phone on any surface in view—object, wall, or person.

Mirror: The usage of the mirror is significant as the projector dangles pointing downwards from the neck.

Mobile Component : The mobile devices like Smartphone in our pockets transmit and receive voice and data anywhere and to anyone via the mobile internet. An accompanying Smartphone runs the Sixth Sense software, and handles the connection to the internet. A Web-enabled smart phone in the user's pocket processes the video data. Other software searches the Web and interprets the hand gestures.

Color Markers: It is at the tip of the user's fingers. Marking the user's fingers with red, yellow, green, and blue tape helps the webcam recognize gestures. The movements and arrangements of these makers are interpreted into gestures that act as interaction instructions for the projected application interfaces.

4.WORKING

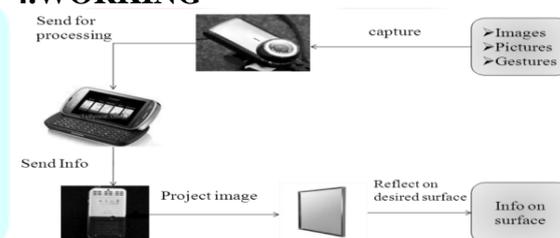


Figure 3: Working

The entire hardware apparatus is encompassed in a pendant-shaped mobile wearable device. Basically, the camera recognizes individuals, images, pictures, gestures one makes with their hands and the projector assists in projecting any information on whatever type of surface is present in front of the person. The usage of the mirror is significant as the projector dangles pointing downwards from the neck. To bring out variations on a much higher plane, in the demo video which was broadcasted to showcase the prototype to the world, Mistry uses colored caps on his fingers so that it

becomes simpler for the software to differentiate between the fingers, demanding various applications.

The software program analyses the video data caught by the camera and also tracks down the locations of the colored markers by utilizing single computer vision techniques. One can have any number of hand gestures and movements as long as they are all reasonably identified and differentiated for the system to interpret it, preferably through unique and varied fiducials. This is possible only because the 'Sixth Sense' device supports multi-touch and multi-user interaction.

MIT basically plans to augment reality with a pendant Pico projector: hold up an object at the store and the device blasts relevant information onto it (like environmental stats, for instance), which can be browsed and manipulated with hand gestures. The "sixth sense" in question is the internet, which naturally supplies the data, and that can be just about anything -- MIT has shown off the device projecting information about a person you meet at a party on that actual person (pictured), projecting flight status on a boarding pass, along with an entire non-contextual interface for reading email or making calls. It's pretty interesting technology that, like many MIT Media Lab projects, makes the wearer look like a complete dork -- if the projector doesn't give it away, the colored finger bands the device uses to detect finger motion certainly might.

The software recognizes 3 kinds of gestures:

- Multitouch gestures, like the ones you see in Microsoft Surface or the iPhone -- where you touch the screen and make the map move by pinching and dragging.
- Freehand gestures, like when you take a picture [as in the photo above]. Or, you might have noticed in the demo, because of my culture, I do a namaste gesture to start the projection on the wall.
- Iconic gestures, drawing an icon in the air. Like, whenever I draw a star, show me the weather. When I draw a magnifying glass, show me the map. You might want to use other gestures that you use in everyday life. This system is very customizable.

5.RELATED TECHNOLOGIES

SixthSense' technology takes a different approach to computing and tries to make the digital aspect of our lives more intuitive, interactive and, above all, more natural. We shouldn't have to think about it separately. It's a lot of complex technology squeezed into a

simple portable device. When we bring in connectivity, we can get instant, relevant visual information projected on any object we pick up or interact with. The technology is mainly based on hand augmented reality, gesture recognition, computer vision based algorithm etc.

5.1 Augmented reality:

Augmented reality (AR) is a term for a live direct or indirect view of a physical real-world environment whose elements are augmented by virtual computer-generated imagery. It is related to a more general concept called mediated reality in which a view of reality is modified (possibly even diminished rather than augmented) by a computer. The augmentation is conventionally in real-time and in semantic context with environmental elements.

There are three major display techniques for Augmented Reality:

➤ Mounted Displays

A Head Mounted Display (HMD) places images of both the physical world and registered virtual graphical objects over the user's view of the world. The HMD's are either optical see through or video see-through in nature.

➤ Handheld Displays

Handheld Augment Reality employs a small computing device with a display that fits in a user's hand. All handheld AR solutions to date have employed video see-through techniques to overlay the graphical information to the physical world. Initially handheld AR employed sensors such as digital compasses and GPS units for its six degree of freedom tracking sensors.

➤ Spatial Displays

Instead of the user wearing or carrying the display such as with head mounted displays or handheld devices; Spatial Augmented Reality (SAR) makes use of digital projectors to display graphical information onto physical objects.

Modern mobile augmented reality systems use one or more of the following tracking technologies: digital cameras and/or other optical sensors, RFID, wireless sensors etc. Each of these technologies have different levels of accuracy and precision. Most important is the tracking of the pose and position of the user's head for the augmentation of the user's view.

For users with disabilities of varying kinds, AR has real potential to help people with a variety of disabilities. Only some of the current and future AR applications make use of a Smartphone as a mobile computing platform.

5.2 Gesture Recognition:

Gesture recognition is a topic in computer science and language technology with the goal of interpreting human gestures via mathematical algorithms. Gestures can originate from any bodily motion or state but commonly originate from the face or hand. Current focuses in the field include emotion recognition from the face and hand gesture recognition. Many approaches have been made using cameras and computer vision algorithms to interpret sign language.

Gestures can exist in isolation or involve external objects. Free of any object, we wave, beckon, fend off, and to a greater or lesser degree (depending on training) make use of more formal sign languages. With respect to objects, we have a broad range of gestures that are almost universal, including pointing at objects, touching or moving objects, changing object shape, activating objects such as controls, or handing objects to others.

Gesture recognition can be seen as a way for computers to begin to understand human body language, thus building a richer bridge between machines and humans than primitive text user interfaces or even GUIs (graphical user interfaces), which still limit the majority of input to keyboard and mouse. Gesture recognition enables humans to interface with the machine (HMI) and interact naturally without any mechanical devices. Gestures can be used to communicate with a computer so we will be mostly concerned with empty handed semiotic gestures. These can further be categorized according to their functionality.

➤ Symbolic gestures

These are gestures that, within each culture, have come to a single meaning. An Emblem such as the “OK” gesture is one such example, however American Sign Language gestures also fall into this category.

➤ Deictic gestures

These are the types of gestures most generally seen in HCI and are the gestures of pointing, or otherwise directing the listeners attention to specific event or objects in the environment.

➤ Iconic gestures

As the name suggests, these gestures are used to convey information about the size, shape or orientation of the object of discourse. They are the gestures made when someone says “The plane flew like this”, while moving their hand through the air like the flight path of the aircraft.

➤ Pantomimic gestures

These are the gestures typically used in showing the use of movement of some invisible tool or object in the speaker’s hand. When a speaker says “I turned the steering wheel hard

to the left”, while mimicking the action of turning a wheel with both hands, they are making a pantomimic gesture.

Using the concept of gesture recognition, it is possible to point a finger at the computer screen so that the cursor will move accordingly. This could potentially make conventional input devices such as mouse, keyboards and even touch-screens redundant. Gesture recognition can be conducted with techniques from computer vision and image processing. The literature includes ongoing work in the computer vision field on capturing gestures or more general human pose and movements by cameras connected to a computer.

5.3 Computer vision based algorithm:

Computer vision is the science and technology of machines that see. As a scientific discipline, computer vision is concerned with the theory behind artificial systems that extract information from images. The image data can take many forms, such as video sequences, views from multiple cameras, or multi-dimensional data from a medical scanner.

Computer vision, on the other hand, studies and describes the processes implemented in software and hardware behind artificial vision systems. The software tracks the user’s gestures using computer-vision based algorithms. Computer vision is, in some ways, the inverse of computer graphics. While computer graphics produces image data from 3D models, computer vision often produces 3D models from image data. There is also a trend towards a combination of the two disciplines, e.g., as explored in augmented reality.

The fields most closely related to computer vision are image processing, image analysis and machine vision. Image processing and image analysis tend to focus on 2D images, how to transform one image to another. This characterization implies that image processing/analysis neither require assumptions nor produce interpretations about the image content. Computer vision tends to focus on the 3D scene projected onto one or several images, e.g., how to reconstruct structure or other information about the 3D scene from one or several images. Machine vision tends to focus on applications, mainly in manufacturing, e.g., vision based autonomous robots and systems for vision based inspection or measurement

5.4 Technologies that uses Sixth Sense as Platform:

SixthSense technology takes a different approach to computing and tries to make the digital aspect of our lives more intuitive, interactive and, above all, more natural. When

you bring in connectivity, you can get instant, relevant visual information projected on any object you pick up or interact with. So, pick up a box of cereal and your device will project whether it suits your preferences. Some of the technologies that uses this are Radio Frequency Identification, gesture gaming, washing machine.

Radio Frequency Identification: The radio frequency identification is the platform which is based on the enterprise intelligence which combines Radio Frequency Identification events with information from other enterprise systems and sensors to automatically make inferences about objects, people, workspaces and their interactions. This is basically an electronic class technology that allows tracking of tags & detection & consequently the objects that they are affixed to. It is used for tagging & remote detection with the low cost having widespread adoption of RFID.

Washing Machine: A remarkable front loader that incorporates the unparalleled sixth Sense 2891 International Journal of Engineering Research & Technology technology has been placed in a Whirlpool AWOE 8758 White Washing Machine, gives more optimization of resources and also increased saving in terms of energy, water and time

6.APPLICATIONS.

6.1 Make a call:



Figure 4: Make a call

You can use the Sixth Sense to project a keypad onto your hand, then use that virtual keypad to make a call. Calling a number also will not be a great task with the introduction of Sixth Sense Technology. No mobile device will be required, just type in the number with your palm acting as the virtual keypad. The keys will come up on the fingers. The fingers of the other hand will then be used to key in the number and call.

6.2 Call up a map:



Figure 5: Map

The sixth sense also implements map which lets the user display the map on any physical surface and find his destination and he can use

his thumbs and index fingers to navigate the map, for example, to zoom in and out and do other controls.

6.3 Check the time:



Figure 6: Wrist Watch

Sixth Sense all we have to do is draw a circle on our wrist with our index finger to get a virtual watch that gives us the correct time. The computer tracks the red marker cap or piece of tape, recognizes the gesture, and instructs the projector to flash the image of a watch onto his wrist.

6.4 Create multimedia reading experiences:



Figure 7: Video in Newspaper

The SixthSense system also augments physical objects the user is interacting with by projecting more information about these objects projected on them. For example, a newspaper can show live video news or dynamic information can be provided on a regular piece of paper. Thus a piece of paper turns into a video display.

6.5 Drawing application:



Figure 8: Drawing

The drawing application lets the user draw on any surface by tracking the fingertip movements of the user's index finger.

6.6 Get product information:



Figure 9: Product information

Technology is integrating the digital and physical worlds, rather than forcing one to switch back and forth between the two.

Sixth Sense comprises a pocket projector, a mirror, and a camera. 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 users pocket.

Giving examples about its use, he said Sixth Sense lets the user draw icons or symbols in the air using the movement of the index finger and recognizes those symbols as interaction instructions.

6.7 Get book information:



Figure 10: Book information

Maes says Sixth Sense uses image recognition or marker technology to recognize products you pick up, then feeds you information on books. The system can project Amazon ratings on that book, as well as reviews and other relevant information

6.8 Take pictures:



Figure 11: Take Pictures

If we fashion our index fingers and thumbs into a square (the typical "framing" gesture), the system will snap a photo. After taking the desired number of photos, we can project them onto a surface, and use gestures to sort through the photos, and organize and resize them.

6.9 Get flight updates:



Figure 12: Flight updates

The system will recognize your boarding pass and let you know whether your flight is on time and if the gate has changed.

7.ADVANTAGES AND ENHANCEMENTS

- Sixth Sense is a user friendly interface which integrates digital information into the physical world and its objects,

making the entire world your computer.

- Supports multi-touch and multi-user interaction
- Data access directly from machine in real time
- It is an open source and cost effective and we can mind map the idea anywhere
- It is gesture-controlled wearable computing device that feeds our relevant information and turns any surface into an interactive display.
- The device could be used by anyone without even a basic knowledge of a keyboard or mouse.
- There is no need to carry a camera anymore. If we are going for a holiday, then from now on wards it will be easy to capture photos by using mere fingers.
- To incorporate camera and projector inside mobile computing device.
- Whenever we place pendant- style wearable device on table, it should allow us to use the table as multi touch user interface.
- Applying this technology in various interest like gaming, education systems etc.
- To have 3D gesture tracking.
- To make sixth sense work as fifth sense for disabled person.

8.CONCLUSION

Sixth sense is the science of tomorrow with the aim of connecting the digital world with the physical world seamlessly, eliminating hardware devices. Even though the sixth sense devices are in development stage and have not been used in widely, it is predictable that this technology will revolutionize the way people interact with the digital world. Sixth sense has potential to become the extreme transparent user interface for accessing information about everything around it. And as different devices have already started to come out with the implementation of this concept, it can be predicted that in near future everyone will have this device in the way they are having cellphones now. Diminishing the mouse and keyboard from everywhere is a challenge. Regardless of that challenge it will for-sure reduce the number of users who uses devices like keyboard and mouse.

There is no doubt that the future of Sixth Sense technology will continue. Once this device is developed, there is no need of printing all the details of components available in the supermarket. Because this device can scan the object and show all the information, details, compositions, and even the costumers' review.

All the details can be stored in the cloud and this device can retrieve that information just like the QR code and project it in the real environment in real time. Finding the suitable algorithm for the feasible working of the device, implementing the security system for the personal informations, are however, the biggest general problems of this concept. If the challenges and limitations are overcome with the enhancements of the device, no doubt the device will be a benefit to everyone in the entire world

REFERENCES

- i. Arora, M. 2012. Basic Principles of Sixth Sense Technology. VSRD International Journal of Computer Science and Information Technology, VSRD-IJCSIT, Vol. 2(8).
- ii. Bhartia, A., Bhatia, R., Bhatia, S. And Rani, G. 2012. Sensing the sixth sense technology, International Journal of information technology and knowledge management, Volume 5, 201-204
- iii. Bimber, O. and Raskar, R. 2005. Spatial Augmented Reality: Merging Real And Virtual Worlds, A K Peters Ltd.
- iv. Dhingra, S. 2011. Sixth Sense Technology will Revolutionize the World.
- v. Archakam, K. C. 2010. Sixth Sense Technology, Available: <http://kalyankrishna4886.wordpress.com/2010/11/13/sixthsense-technology/>

