

# The Sixth Sense Technology

Guided by: Ms. -----

KRISHNACHAND DUBEY

**ABSTRACT:-** The Sixth Sense 'An Extrasensory Perception' has turned into the new called 'The Sixth Sense Technology' which has emerged in few years. We all have evolved over millions of years to sense the world around us. We always make use of our five natural senses to perceive the information around us whenever we come across a thing, a person or a place. That information helps us make judgments and embrace the appropriate action to be taken. But arguably, the most useful information that can help us take the right decision and judgments is not naturally cognoscible information with the help of our five senses, namely the data, information and knowledge that mankind has amalgamated but, rather it's the 'Sixth Sense Technology.

**Keywords:-** Digital World, Natural Hand Gestures, Sixth Sense Technology, Sixth Sense Device, Security Issues

## I. INTRODUCTION

'SixthSense' is a wearable gestural interface that augments the physical world around us with digital information and lets us use natural hand gestures to interact with that information. We've 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 to perceive information about it; that information helps us make decisions and choose the right actions to take. But arguably 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 mankind has accumulated about everything and which is increasingly available online. Although the miniaturization of computing devices allows us to carry computers in our pockets, keeping us continually connected to the digital world, there is no link between our digital devices and our interactions with the physical world. By using a camera and a tiny projector mounted in a pendant-like wearable device, 'Sixth Sense' sees what you see and visually augments any surface or objects we are interacting with. It projects information onto surfaces, walls and physical objects around us, and let us interact with the projected information through natural hand gestures, arm movements, or our interaction with the object itself. The software program processes the video stream data captured by the camera and tracks the locations of the colored markers (that we wear on our fingers) using simple computer vision techniques. This paper helps us have knowledge of how the sixth sense device had vanquished the five natural senses. This paper makes us cognizant how the sixth sense technology

provides an integration of the digital world with the real world. This paper focuses over various applications light over various security related issues and further implications. The theory behind Sixth Sense Technology is that the Sixth Sense Device tries to determine not only what someone is interacting with but also how he or she is interacting with it. The software searches the internet for the information that is relevant to that situation.

## II. HISTORY

Pranav Mistry, of Indian origin, a PhD student in Fluid Interfaces Group at the MIT Media Lab is the mastermind behind the Sixth Sense technology. Pranav was inspired by the movies like "Robocop" and "Minority Report" which inspired him to create his view of a world not dominated by the computers, human robots and digital information rather build a technology with Human gestures which is portable enough to carry and to make the world more interactive and workflow much easier. Sixth Sense will allow us to interact with the world like never before. We can get any information anywhere within few moments and that took on a new level without any screen or computer hardware components. On great part of the device is its ability to scan objects or people and project out information regarding what you are looking for. The Sixth Sense technology was developed at media labs in MIT and termed as Wear Your World (WUW.)

## III. BASIC COMPONENT

It consists of certain commonly available components, which are intrinsic to its functioning. These include a camera, a portable battery-powered projection system coupled with a mirror and a cell phone. All these components communicate to the cell phone, which acts as the communication and computation device. The entire hardware apparatus is encompassed in a pendant-shaped mobile wearable device. Basically the camera recognises 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 coloured 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 videodata caught by the camera and also tracks down the locations of the coloured markers by utilising 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.

### Hardware Setup Camera

Captures an object in view and tracks the user’s hand gestures. It sends the data to smart phone. It acts as a digital eye, connecting you to the world of digital information.

### Projector

The Projector projects visual information enabling surfaces and physical objects to be used as interfaces. The projector itself contains a battery inside, with 3 hours of battery life. A tiny LED projector displays data sent from the smart phone on any surface in view—object, wall, or person. Pocket projector Pk101 from Optoma is used. It is suitable for mobile usage.

### Mirror

The usage of the mirror is significant as the projector dangles pointing downwards from the neck. The mirror is used to focus projections on surface.

### Mobile Component

A Web-enabled smart phone in the user’s pocket processes the video data. Other software searches the Web and interprets the hand gestures. Nokia n95 smart phone is used (running Symbian O.S s60 edition). It has multi-tasking capability. Built-in camera provides execution of both Gesture tracking engine and Gesture enabled application.

### Colored Markers

Marking the tip of user’s fingers with red, yellow, green, and blue tape helps the webcam recognize gestures. Their movements and arrangements of these markers are interpreted into gestures that act as interaction instructions for the projected application interfaces.

### Software Setup

Applications are implemented using JAVA 2 MICRO edition, a Java platform designed for embedded systems where target devices range from industrial controls to mobile phones. Computer vision library is written in Symbian C++ (used in Gesture tracking). The software for the sixth sense prototype is developed on a Microsoft Windows platform using C#, WPF and open CV. The software works on the basis of computer vision. A small camera acting as an eye, connecting us to the world of digital information. Processing is happening in the mobile phone, and basically works on computer vision algorithms. Approx 50,000 lines of code are used.

## IV. WORKING

As we can see in Figure 3 that the camera captures the movement of moving colored markers on the user’s finger tips when they move their hands. Camera and projector both are

connected to the smart phone in user’s pocket. Recognition is made using *Computer Vision Technique*. The software program processes this video stream data and interprets the movements into gestures. Each gesture is different from one another and is assigned some commands. These gestures act as input to application which is projected by the projector. The mirror reflects the image formed by the projector to front. The projector projects visual images on a surface. This surface can be wall, table or even your hand. This technology is mainly based on hand gesture recognition, image capturing, processing and manipulation, etc.

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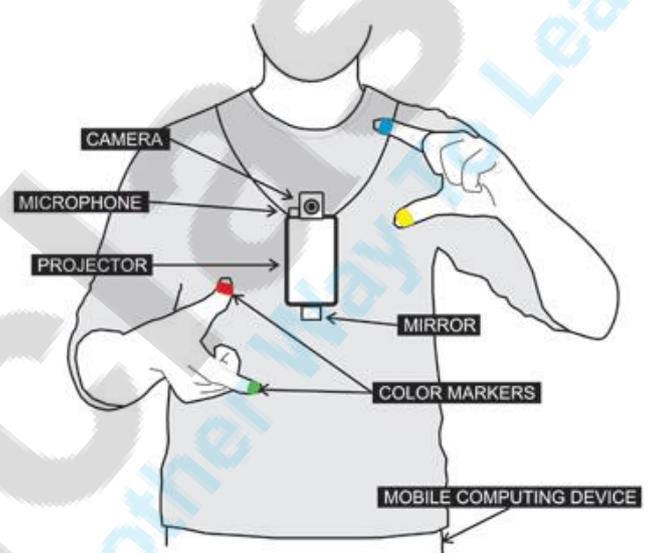


Figure 1 : The Sixth Sense Device

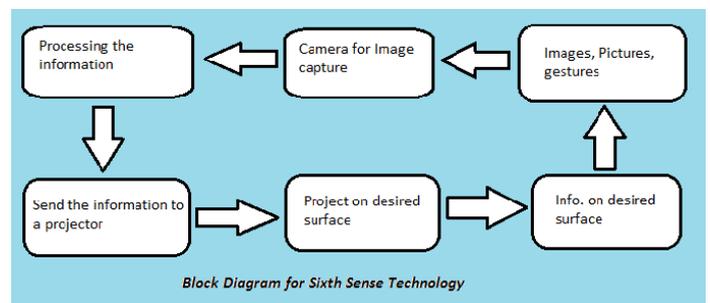


Figure 2: Working of Sixth Sense Device

### The software recognizes following 3 kinds of gestures:

- Multi-touch Gestures: where we touch an image like a map and make it move by pinching & dragging.

- **Iconic Gestures:** like drawing a star in the air with fingers and it shows me weather. Or drawing a circle on my wrist and it shows me watch.

- **Freehand Gestures:** all the gestures done with free hands like clicking a picture in the air and it projects that picture on any surface.

## V. APPLICATIONS

Sixth Sense prototype implements several applications that demonstrate the usefulness, viability and flexibility of the system. The SixthSense device has a huge number of applications. 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. 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. 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. The Sixth Sense 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. The user can zoom in or zoom out using intuitive hand movements. The drawing application lets the user draw on any surface by tracking the fingertip movements of the user's index fingering formation 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 Product information Maes says Sixth

There are various applications of Sixth Sense that exhibits the efficiency, viability and flaccidity of the system.

**5.1 Make a Call:** This technology enables the user to call without using the dialer. The dialer will be projected as soon as user brings the palm in front of the device. The user does not need a mobile phone to make the call rather the virtual keypad it projected on the palm.

**5.2 Get Flight Updates:** The device can also tell the user whether the flight is delayed or is on time by looking at the ticket.

**5.3 The Map:** The map application allow the user to navigate a map that displayed on a nearby surface by using our hand gestures, which is similar to the gestures supported by Multi-Touch based systems, permitting the user to zoom in, zoom out or pan using intuitive hand movements.

**5.4 3D Drawing Application:** The drawing application of this device lets the user draw on any surface by tracking the tips movements of the user's index finger.

**5.5 The Clock:** The user just needs to make a gesture of a circle

on the wrist and the clock with current time will be projected on the user's hand.

**5.6 Motion Capture:** Using fingers the user can capture photos and no need to carry an extra gadget. The box created by fingers act as a frame. These photos can be edited also or shared with people.

**5.7 Video Newspapers:** This device also recognizes articles in the newspaper, retrieve the latest related stories or video stream from the internet and then display them on pages for user. It had said goodbye to "dictionary and encyclopedia."

**5.8 Book Information:** for book lovers it had proved to be a blessing as you just open any book and find the ratings of the book, also move to any page and get additional information. Similarly, we can find information about any product also.

## VI. VARIOUS SECURITY THREATS

Every technology available in the market and in process faces some severe security threats. With sixth sense device also there are some security concerns due to which it is still not in the market. There are several Cyberwarfare with Sixth Sense. Cyberwarfare also known as Cyber War are any virtual conflict initiated to attack on enemy's computer and information system.

Through Internet, these attacks disable financial and organizational systems by stealing or altering classified data to undetermined network websites and services. It leads to military and financial computer systems at risk and Security breaches. There

### Potential Benefits and Advantages

SixthSense has a user guide that can be used very simply. Some of important gestures that people can learn easily are like taking a picture or making a phone call or trying to know the time. In order to snap a picture, the user has to make a rectangle in the air with their fingers as if they are snapping a picture. The picture will be taken and it will be placed in the memory card of the device. Whenever the user wants to edit the picture, they can always access the picture. A person can resize and edit it by making few finger motions on the projected screen on any hard surface. A phone call, using the SixthSense, can be made so easily. All a person needs to do is to touch digital keys on one's palm or whichever surface he decides to project. If the user wants to check the time, all they have to do is gesture a circle on the user's wrist. The SixthSense will recognize the movement and project an analog clock on to the wrist (Mistry, 2010).

There are also many special features in addition to recognizing our physical movements. SixthSense can scan a book you want to read and it can present you detailed reviews, ratings and even summaries of that same book. Not only a book, it can recognize a newspaper, a magazine. While Pranav Mistry presented his SixthSense, he did an experiment using a newspaper. While he scanned a picture from the news paper, the SixthSense pulled up a video online about the same news that is published in the newspaper. This device comes in handy and can used very easily by all the people because it uses hand gestures which everyone actually uses in everyday life.

Apart from the features mentioned above, SixthSense can also be a great substitute for a laptop or a computer. Checking email, web

browsing, other programs like Microsoft word, adobe are also included in this device. For instance, when a user wants to check his email, he needs switch on the projector and write “@” with his fingers. The camera quickly recognizes and presents the user with different email options he can use (TED, 2009).

Benefits which we get by using the SixthSense also include many other things like playing games to writing accounts. Pranav made a clip like object by using a microphone from the webcam. When you attach that clip to the project and clip to a paper, you can draw on the paper with your fingers and it can calculate and give you the information of that graph or 3d you drew. When you want to play a game, the same clip produces sound outward and we can hear all the noises of any particular game or even watch a movie with just a paper and the SixthSense device (TED, 2009)

### Concerns, Issues and Disadvantages

The product is not yet released into the market. There are no legal obligations as of now, because there are some modifications still being made on the product itself. However, there are some security concerns about this product. New inventions in information technology have some kind of security concerns. For example when a person is taking a picture using the SixthSense, he just snaps with his fingers which have little marker caps on them. People don't want to be captured on a camera of a random person. One can never tell when SixthSense is taking a picture, because it is not a big object and nothing is being help in your hand in order to take a picture like a camera or a phone. This is invading other's privacy which can be a huge problem.

Some of the health issues are regarding SixthSense's projection technology. When the device is projecting on a hard surface, it is not private enough for just the user. People around him can see the projection since it is very detailed. Projection is better in the night time and dark areas rather than mornings and bright areas. This is an issue because the vision of the user can be damaged when using this instrument. SixthSense should be able to shift its projection techniques during different times of the day. That way it won't be an issue for the vision of the user. Since the device is still being modified and tested, Mistry can try to overcome issues with projection.

Concerns about the pricing of this device are also rising among the people. Mistry announced that the present device is costing about \$350 for each, on his website (Mistry, 2010). This information was updated in 2009, but ever since then there is not news about this device. Mistry is working on many other technologies and inventions, but the world doesn't know whether the work on this device is stopped (Doherty, 2009). Turns out that this is the most important ethical issue. People and the manufactures who are ready to have this product out in market do not know when this will be out. Pranav Mistry said, “This prototype needs some serious engineering and programming.” Everyone is waiting hoping that this will be available in market once all the modifications are done (Boyd, 2009).

### VII. FUTURE ENHANCEMENTS

As this technology will emanate may be new devices and new technologies based on it will also come up. Sixth Sense Device is completely different from the computers as it

enables one to compute and browse on any surface that we can find around. The foremost thing is to overcome all the security threats discussed in previous section; as many new technologies came and died due to security issues and threats. Secondly, to get rid of the color markers and integrate camera and projector inside the mobile computing device itself. Thirdly, implementing this technology in various areas like gaming, education system etc. Fourthly, there can be a 3D gesture tracking as in MS Kinect device. Fifthly, in this world of smart phones where smart phone as available at cheaper prices with more features Pranav should try to reduce its actual cost from

\$350. Lastly, and the most essential which can be benefit for the society also to make sixth sense work as fifth sense for disabled people.

### VIII. THE INVENTOR

**Pranav Mistry, 28 year old, of Indian origin** is the mastermind behind the sixth sense technology. He invented ‘**Sixth Sense / WUW ( Wear UR World)**’ which is a wearable gestural, user friendly interface which links the physical world around us with digital information and uses hand gestures to interact with them .He is a PhD student at MIT and he won the ‘Invention of the Year 2009 ‘ - by Popular Science

### IX. CONCLUSION

The sixth sense technology using gesture movement and speech integrated circuits are emerging innovative ideas. We have a seamless access to data or information that may exist to help us make decisions. This provides access to relevant information about the things in the environment and enables the new interactions between the real world and the world of data. Although the miniaturisation of computing devices allows us to carry computers in our pockets, there had been no link between the digital devices we carry and our interactions with the physical world, and our speech in a efficient level .Sixth sense is developed to seamlessly integrate information into reality. The future may depend upon this sixth sense. May be within this 2020, the proliferation and the use of this technology is immense. Sufficient awareness of the sixth sense will lead to further development of any technology which aids for getting information and performing any type of action practically at any time, using simply the gestures and commands given .The advantage of this technology is portable, its connectedness between the world and the information as speech. Its cost effectiveness and data can accessed from the machine directly in real time. It can also be said as an open source technology. Within twenty years this technology will bring a drastic change in field of science and will create a revolutionary change among the mass. The device will soon be up for sale and will be available to the common public the device will cost around 350\$ without the custom made PC. which aids for getting information and performing any type of action practically at any time, using simply the gestures and commands given.

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