

Sixth Sense Technology

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Abstract—Sixth Sense Technology integrates digital information into the physical world and its things, making the whole world your computer. It can turn any surface into a screen touch for computing, controlled by simple hand gestures. Sixth Sense device is a mini-projector coupled with a camera and a cell phone-which acts as the computer and your connection to the Cloud, all the data stored on the web. Sixth Sense will allow us to connect with our world like never before. They can get data 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 public. One great part of the device is its ability to scan objects or even people and project out data regarding what you are looking at.

Sixth Sense is a wearable “gesture based” device that augments the physical world with digital data and let’s public use natural hand gestures to interact with that data. It was built by Pranav Mistry, a PhD student in the Fluid Interface Group at the MIT Media Lab. Sixth Sense in scientific (or non-scientific) terms is defined as Extra Sensory Perception or in short ESP. It consist the receiving of data not gained through any of the 5 senses. It is not taken from any experiences from the past or known. Sixth Sense aims to more like a dream integrate online information and tech into everyday life. By making available information required for decision-making beyond what we have access to with our five senses, it efficiently gives users a sixth sense

I. INTRODUCTION

We have evolved over millions of years for sense the planet around us. When we come upon something, somebody or some place, we employ our five natural senses which comprise eye, ear, nose, tongue mind and body to see information about it; that data helps us create decision and choose the right actions to take. But arguably the mainly helpful information that can assist us make the right choice is not logically perceivable with our five senses, namely the data, information and facts that mankind has accumulate about everything and which is increasingly all available on internet.

Even though the efficiency of computing devices allows us to carry computers in our pockets, keeping us constantly connected to the digital world, there is no link connecting our digital devices and our interactions with the physical world. Information is restricted usually on paper or digitally on a screen. Sixth Sense bridge this gap, bringing intangible, digital data out into the physical world, and allowing us to work together with this data via natural hand gestures. 'Sixth Sense'

free data from its confine by seamlessly integrating it with reality, and thus making the whole world your computer.

"Sixth Sense Technology", it is the latest terminology that has proclaims its presence in the technical field. This technology has developed, which has its relation to the power of these six senses. Our normal computers will soon be able to sense the dissimilar feelings accumulate in the environment and it is all a gift of the "Sixth Sense Technology" recently introduced.

Sixth Sense is a wearable “gesture based” device that augments the physical world with digital data and let’s people use natural hand gestures to connect with that useful data. It was developed by Pranav Mistry, who is a PhD scholar in the Fluid Interfaces grouping at the MIT Media Lab. A grad scholar with the Fluid Interfaces Group at MIT, he caused a storm with his making for Sixth Sense. He told that the films like "Robocop" and "Minority Report" gave him the motivation to create his view of a world not dominated by computers, digital data and human being robots, but one where computer and other digital devices enhance people's pleasure of the physical world.

Right now, we use our devices (for e.g. PC’s, mobiles, tablets, etc.) to go into the internet and get data that we want. With Sixth Sense we will employ a device no bigger than modern cell phones and perhaps eventually as small as a button on our shirts to bring the internet to us in order to connect with our world.

Sixth Sense will permit us to connect with our world like never before. We can get data on anything we want from anywhere within a little moments. We will not only be able to connect with things on a whole new level but also with people. One great element of the device is its capability to scan items or even people and project out information about what you are looking at. [1]

II. LITRATURE REVIEW

The history of six sense technology goes reverse into 1990s when Steve Mann first effort to propose a neck worn projector & a camera combination. The thought of implement of computer technologies to daily job as Six Sense was further developed by Pranav Mistry who also appears to be an MIT lab Phd scholar as well as Steve Mann. Pranav Mistry is an

Indian computer scientist. At present he is the leader of Think Tank team & Director & researcher of Samsung. He is best identified for his work on six sense technology. The very 1st model of the six sense technology was really bigger than what it looks like today & it was not working properly to utilize in daily life. Pranav Mistry primary tried out his idea on a simple computer mechanical mouse. First he put two rollers into one mouse & sees if he could obtain data & guides the actions of the mouse. Then two rollers did not work correctly so he decided to utilize four rollers & see if it could work better four rollers gave him the idea that he could employ the same idea on fingers & that is what the next moved on to.

The difficulty was he started with a larger projector that was mounted on a helmet. But that proved bulky if someone was projecting information onto a wall then turned to speak to friend the data would project on the friend's face directly. [1]

Maes' MIT group, which includes seven graduate students, were thinking on how a person could be more integrated into the world around them and access data without Sixth sense Technology having to do something like take out a phone. They originally produced a wristband that would read a Radio Frequency Identification label to know, for example, which book a user is holding in a store.

They also had a ring that used infrared to speak by beacon to supermarket smart shelves to give you data on products. As we take a package of macaroni, the circle would shine red or green to inform us if the product was organic or free of peanut traces; whatever criterion we program into the system. They wanted to make data more helpful to people in real time with minimal effort in a way that doesn't need any activities changes. The wristband on hand was getting close; however we still had to get away our mobile to look at the data. That's when they struck on the idea of accessing data from the internet and projecting it on the surface. So somebody wearing the wristband could pick up a paperback in the bookstore and instantly call up reviews related the book, projecting that data onto a surface in the store or doing a keyword search through the book by accessing digitized pages on Amazon or Google books. They started with a bigger projector that was mounted on a helmet. But it proved awkward if someone was projecting data onto a wall then turned to speak to friend the information would project on the friend's face.

Now they have switched to a smaller projector and formed the pendant prototype to be worn around the neck. The Sixth Sense prototype is consisting of a pocket projector, a small mirror and a tiny camera. The hardware components are joined in a pendant-like mobile wearable device. Both the projector as well as the camera is interfaced to the mobile computing device in the user's pocket. It works as the device linked to it is hanged around the neck of a person and thus the projection starts by means of the micro projector connected to the device. Therefore, in course, we can turn out to be a moving computer in yourself and the fingers act like a mouse and a keyboard. [3]

III. SIXTH SENSE TECHNOLOGY

A. What is Sixth Sense?

Sixth Sense in scientific (or non-scientific) provisos is defined as Extra Sensory Perception or in short ESP. It involves the reception of data not gained through any of the five senses. Nor is it taken from every experience from the past or known.

Sixth Sense Technology integrates digital data into the physical world and its objects, making the entire world your computer. Sixth Sense aims to more seamlessly integrate online data and tech into everyday life. By making available information required for decision-making beyond what we have access to with our five senses, it efficiently gives users a sixth sense.

B. Why Built Six Sense Technology?

Basically humans take decisions after acquiring inputs from the senses. But this data has not sufficient in humans than its effect to the correct decisions. Although in this time with the use of Net we accumulate a huge number of data which making a good decision after the some minutes. This six sense technology provide us with the freedom of interacting with digital world with hand gestures. This technology has a wide use in the field of Artificial Intelligence. This method can help in synthesis of bots that will be able to interact with humans.

C. Why Choose Sixth Sense Technology?

This sixth sense technology provides us with the choice of interacting with the digital world using hand gestures. This technology has a broad application in the field of artificial intelligence. This method can help in fusion of bots that will be able to connect with humans. This technology enables citizens to interact in the digital world as if they are interacting in the real world. The Sixth Sense prototype implements numerous applications that demonstrate the usefulness, capability and flexibility of the system. [2]

IV. WORKING OF THE SIXTH SENSE

A. Software

The six sense technology software will be open sources, as for as this seems to be a less set of items there will not be user interfaces or more advances program for the users. There will be greatly harder & secured coding inside the device to make sure the security of the software. The model structure runs on windows platform & greater part of the code is written in C++ & C#.

B. Components

The hardware components are coupled in a pendant like mobile wearable device, the components are as follows:

- Camera
- Projector

- Mirror
- Mobile Component
- Color Markers
- Microphone

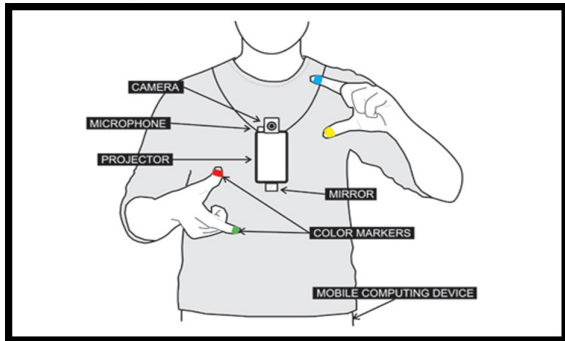


Figure 1. Arrangement of the Components

a) Camera

The camera is the key input device of the Sixth Sense system. Mainly it act as a digital eye which connects to the world of digital information. It basically captures the scene the user is looking at. The video flow captured with the camera is passed to mobile computing device which does the appropriate computer visualization computation. The main functions of the camera can be listed as BELOW:

- It sends the data to the smart phone for further processing.
- It also tracks the actions of the thumb and index fingers of both of the user's hands.
- Captures user's hand activities as well gestures.
- Captures the scene in front and objects the user is interacting with.
- Takes a snap of the view in front when the user performs a 'framing' gesture.

b) Projector

The projector is the key output device of the Sixth Sense system. The projector visually enhances surfaces, walls and physical objects the user is interacting with by projecting digital information and graphical user interfaces.

The mobile computing device provides the projector with the content to be projected. The projector component used in model runs on a rechargeable battery and having the three hours of battery life. A very small projector displays data transmitted from the mobile on any surface in sight things, wall, or person.

The major operations of the projector can be scheduled as:

- Projects graphical user interface of the preferred application on the surfaces or walls.
- Enhance the physical objects the user interacting with by projecting just-in-time and related information from the Internet.

- Suggested product of projectors is LED or LASER.
- Also, a projector opens up interaction and sharing. You are touching that object and projecting info on that object. The data will seem like it is element of the object.

c) Mirror

The mirror reflects the projection coming out from the projector and thus helps in projecting onto the desired locations on walls or surfaces. The user physically can modify the angle of the mirror to change the location of the projection.

For example in application where the user wants the projection to go on the ground instead of the surface in front, he can modify the angle of the mirror to change the projection. Thus, the mirror in the Sixth Sense supports in overcoming the limitation of the limited projection space of the projector. The uses of the mirror is significant as the projector, dangles pointing down towards from the neck.

d) Microphone

The microphone is an optional part of the Sixth Sense. It is necessary when by means of a paper as a computing interface. When the user needs to employ a part of paper as an interactive surface, he or she clips the microphone to the paper.

The microphone attached this way captures the sound signals of user's touching the paper. This information is transmits to computing device for processing. Later, joint with the tracking data regarding user's finger, the system is capable to identify precise touch actions on the paper. Here, the sound signal click by the microphone gives time data whereas the camera performs tracking.

e) Mobile Component

A Web-enabled smart phone in the user's pocket used to processes the video data. The Sixth Sense system uses a mobile computing device in user's pocket as the processing device. The software series enabling all the features of the system runs going on this computing device. This device can be a mobile or a small laptop. The camera, projector and the microphone are linked to this device with wired or wireless connection. The mobile device is too connected to the Internet using 3G network or wireless connection.

The mobile devices like Smartphone in our pockets transmit and receive voice and information anywhere and to anyone through the mobile internet. An accompanying Smartphone runs the Sixth Sense software, and handles the connection to the internet. Other software searches the Web and interprets the hand gestures.

f) Color Markers

Colored Markers: Red, blue, green, and yellow ribbon worn on the users fingertips for tracking purposes. This color marker is used to trace the finger movement. Using the color marker user can create a painting on the wall or any surface.

It is at the tip of the user's fingers. Marking the user's fingers by means of red, yellow, green, and blue ribbon helps the webcam identify gestures. The activities and arrangements of these markers are interpreted into gestures that proceed as communication instructions for the projected application interfaces.

C. Working Concept

At present the commercial product isn't launched but the prototype is prepared. The hardware that makes Sixth Sense work is a pendant like mobile wearable interface. The sixth sense prototype is made using very common and easily available equipments like projector, a mirror, mobile, color markers and a tiny camera.

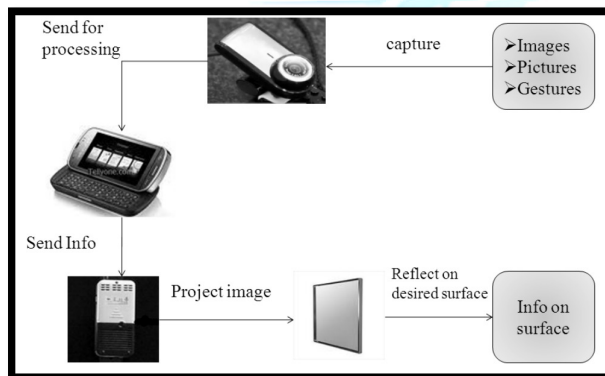


Figure 2. Block Diagram of Sixth Sense Working

The projector projects visual images on a surface. This surface can be wall, table, book or also your hand. Thus, the complete world is accessible on your screen now. When user moves their hands to form different actions with colored markers on the finger tips, the camera captures these movements. Information is sent to the Smartphone for processing. Both the projector and the camera are connected to the mobile computing device in the user's own pocket. Recognition is completed using computer visualization technique. These markers operate as visual tracking. [1]

The software program processes this video stream data and interprets the movements hooked on gestures. The gestures are dissimilar from one another and are given some commands. These gestures can operate as input to function which is projected by the projector. The downward-facing projector projects the output image on to the mirror. The projector is aligned downwards for compactness; therefore images would be formed at the user's foot if mirror wasn't used. The mirror reflects the image created by the projector to the wanted surface. Thus, digital data is given from its confines and placed in the physical world.

The whole hardware is fabricated in the form of a pendant. The entire product cost around \$ 350(cost about Rs.21021/-)

and that also because of projector. It works extremely similar like a touch screen phone with whole world as the screen.

To fetch away 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.

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. This is possible only because the 'Sixth Sense' device supports multi-touch and multi-user interaction. The entire job is in the software. The system is constantly trying to outline what's around you, and what you are looking to do. It has to identify the images you see, track your gestures, and then relate it all too relevant data at the similar time.

The "sixth sense" in question is the internet, which logically supplies the data, and that can be just concerning 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, beside with an entire non-contextual boundary for reading email or making calls. It's attractive motivating technology that, like a lot of MIT Media Lab projects, make the wearer seems like a whole dork; if the projector doesn't give it away, the colored finger bands the device uses to identify finger movement certainly might. The thought is that Sixth Sense tries to decide not only what someone is interacting with, but also how he or she is interacting with it. The software finds the internet for data that is potentially significant to that situation, and then the projector takes over. [5]

a) Gesture Recognition

Gesture recognition is a technology with the goal of interpreting human gestures via mathematical algorithms. Gestures can create from any physical movement or state but commonly initiate from the face or hand. Current focuses in the field include emotions identification from the face and hand gesture identification. Many approaches have been made using cameras and computer visualization algorithms to understand sign language. [8]

b) Types of Gestures

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.

The software recognizes 3 kinds of gestures as follows:

1. Multitouch gestures
2. Freehand gestures
3. Iconic gestures
4. Symbolic gestures

1. Multitouch gestures

Like the ones you observe in Microsoft Surface or the iPhone where you touch the screen and make the map move by pinching and dragging.

2. Freehand gestures

Like when you take a picture [as mention in the applications] or, you might have noticed in the demo, because of my culture, I do a namaste gesture to start the projection on the wall.

3. Iconic gestures

Drawing a shape in the air medium. Like, at any time I draw a star; show me the condition of weather. When I draw a magnifying glass, show me the view of map. You might want to use other gestures that you use in every day to day life. This system is extremely customizable according to the need of the user.

4. Symbolic gestures

These are gestures that, within each culture have come to a single meaning. A symbol such as “OK” gesture is one such example.

The technology is mainly depending on hand gesture recognition, image capturing, processing, and manipulation, etc. The map application let the user locate the way a map displayed on a close to surface using hand gestures, similar to gestures support by multi-touch based systems, letting the user zoom in, zoom out or pan by means of pinching. The drawing application lets the user draw on any surface by tracking the fingertip activities of the user’s index finger. [8]

V. APPLICATIONS

The Sixth Sense device has an enormous number of applications. The Sixth Sense prototype implements several applications that display the usefulness, feasibility and flexibility of the system. The following are few of the applications of Sixth Sense Technology:

- Make a call
- Call up a map
- Check the time
- Create multimedia reading experience
- Drawing application
- Zooming features
- Get product information
- Get book information
- Get flight updates
- Feed information on people
- Take pictures
- Check the email

1) ADVANTAGES AND DISADVANTAGES

a. Advantages

- Sixth Sense is a user friendly boundary which integrates digital information into the physical world and its objects, making the entire world your computer.
- Sixth Sense does not change human habits but causes computer and other machines to adapt to human needs.
- It uses hand gestures to interact with digital information.
- Supports multi-touch and multi-user interaction data access directly from machine in real time.
- It is an open source and price effective and we can mind map the proposal anywhere.
- It is gesture-controlled wearable computing device that feeds our important data and turns any surface into an interactive display.

b. Disadvantages

- Privacy is a most important issue; when the device is projecting on a hard surface, it is not private sufficient for the user. Public around him can see the projection since it is extremely detailed.
- Projection is improved in the night time and dark areas rather than mornings and bright areas.

Conclusion

This will have different application for different developers. So, considering its extensive applications the originator Pranav Mistry has decided to make its software open source. This will enable persons to make their own application depending upon requirements and imagination. The key here is that Sixth Sense recognizes the objects around you, displaying data automatically and letting you entrance it in any way you want, in the simplest way possible.

Clearly this has the potential of becoming the ultimate "transparent" user interface for accessing data about everything around us. This technology can be used as a replacement of the 5th senses for handicapped persons. This can provide easy control over machineries in industry. If they can get free of the colored finger caps and it ever goes beyond the initial progress phase. But as it is now, it may modify the way we interact with the real planet and truly give everyone absolute awareness of the environment around us.

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