



Sixth Sense Technology

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Abstract

Sixth Sense technology is a technology with which a system could be trained to recognize and percept real world objects and react as desired. Sixth Sense technology bridges the gap between the physical world and the digital world, bringing intangible, digital information out into the tangible world, and allowing us to interact with this information via natural hand gestures. Sixth Sense technology is implemented in 'Sixth Sense/WUW (wear your world) using gesture recognition, augmented reality, computer vision. Paper states that Sixth Sense technology could be integrated with voice recognition. Also Bluetooth device and laser projectors could be used.

Index Terms: Sixth sense, WUW, Gesture Recognition, Computer Vision, Augmented Reality, Voice Recognition.

1. INTRODUCTION

We use our five natural senses to perceive any information; 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 all 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. Information is confined traditionally on paper or digitally on a screen. Sixth Sense Technology bridges this gap, bringing intangible, digital information out into the tangible world, and allowing us to interact with this information via natural hand gestures. 'Sixth Sense' frees information from its confines by seamlessly integrating it with reality, and thus making the entire world your computer.

WUW was developed by Pranav Mistry, a Ph. D student at Fluid Interfaces Group at the MIT Media Lab. The key here is that Sixth Sense recognizes the objects around you, displaying information automatically and letting you access it in any way you want, in the simplest way possible. The device brings us closer to reality and assists us in making right decisions by providing the relevant information, thereby, making the entire world a computer.

The technology is mainly based on hand gesture recognition, image capturing, processing, and manipulation, etc. The software of the technology uses the video stream, which is captured by the camera, and also tracks the location of the tips of the fingers to recognize the gestures. This process is done using

some techniques of computer vision. 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.

2. ARCHITECTURE OF THE DEVICE



Fig-1: Architecture of Device

2.1 Camera:

Camera captures an object in view and tracks the user's hand gestures. It sends the data to smart phone. Camera recognizes and tracks user's hand gestures and physical objects using computer-vision based techniques. Sixth Sense system implements a gestural camera that takes photos of the scene the user is looking at by detecting the 'framing' gesture. It acts as a digital eye, connecting you to the world of digital information.

4.2 Projector:

A tiny LED projector displays data sent from the smart phone on any surface in view-object, wall, or person. The projector projects visual information enabling surfaces, walls and physical objects around us to be used as interfaces. The projector itself contains a battery inside, with 3 hours of battery life.

4.3 Mirror:

The usage of the mirror is significant as the projector dangles pointing downwards from the neck. Mirror reflects image on to the desired surface.

4.4 Smart Phone:

A Web-enabled smart phone in the user's pocket processes the video data, using vision algorithms to identify the object. Other software searches the Web and interprets the hand gestures.

4.5 Color Marker:

Color marker 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 markers are interpreted into gestures that act as interaction instructions for the projected application interfaces. The software program processes the video stream data captured by the camera and tracks the locations of the colored markers (visual tracking fiducials) at the tip of the user's fingers using simple computer-vision techniques. The movements and arrangements of these fiducials are interpreted into gestures that act as interaction instructions for the projected application interfaces. The maximum number of tracked fingers is only constrained by the number of unique fiducials, thus Sixth Sense also supports multi-touch and multiuser interaction.

3. TECHNOLOGIES USED:

3.1 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

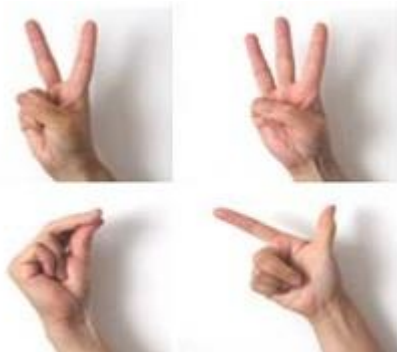


Fig-2: Gesture Recognition

The keyboard and mouse are currently the main interfaces between man and computer. Humans communicate mainly by vision and sound, therefore, a man machine interface would be more intuitive if it made greater use of vision and audio recognition. Another advantage is that the user not only can communicate from a distance, but need have no physical contact with the computer. However, unlike audio commands, a visual system would be preferable in noisy environments or in situations where sound would cause a disturbance. Many approaches have

been made using cameras and computer vision algorithms to interpret sign language. However, the identification and recognition of posture, gait, polemics, and human behaviours is also the subject of gesture recognition techniques. 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. Using the concept of gesture recognition, it is possible to point a finger at the computer screen so that the cursor will move accordingly. Gesture recognition is useful for processing information from humans which is not conveyed through speech or type. As well, there are various types of gestures which can be identified by computers.

3.2 Computer Vision

Computer vision is the science and technology of machines that see. It is concerned with the theory behind artificial systems that extract information from images. An image is a huge array of gray level (brightness) values of individual pixels. Taken individually, these numbers are almost meaningless, because they contain very little information about the scene. A robot needs information like "object ahead", "table to the left", or "person approaching" to perform its tasks. The conversion of this huge amount of low level information into usable high level information is the subject of computer vision. Earlier algorithms were too computationally expensive to run in real-time, but also required any type of memory and modeling.



Fig-4: Computer Vision

3.3 Augmented Reality

Augmented reality 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. Augmented reality blurs the line between what's real and what's computer generated by enhancing what we see, hear, feel and smell. Augmented reality is one of the newest innovations in the electronics industry. It superimposes graphics,

audio and other sense enhancements from computer screens onto real time environments. Augmented reality goes far beyond the static graphics technology of television where the graphics imposed do not change with the perspective. Augmented reality systems superimpose graphics for every perspective and adjust to every movement of the user's head and eyes. However, augmented reality is more advanced than any technology you've seen in television broadcasts.

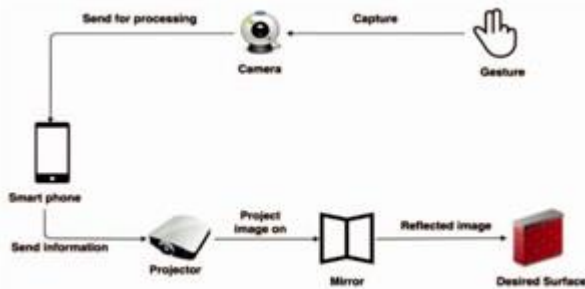


Fig-5: Augmented Reality

4. PROPOSED WORK

The Sixth Sense device is pendant like wearable device. It consists of camera, mirror and projector and is connected to Smart phone



Fig-6: Proposed Work

The camera captures the gesture made by the user. Then the information is sent to the smart phone for processing. The projector then projects visual images via the mirror on the surface. The surface can be anything like the wall, table or palm of your hand. Hence, the entire world can be a screen now. When user moves their hands to form different movements with coloured markers on the finger tips, the camera captures these movements. Recognition of these gestures is done by computer vision techniques. The markers act like a tracker. Basically, camera captures all the gestures one makes with their hands and the projector helps in projecting the information on any desired surface. Here the use of mirror is very important as the projector dangles downwards from the neck. The colour caps are used so that is becomes easy for the software to differentiate between fingers which need to perform different operations for the applications. The Sixth Sense software/code looks for the location of the colour markers by making use of 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 fiducially.

5. APPLICATIONS

5.1 Calculator:

You can use the Sixth Sense to project a keypad onto your hand. Then we can use that virtual keypad to calculate values. Not only this, it can be made to project keyboard as well, hence eliminating use of physical keyboard.

5.2 Zooming Features:

We can zoom in and out by hand gestures by pinching fingers of both hands to zoom in and make both hands closer to each other to zoom.

5.3 Take Pictures:

Take a picture just by making photo frame or rectangle by fingers. The photo will be taken and it will be placed in smart phone's memory. A person can resize and look for the photo whenever needed by projecting it on hand or any surface.



Fig-7: Take Pictures

6. ADVANTAGES

The interface of sixth sense is easy to use and it classifies digital data into physical world. Hence, the whole world can be used as an interface making the whole world your machine.

It is easy to carry device, supports multi-touch, easily affordable, world and the information are connected to each other, data can be accessed in real world, helps us in making right decisions, it acts a computer as well as saves our time searching information on the internet. Sixth Sense uses hand gestures to interface with digital data. Information is directly displayed from digital world to physical world. It is a wearable gesture based device which can turn any surface an intuitive presentation. It is compact and easy to wear in our neck. This device can be used by anybody, even the one who doesn't know how to use a computer mouse or console or keyboard. In today's modern world it will be easy to catch photographs just by using fingers. Sixth Sense also recognizes user's freehand gestures (postures) and saves electricity.

7. CONCLUSION

Sixth Sense technology recognizes the objects around us, displaying information automatically and letting us to access it in any way we need. The Sixth Sense prototype implements several applications that demonstrate the usefulness, viability and flexibility of the system. Allowing us to interact with this information through natural hand gestures, the potential of becoming the ultimate "transparent" user interface for accessing information about everything

around us. Currently the prototype of the device costs around \$350 to build. It could change the way we interact with the real world and truly give everyone complete awareness of the environment around us. The Sixth Sense prototype implements several applications that demonstrate the usefulness, viability and flexibility of the system. It will definitely revolutionize the world.

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