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# Sixth Sense Technology: The Way Forward

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***Abstract:*** ***The storm called sixth sense is a neck worn gestural interface device which enables the user to augment the physical world with the digital world. The device works in a constant loop analyzing the live gestural data to interact with the information. The goal of gesture computing is to make it possible for the user to interact with their computer interaction without the " middleman " of controls that means keyboard, mouse, touchpad, etc. and to make the computer as " human" as possible. Gesture computing is called "perceptual computing ", a style of personal computing experience that gives the devices we use every day the ability to interpret what we are doing via human-like senses. This increases the viability and accessibility of the device. The proposed technology makes use of a camera, a projector and a computing device. The name sixth sense was derived as it could act in augmentation to the already present five senses – Hearing, Vision, Taste, Smell and Touch.***
***Keywords : Gestural interface, Augmentation, Camera, Projector, Computing device***

## I. INTRODUCTION

Computers have become the basic necessity of functioning. Everyday life problems have been resolved to an extent and living has become relatively easy after the invention of the computers. Most of the work these days gets done on a computing device like a phone or a tablet or a desktop. Technology is the master in this 21st century and every field like medical, education, finance, transport, security is dependent on it. The size of the computers is getting reduced day by day and sixth sense technology is one such by product. The main goal of this device is integrating the physical world and digital world. An example of the technology usage is when we look at any object, with our limited knowledge about it, we may take decisions which may not be well supported with the complete facts and figures. Sixth sense technology works to resolve this situation by connecting the object with the information available on the extensive internet. It makes information available for decision making beyond what we already have with our five senses. Technically this technology can also be called as extra sensory perception. Information is generally stored on a paper or a digital storage device. This technology successfully bridges the gap between the two.



Figure 1: Steve Mann with his first implementation

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### *A. Evolution*

Steve Mann, the Canadian born researcher first made this neck worn computers in 1997. Pranav Mistry, a PhD student at MIT Labs further developed this idea into what it is now today. Pranav Mistry further came up with this product called "Wear Ur World" which is a neck worn sixth sense technology device. The MIT students had long been wondering on how to provide the vast information about the world to the user for daily use without taking out a gadget to access the internet. They opined that information available at world wide web should be more useful to the people for daily use with much ease. Before this sixth sense technology, people have successfully applied the speech, pattern and touch recognition to facilitate the daily use of products with direct interaction between physical world with digital world. Sixth sense was awarded the 2009 Innovation award by Popular Science. Pranav Mistry too has a long list of laurels against his name. He was name amongst the 50 most creative people for the year 2010 by Creative50. Recently he was awarded the Young Global Leader for the year 2013 by World Economic Forum.

## II. PROTOTYPE AND WORKING

The Wear Ur World Sixth Sense prototype is comprised of –

*A.* A Camera
*B.* A Projector
*C.* A computational device (preferably a smart phone)
*D.* A mirror
*E.* Colored markers for the tip of the fingers

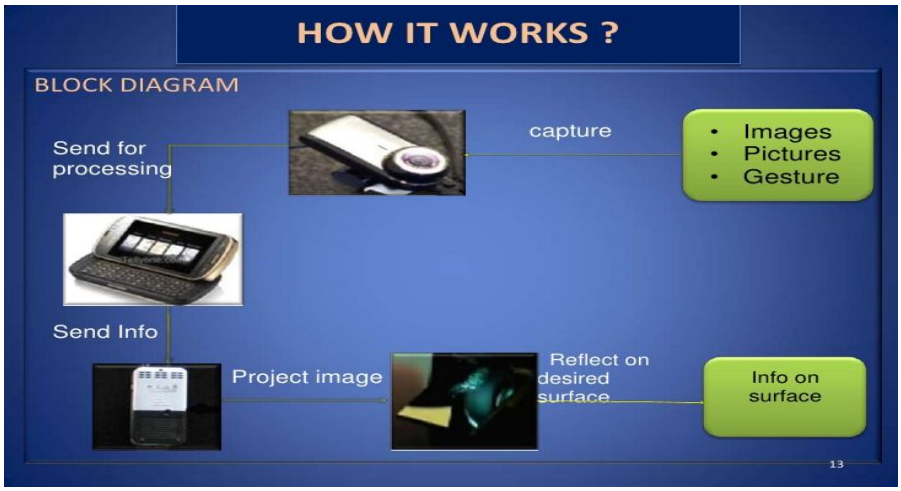



Figure 2: Block Diagram of how the technology works

*1)* The camera, the projector and the mirror are wirelessly connected to the computational device (Smart phone) using Bluetooth. This smart phone is present in the users pocket and the user doesn't have to take it out for the functioning. This smart phone is connected to the internet through cloud, hence having access to all the information present on the world wide web at all times.
*2)* The software present in the smart phone processes the live feed from the camera and produces the analysis.
*3)* The high pixelated camera instantly recognizes the objects, individuals, images, locations present in the frame using computer vision based technique. Also it recognizes the hand gestures and sends the data to the phone for processing.
*4)* The software present at the phone could use algorithms like canny edge detection to detect the gestures. The colored markers at the finger tips further helps in distinctly analyze the gestures. This is called as "visual tracking fiducials". The motion and arrangements of these fiducials are interpreted as relevant gestures.
*5)* The micro projector overlays the information on any surface. The projector projects the visual information enabling surfaces and physical objects to act as interactive surfaces.
*6)* The mirror helps in projecting the information in the direction that we want. The user can manually tilt the mirror arranging it to suit his requirement. This helps in overcoming the limited projecting space provided by the micro projector.
*7)* A microphone is an optional component which could be helpful while using any thin surface like paper. The microphone if clipped to the thin surface, can then detect the fingers touching the surface. This information coupled with the information with the camera provides better efficiency for the surface.

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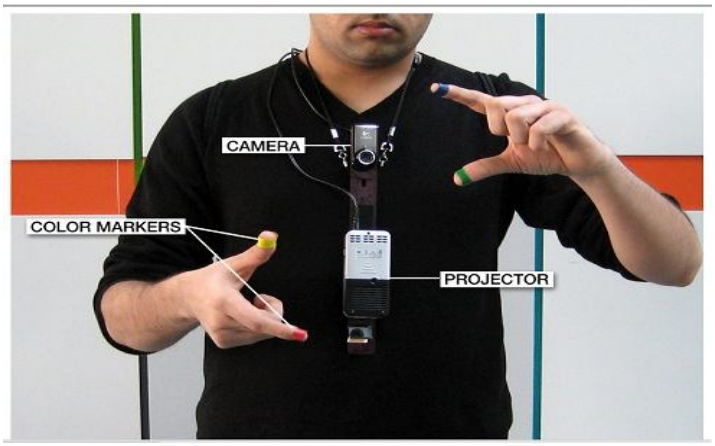


Figure 3: The neck worn sixth sense device

## III. RELATED TECHNOLOGIES

### *A. Augmented Reality*

It is basically superimposing images and sounds over the real world that the user experiences. The main difference between Sixth sense and Augmented reality is that Augmented reality requires an external device to input the surroundings that need to be simulated. The head mounted display is used in augmented reality which superimposes the graphics and sounds over what the user looks at. It also tracks the user's head and eye movements to provide real time superimposition.

### *B. Gestural Recognition*

The main purpose of this technology is to interpret the human gestures with the help of the mathematical algorithms fed into the device. The colored markers at the tip of the fingers further provides an easy solution to achieve the exact location of each finger.

## IV. APPLICATIONS

### *A. Mouseless*

One of the present implementations of the sixth sense is of an invisible computer mouse that enables interaction with computer without attaching any hardware. The movement of the fingers would determine the mouse movement and the finger gestures would determine the clicks.

### *B. Map Application*

One can call upon any map of their choice and toggle through the selection using the fingers swipe. The selected map can be further zoomed using the pinching of the thumb and the index finger gesture.


Figure 4: Pan in-out on maps

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*C. Taking pictures*

One can take pictures using the framing gesture detected by the camera. After taking the picture, these pictures can be projected on any surface and organized.



Figure 5: Taking a picture using frame gesture

*D. Check time*

A hand watch can be projected on the wrist by drawing a circle on the wrist. The index finger used to draw the circle is tracked by the computer and projects a hand watch on the wrist.

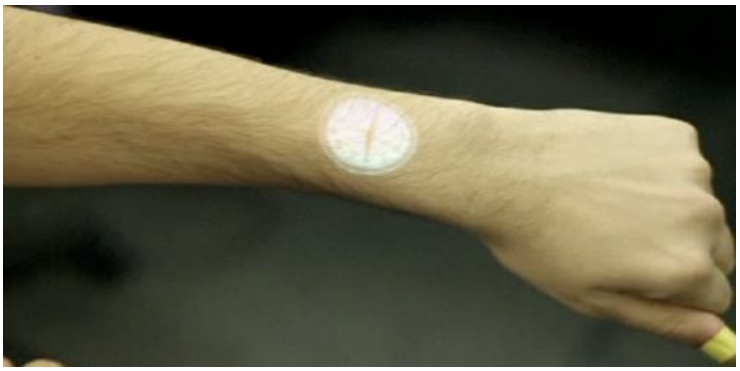


Figure 6: Sixth Sense watch projection

*E. Read Paper*

Paper reading can be taken to the next level with the help of the sixth sense technology. When a particular headline or a picture is focused, more information like related videos or latest updates can be projected.




Figure 7: Paper reading using sixth sense

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*F. Palm as a dialer*

With one gesture of the fingers a dialer would be projected on the palm. We can dial without using an actual dialer and using a Bluetooth headphones or ear piece we can talk on a call without actually handling the mobile phone.




Figure 8: Palm as the new dial pad

*G. Flight Updates*

This application enables the user to receive regular updates regarding the flight, from scanning the ticket. This saves time checking the flight delays on phone from time to time.

## V. REMARKS

*A. Pros –*

*1)* The digital world integrated with the physical world provides the vast information at our fingers. Literally!
*2)* Hand gestures are an easy way of communicating.
*3)* With internet always available, this technology helps us take more informed decisions.
*4)* It will provide reliable information at all times,
*5)* This technology is less time consuming and less noisy, given that it uses less mechanical elements.
*6)* It makes the computer understand and tend to human needs and not the other way round.
*7)* Open source software helps in interested programmers build their own version and modify the device as per their requirement.

*B. Cons*

*1)* Being a very creative technology, it can become very addictive.
*2)* There is no security over the usage of the device. All fingers with colored markers are considered the same, hence no control of the owner over the device. This can lead to easy hacking of the system. It can be privacy invading too.
*3)* There is no previous database available to tap into incase internet connectivity is not available.
*4)* It works well in the night and in dark places, but in bright light it is difficult to work with.

## VI. FUTURE SCOPE

This technology can be utilized in each and every field of work. Its utility knows no bound. However, there is always scope to improve the present system.

*A.* The use of colored markers at the tip of the fingers is a must for now to get the correct hand gesture recognitions. Future models should aim to take out the colored markers.
*B.* The above mentioned security and privacy looms large over the technologies proliferation. These threats must be addressed.
*C.* A robust design enabling the camera and the projector to be tied down to a small single device would further reduce the bulkiness of the device.
*D.* There is a real chance of using this technology for the physically handicapped. It can serve as the fifth sense for them. A device with simple functioning and voice commands could be developed which can help the physically handicapped people.
*E.* The usage of this technology in gaming can lead to a revolution. It will further enhance the gaming experience with user's surroundings playing the digital surroundings in the game as well. Similar could be the usage in the educational stream.

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## VII. CONCLUSION

Sixth Sense technology is one of the very popular applications of artificial intelligence. Humans like to take decisions based on the knowledge that they know. Sixth sense will provide a vast information about any particular object, location or an individual. Although other instruments like smart phone and computer can provide the information, there is no relevant integration between the physical world and the digital world. The software of this technology is open source hence allowing the individual to make their own applications as per their need. It has the potential to change the user's perception altogether and guide them towards better decision making.

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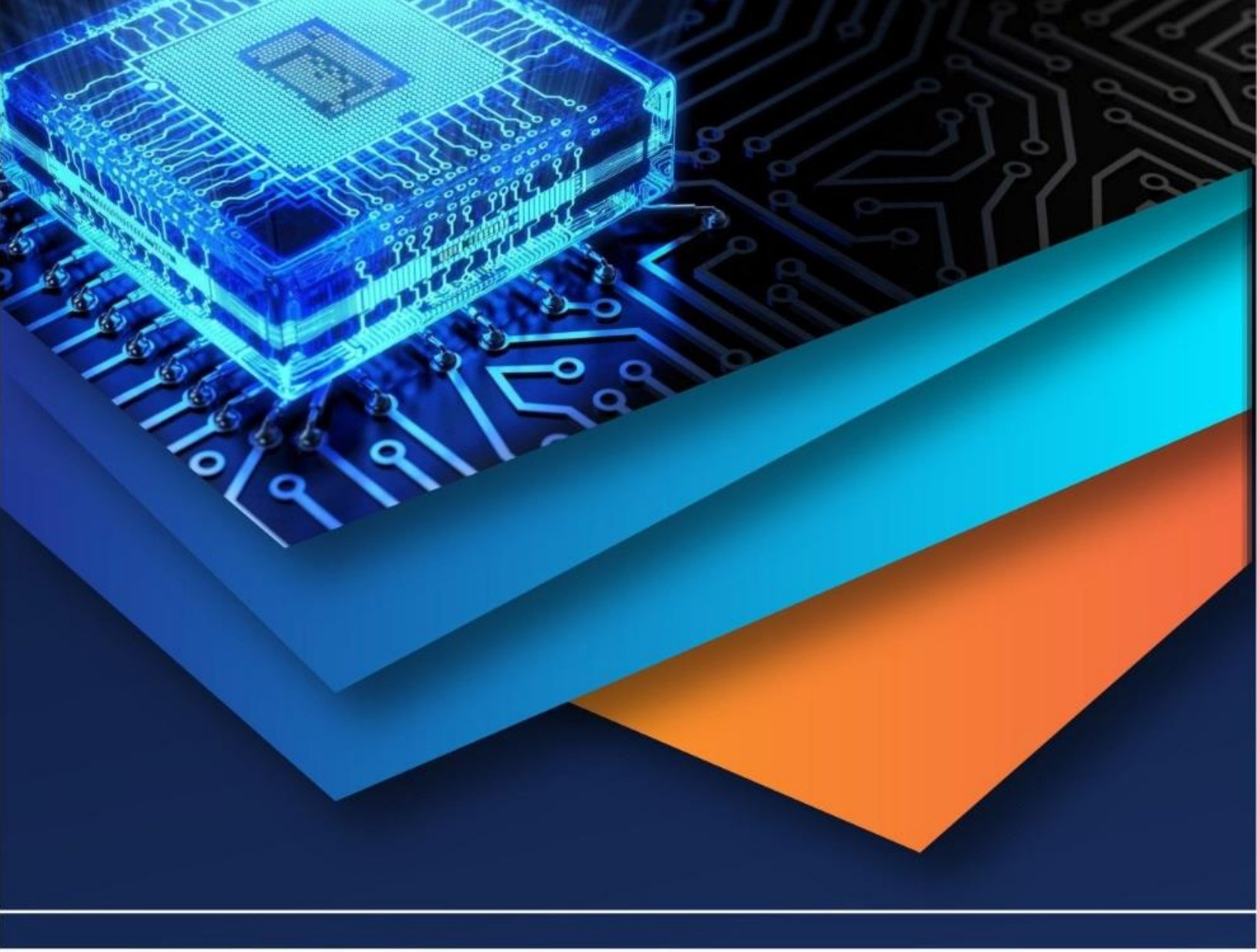
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