SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
An Autonomous Institution

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DEPARTMENT OF INFORMATION TECHNOLOGY

16IT AUGMENTED REALITY AND VIRTUAL REALITY

III YEAR – V SEM

UNIT 1 –INTRODUCTION TO AUGMENTED REALITY

TOPIC 2 – Working of Augmented Reality

What is Augmented reality?

Augmented reality is a term for a live direct or an indirect view of a physical, real-world environment whose elements are *augmented* by computer generated sensory input.

The sensory inputs can be sounds or graphics.

Put simply, it is a layer of virtual elements on the real world.

AR v/s VR

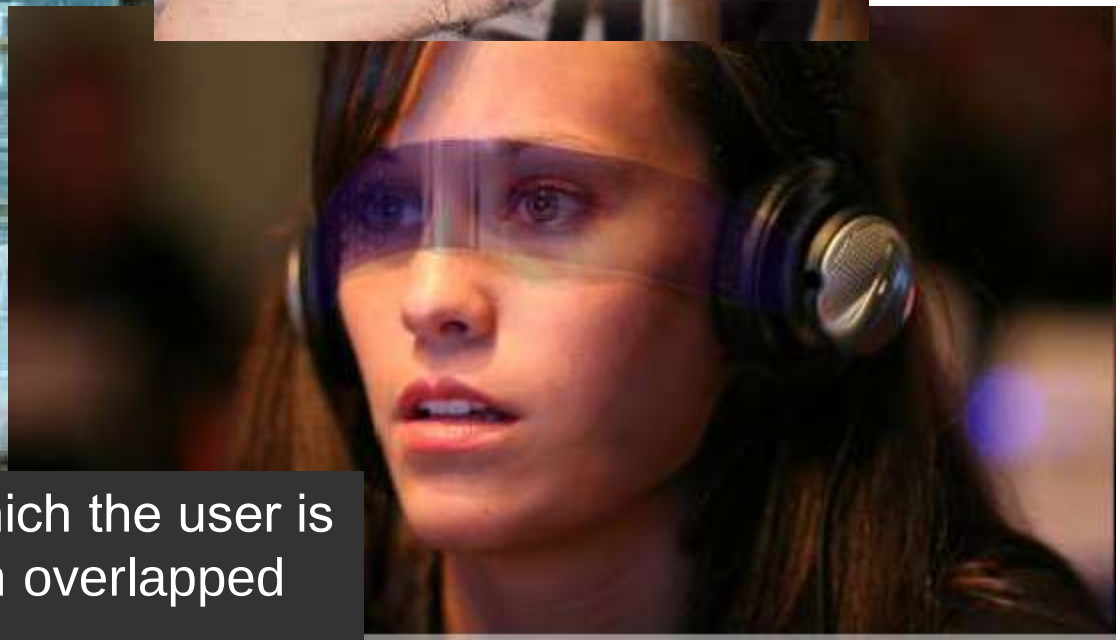
VR technologies completely immerse a user inside a synthetic environment. While immersed, the user cannot see the real world around him.

In contrast, AR allows the user to see the real world, with virtual objects superimposed upon or composited with the real world.

Virtual Reality...

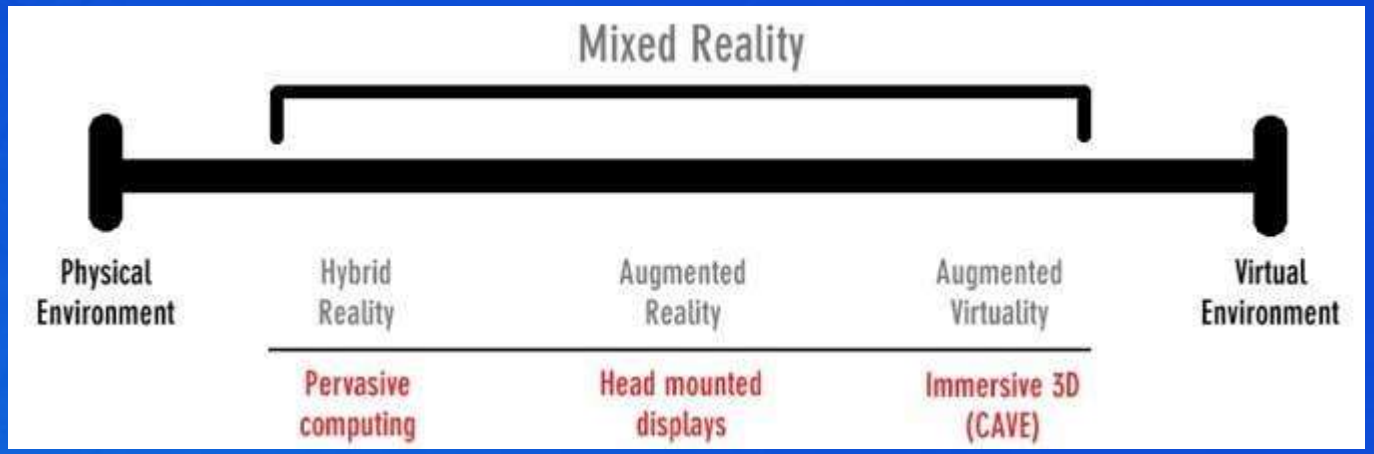
VR, experience is one “in which the user is effectively immersed in a responsive virtual world.”

Augmented Reality...



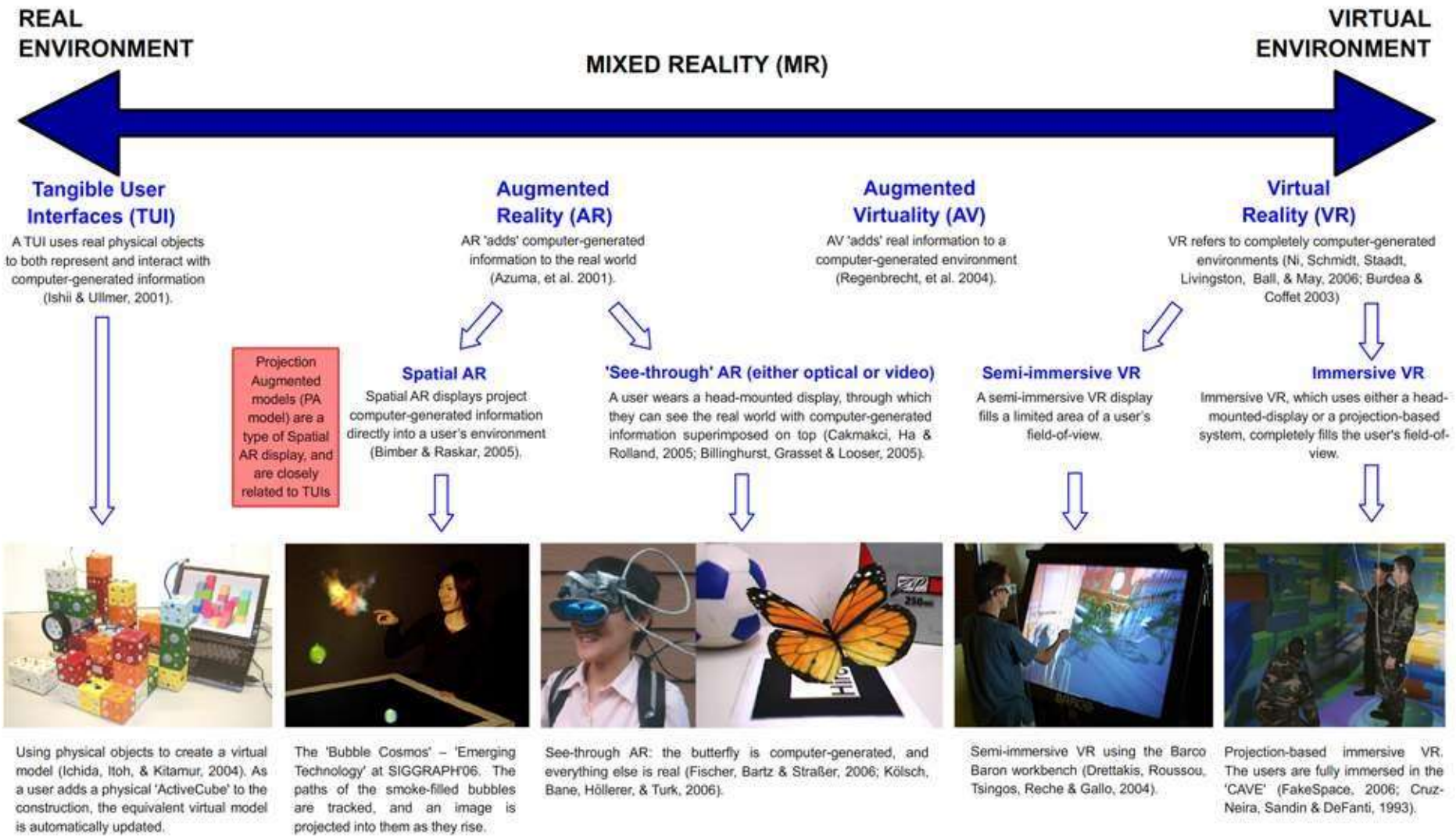
AR, experience is one “in which the user is presented the real world with overlapped virtual data.”

Milgram's Continuum...



In 1994 Paul Milgram and Fumio Kishino defined a **mixed reality** as "anywhere between the extrema of the *virtuality continuum*", where the Virtuality Continuum extends from the completely real through to the completely virtual environment with augmented reality and augmented virtuality ranging between.

Milgram's Continuum- a detailed view.



Never heard of AR?

Simple AR

Lbw decisions, spider diagrams, ball trajectories, etc. in cricket is a very basic example

Simple AR

Touch down lines, off side lines, etc. in football and soccer

Simple AR

Camera interfaces and menus

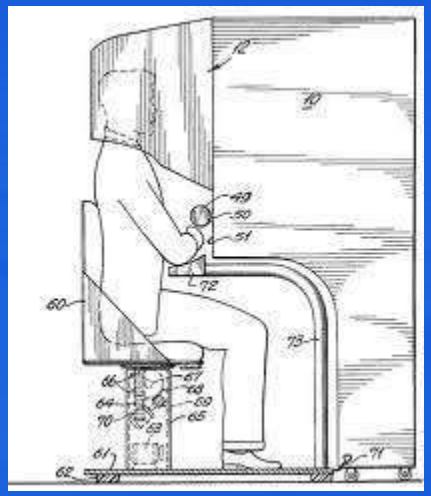
Virtual data on real world input?

Is the data or input live?

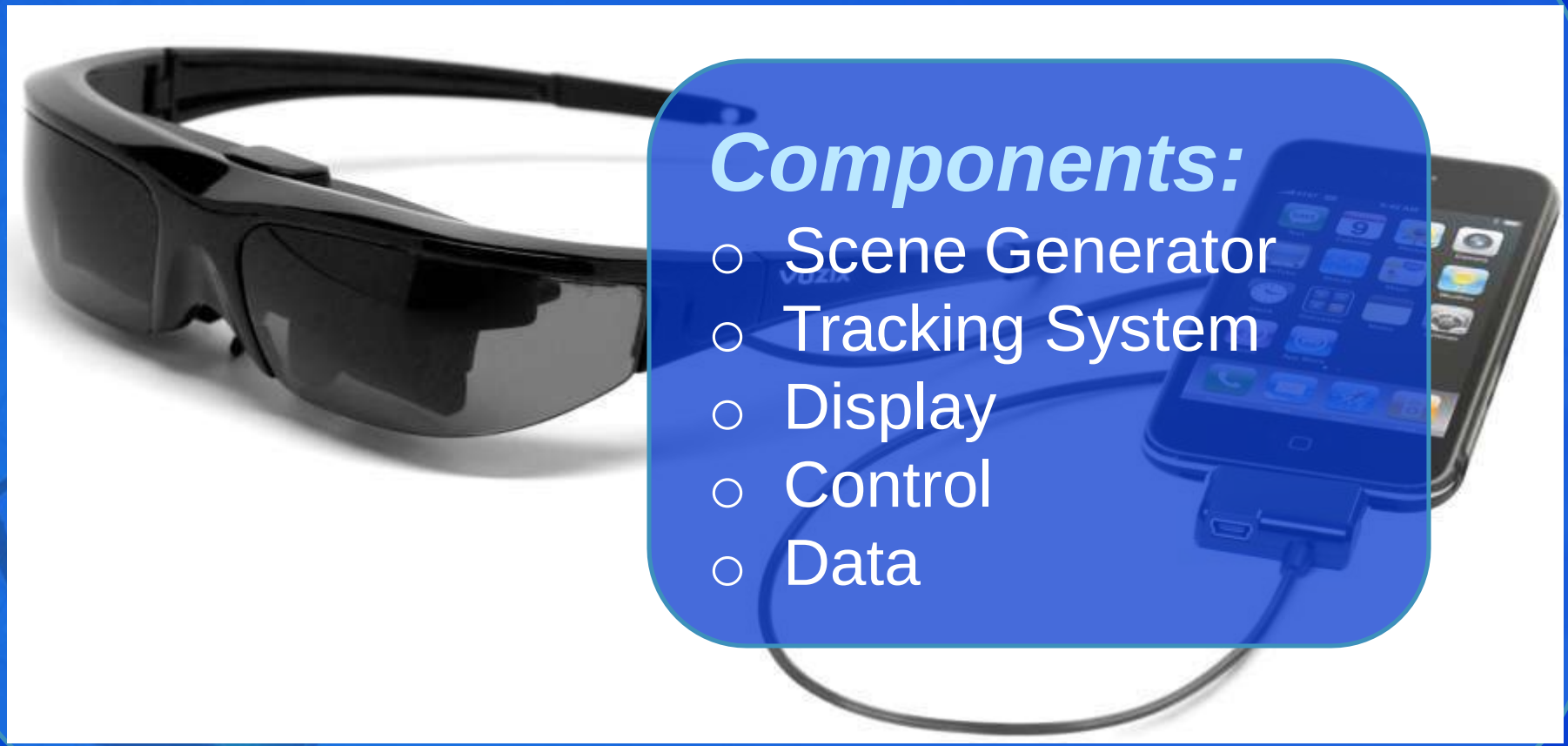
Is the data interactive?

Augm ed Reality!

History of Augmented Reality



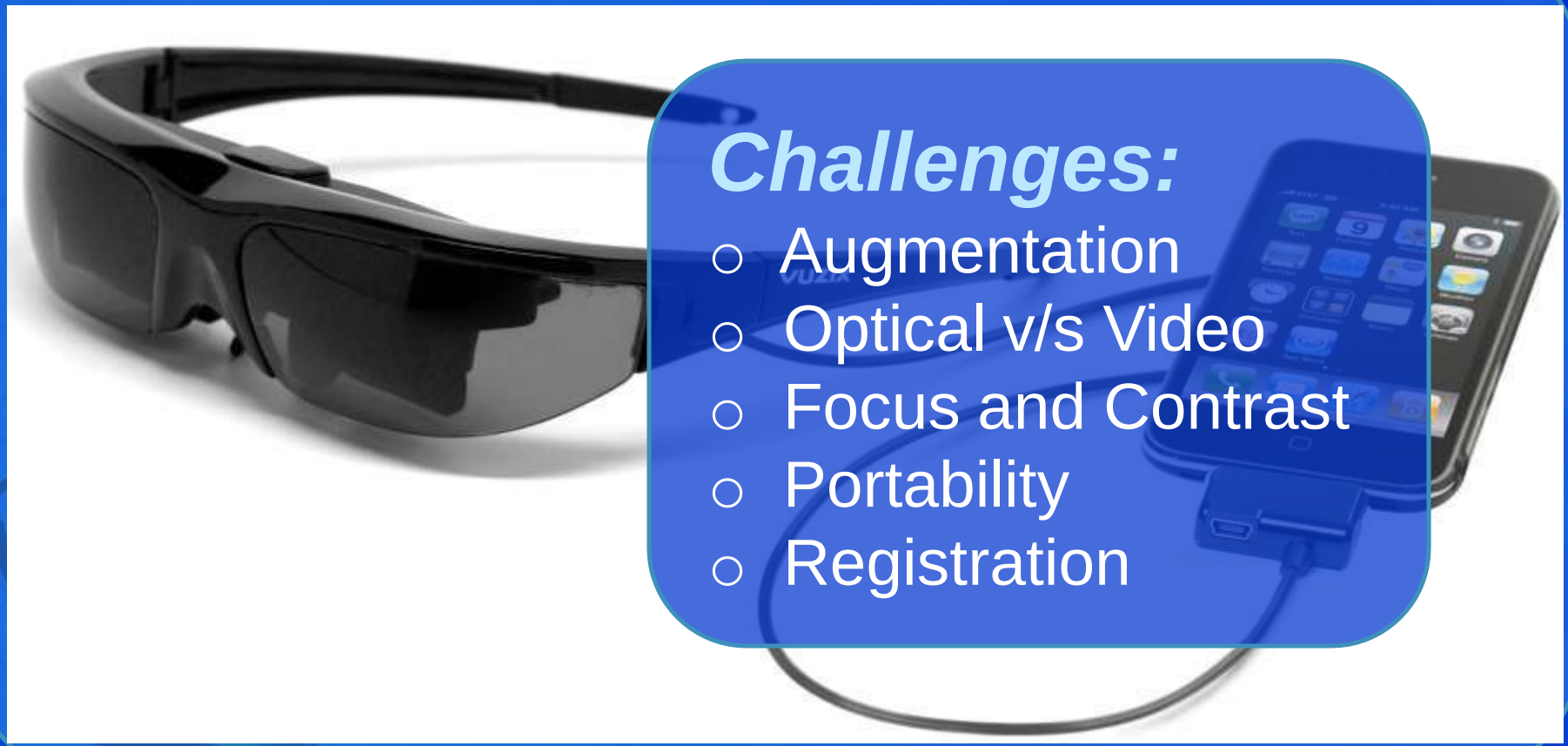
Overview of the Technology



Components:

- Scene Generator
- Tracking System
- Display
- Control
- Data

Overview of the Technology



Challenges:

- Augmentation
- Optical v/s Video
- Focus and Contrast
- Portability
- Registration

Augmented Reality today

Motivation

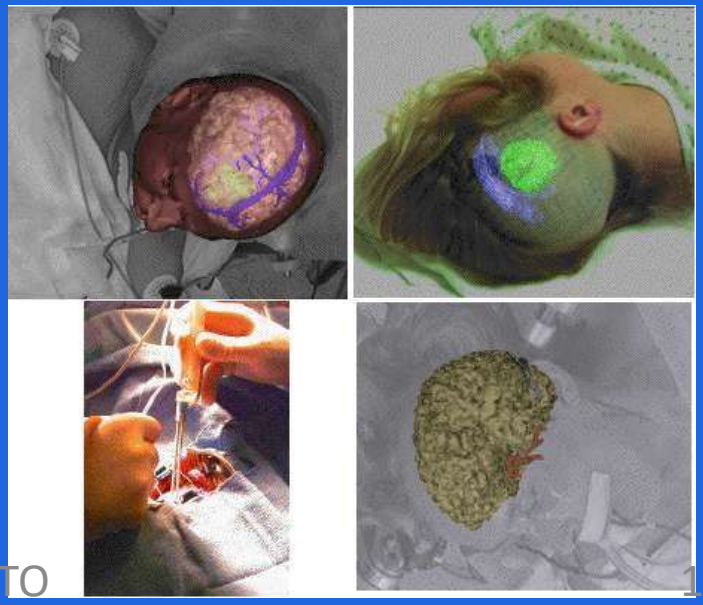
- AR enhances a user's perception of interaction with the real world.
- The virtual objects display information that the user cannot directly detect with his own senses.
- The information conveyed by the virtual objects helps a user perform real-world tasks.
- AR is a specific example of what is known as ***Intelligence Amplification (IA):*** using the computer as a tool to make a task easier for a human to perform.

Augmented Reality today

Mobile AR

BMW have developed a concept for augmented reality glasses, which assist mechanics in performing maintenance on the company's cars. the glasses point out the part that needs replacing, the screws that need turning, while an audio track talks the mechanic through the steps of the repair.

To provide the doctor with decision support for treatment by communicating comprehensive information from multiple sources, to guide the procedure by means of visual and haptic feedback. Guidance is based on several imaging modalities, such as ultrasound, MRI and video-endoscopy. AR helps the medical community in treading towards their goal of minimal invasive surgery



The „Sixth Sense"

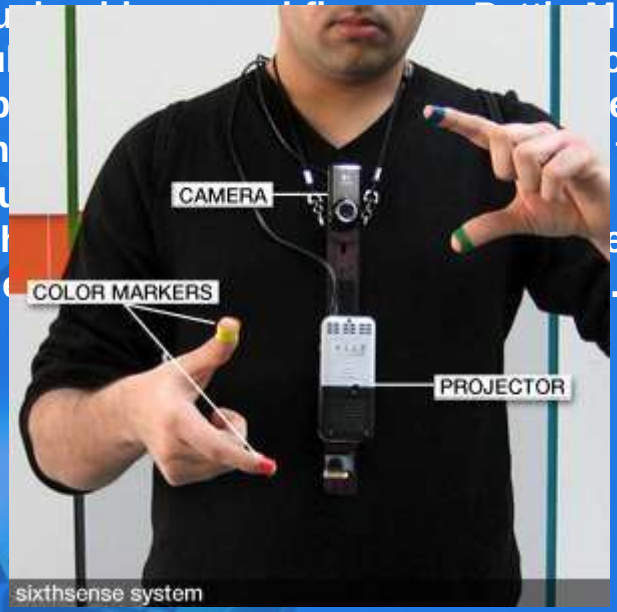
Some of the most exciting augmented-reality work is taking place in research labs at universities around the world. In February 2009, at the TED conference, Pattie Maes and Pranav Mistry presented their augmented- reality system, which they developed as part of MIT Media Lab's Fluid Interfaces Group. They call it SixthSense, and it relies on some basic components that are found in many augmented reality systems- A camera, a projector, a mirror and markers.

These components are strung together in a lanyardlike apparatus that the user wears around his neck. The user also wears four colored caps on the fingers, and these caps are used to manipulate the images that the projector emits.

SixthSense is remarkable because it uses these simple, off-the-shelf components that cost around $350. It is also notable because the projector essentially turns any surface into an interactive screen. Essentially, the device works by using the camera and mirror to examine the surrounding world, feeding that image to the phone (which processes the image, gathers GPS coordinates and pulls data from the Internet), and then projecting information from the projector onto the surface in front of the user, whether it's a wrist, a wall, or even a person. Because the user is wearing the camera on his chest, SixthSense will augment whatever he looks at; for example, if he picks up a can of soup in a grocery store, SixthSense can find and project onto the soup information about its ingredients, price, nutritional value -- even customer reviews.

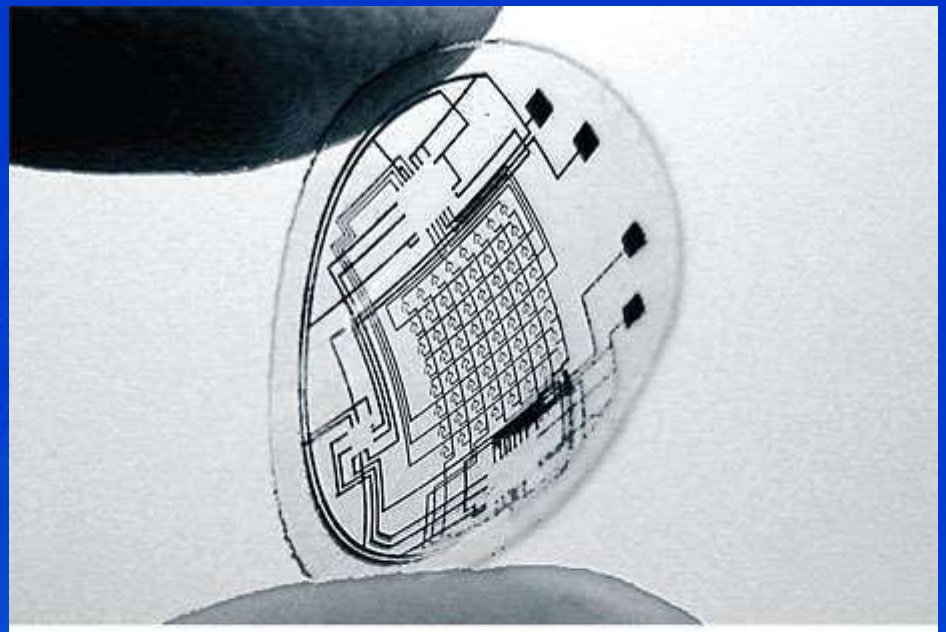
By u laes says even fingers with different colors of nail polish woul ons on the projected information, which are then picked up b e phone. If he wants to know more about that can of soup than fingers to interact with the projected image and learn abou

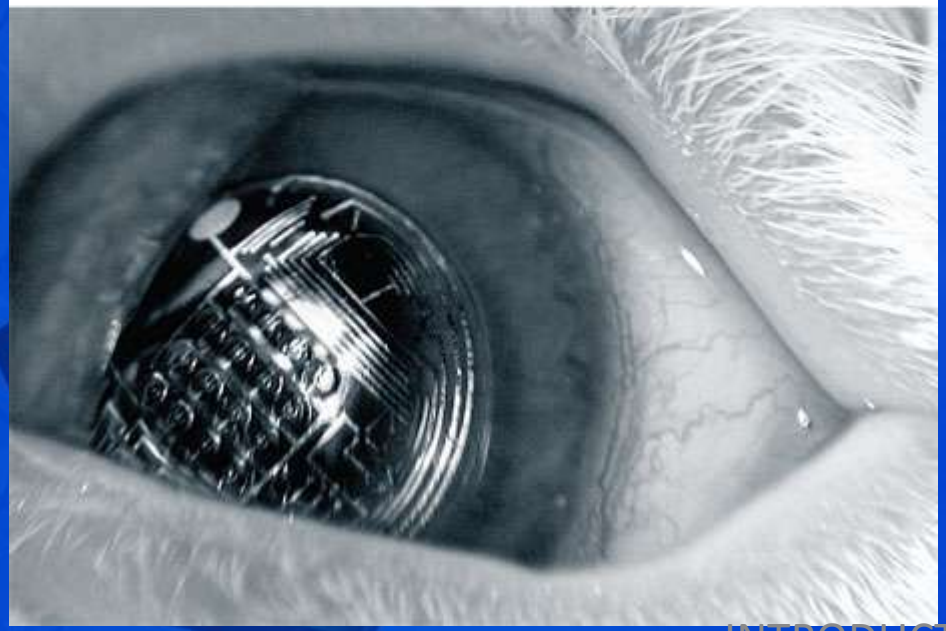
Sixth ex gestures -- draw a circle on your wrist and SixthSense proj .



Augmented Reality of Tomorrow

Augmented reality research explores the application of computer-generated imagery in live-video streams as a way to expand the real-world. Advanced research includes use of head-mounted displays and virtual retinal displays for visualization purposes, and construction of controlled environments containing any number of sensors and actuators.



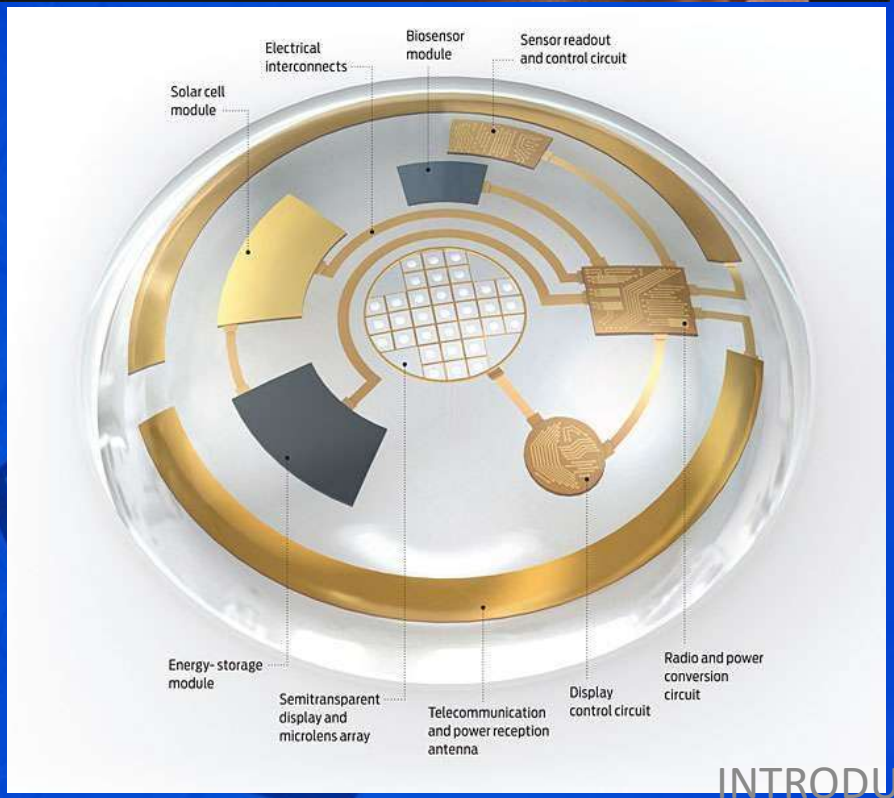


Augmented Reality in contact lenses

Contact lenses are worn daily by more than a hundred million people. The goal is to create a contact lens with LEDs to superimpose images on reality, not meant to improve vision but to display important information right to the eye in real time.

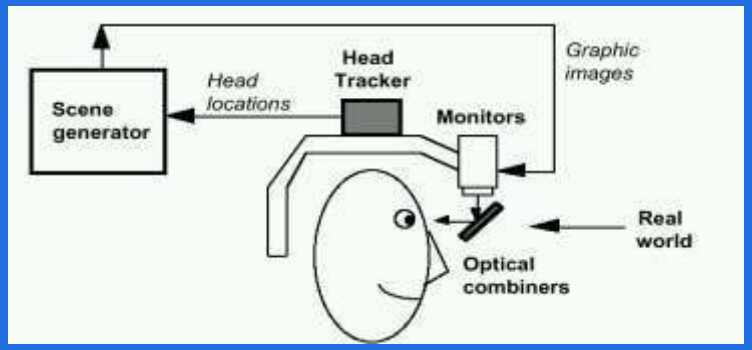
A lens with just one pixel could serve as an indicator for various things. Adding color and resolution would enhance uses to possibly offering visual cues from a navigation system.

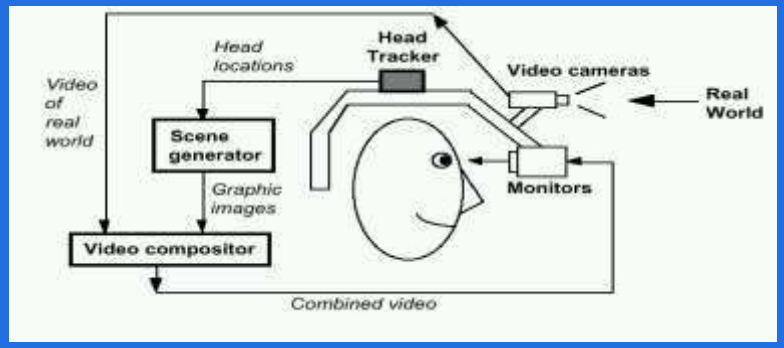
With basic image processing and internet access, the possibilities grow even more.



- **Antenna** collects incoming RF energy from a separate portable transmitter.
- **Power-conversion circuitry** provides DC power to other parts of the system and sends instructions to the display control circuit.
- **The display** might consist of LEDs, which would turn on and off, or LCD-like elements, whose transparency would be modulated by the control circuit.
- **An energy-storage module**, perhaps a large capacitor, is connected to a solar cell, which could provide a boost to the lens.
- **A biosensor** samples the surface of the cornea, performs an analysis, and provides data to the telecommunication module to transmit to an external computer.

Future Display systems





Optical or direct see-through

Video see-through

Demo- Toyota iQ AR Catalogue

Conclusion

↗ AR is a relatively new field (since 1993) and is far behind VR in maturity.

- Several vendors sell complete, turnkey VR systems.
- No commercial vendor currently sells an HMD-based AR system.

↗ First deployed HMD-based AR system will probably be in the application of aircraft manufacturing (Boeing is currently exploring this technology extensively).

↗ A breakthrough is required in real-time HMD tracking in the outdoors at the accuracy required by AR for this technology to move ahead rapidly.

↗ AR has a great future as it promises better navigation and interaction with real and virtual world in ways which has previously been unimaginable.