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INTRODUCTION TO ARVR

I YEAR/ II SEMESTER

UNIT – I

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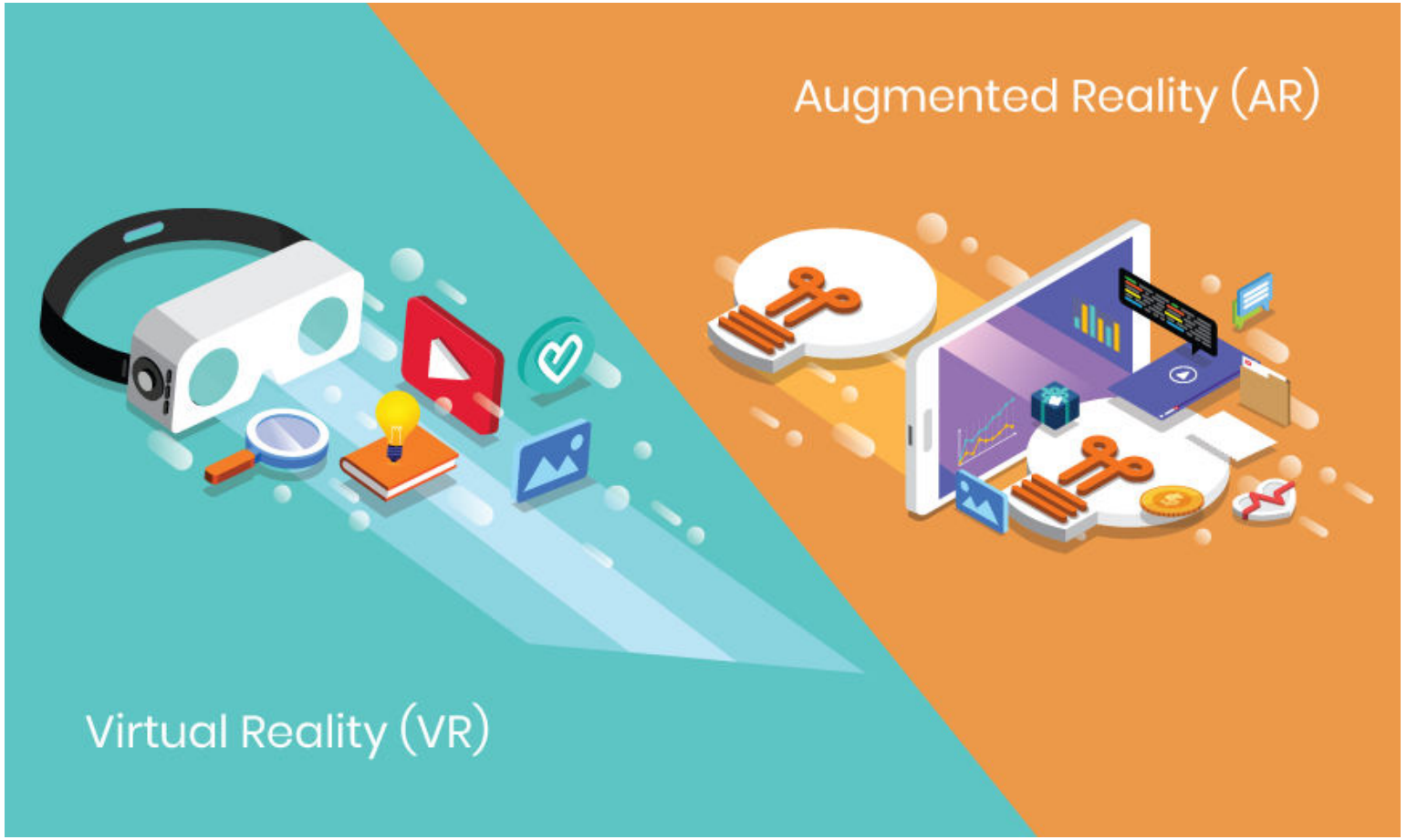
Augmented Reality Interaction

- Augmented reality (AR) is an **emerging technology** that has yet to be a mature consumer product.
- Given that **user experience** plays a significant role in the success of new technologies, the development of appropriate AR user interfaces needed.
- As such, defining the challenges to current AR user interfaces is a steppingstone to enhancing user experience.
- There are three principal components of interaction in AR systems: **the user, the user interface and the virtual content.**

Virtual Reality (VR)/Augmented Reality (AR)



Augmented Reality vs. Virtual Reality

Augmented Reality

- System augments the real world scene
- User maintains a sense of presence in real world
- Needs a mechanism to combine virtual and real worlds

Virtual Reality:

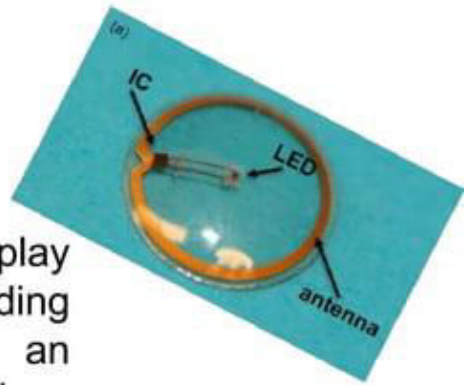
- Totally immersive environment
- Visual senses are under control of system (sometimes aural and proprioceptive senses too)

DISPLAY

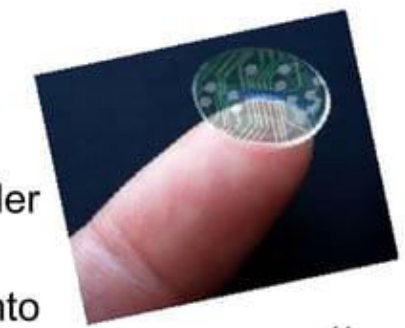
- **Head-mounted Display(HMD)**
  - device paired to a headset such as a harness or helmet

- **Eye Glasses**
  - eye wear that employs cameras to intercept the real world view and re-display it's augmented view through the eye pieces

DISPLAY(cont..)



- **Contact Lenses**
  - Contain the elements for display embedded into the lens including integrated circuitry, LEDs and an antenna for wireless communication.
  - Under development
- **Virtual Retina Display**
  - a personal display device under development .
  - a display is scanned directly onto the retina of a viewer's eye.



This is how AR works

- Pick A Real World Scene
- Add your Virtual Objects in it.
- Delete Real World Objects
- Not Virtual Reality since Environment Real.

DISPLAY(cont..)

- **Handheld**
  - a small display that fits in a user's hand.
  - Portable
  - Ubiquitous
  - Physical constraints of the user having to hold the device
  - Distorting effect

- **Spatial**
  - makes use of digital projectors to display graphical information.
  - user is not required to carry equipment or wear the display over their eyes.
  - can be used by multiple people at the same time without each having to wear a head-mounted display.

Applications

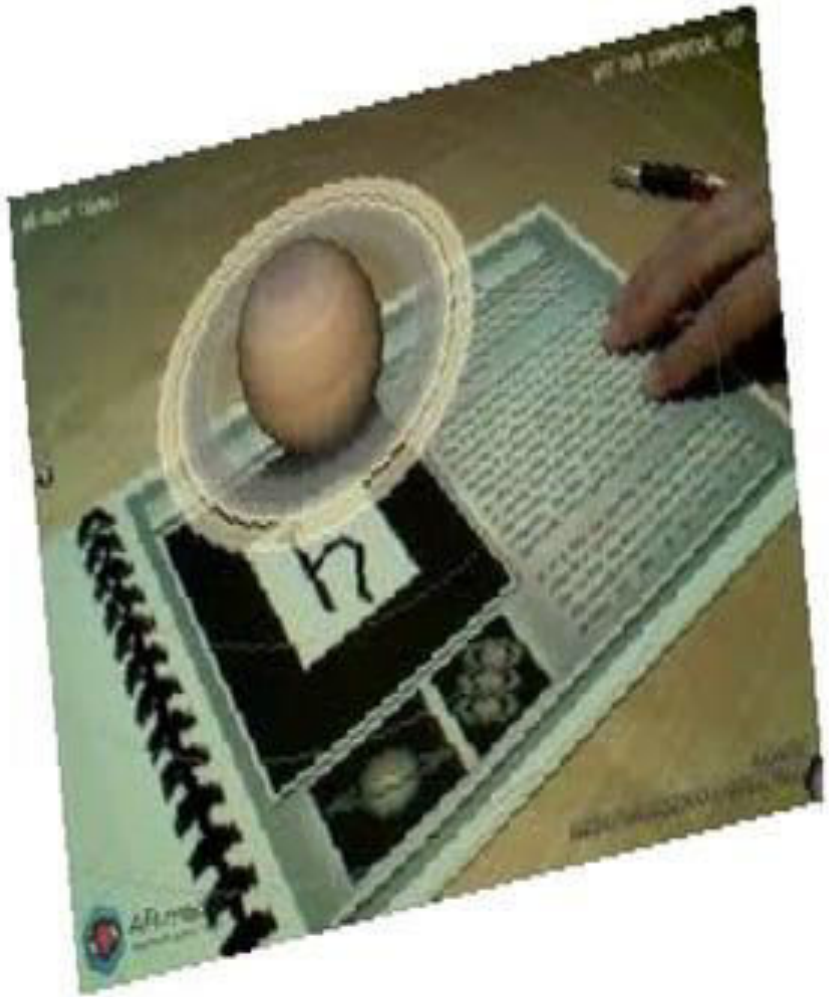
- Medical
- Entertainment
- Military Training
- Engineering Design
- Robotics and Telerobotics
- Manufacturing, Maintenance, and Repair
- Consumer Design
- Hazard Detection
- Audio

Medical

Entertainment

Defence

Education



Remote evaluation of augmented reality interaction with personal health information

- Augmented Reality (AR) can be utilized to present “omic” (i.e., genomes, microbiomes, pathogens, allergens) information to non-expert users.
- While existing research shows the potential of AR as a tool for personal health, methodological challenges pose a barrier to the ways In which AR research can be conducted.
- There is a **growing need for new evaluation methods** for AR systems, especially as **remote testing** becomes increasingly popular.
- In this article, we present **two AR studies adapted for remote research environments in the context of personal health**

- The first study (*n* = 355) is a non-moderated remote study conducted using an AR web application **to explore the effect of layering abstracted pathogens and mitigative behaviors on a user**, on perceived risk perceptions, negative affect, and behavioral intentions.

- This study introduces methods that address participant precursor requirements, diversity of platforms for delivering the AR intervention, unsupervised setups, and verification of participation as instructed.

- The second study (*n* = 9) presents the design and moderated remote evaluation of a technology probe, a prototype of a novel AR tool that overlays simulated timely and actionable environmental omic data in participants' living environment, which helps users to contextualize and make sense of the data.

Techniques using Augmented Reality Interaction (Interact with 3D model)

FLIP-FLOP INTERACTION TECHNIQUE

- In most of AR techniques designed for control application, each **fiducial marker is used to trigger a single event or action.**
- This may become a drawback when a large number of event / action are required.
- The approach we propose here is based **on a bimanual interaction and a V-shaped menu** that allows to trigger many event/action with only **8 fiducial markers**.

➢The developed application, activated by the covering of the fiducial markers of the master sub-menu by the user's hand. These functionalities are the following :

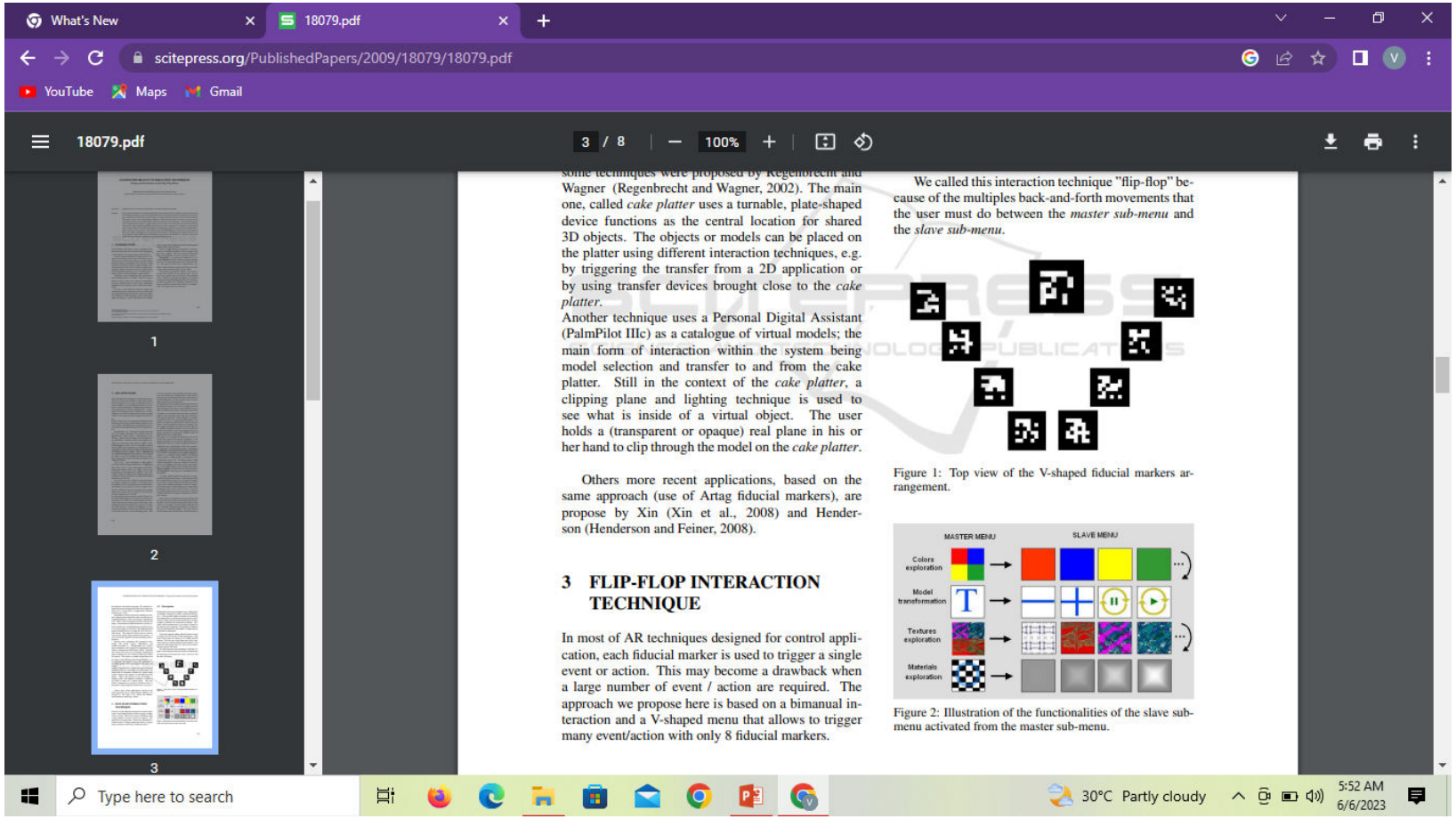
- **Colors exploration**: Exploration of the colors palettes. The change of palette is done each 800ms. This value was tuned using preliminary testing involving few participant.
- **Model animation**: Activation of functionalities allowing to (1) reduce or (2) increase the size of the mannequin and (3) to make the mannequin rotate or (4) to stop it in a specific position.

- **Texture database exploration**: Exploration of the different preset texture sets. The display of a new texture sets is done automatically each 800ms.
- **Materials exploration**: Activation of functionalities allowing to change the material that simulate the fabric visual aspect.

For a Reference

https://www.scitepress.org/PublishedPapers/2009/18079/18079.pdf

Cont…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Wagner (Regenbrecht and Wagner, 2002). The main one, called *cake platter* uses a turnable, plate-shaped device functions as the central location for shared 3D objects. The objects or models can be placed on the platter using different interaction techniques, e.g. by triggering the transfer from a 2D application or by using transfer devices brought close to the *cake platter*.
Another technique uses a Personal Digital Assistant (PalmPilot IIIc) as a catalogue of virtual models; the main form of interaction within the system being model selection and transfer to and from the cake platter. Still in the context of the *cake platter*, a clipping plane and lighting technique is used to see what is inside of a virtual object. The user holds a (transparent or opaque) real plane in his or her hand to clip through the model on the *cake platter*.
Others more recent applications, based on the same approach (use of Artag fiducial markers), are propose by Xin (Xin et al., 2008) and Henderson (Henderson and Feiner, 2008).
3 FLIP-FLOP INTERACTION TECHNIQUE
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We called this interaction technique "flip-flop" because of the multiples back-and-forth movements that the user must do between the *master sub-menu* and the *slave sub-menu*.
Figure 1: Top view of the V-shaped fiducial markers arrangement.
MASTER MENU
SLAVE MENU
Colors exploration
Model transformation
Textures exploration
Materials exploration
Figure 2: Illustration of the functionalities of the slave sub-menu activated from the master sub-menu.
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