

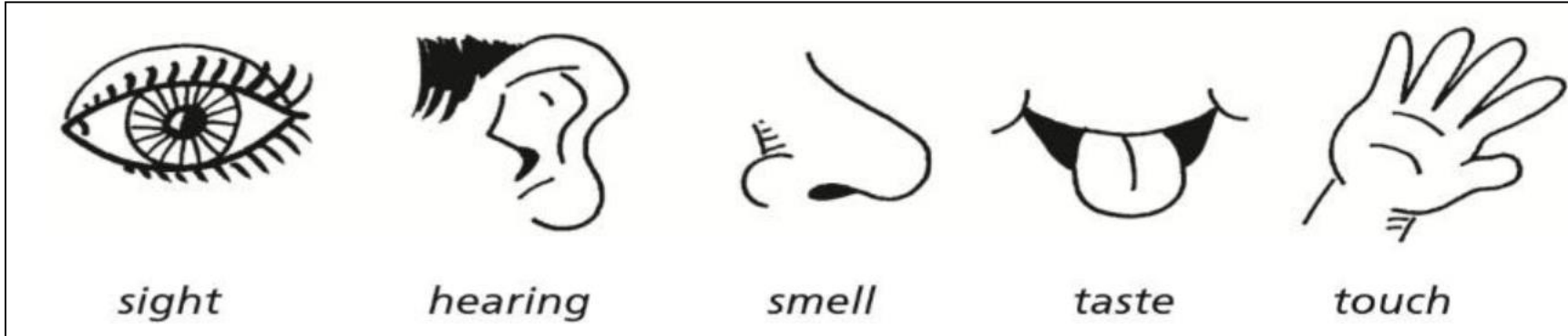
Introduction to Augmented Reality & Virtual Reality

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Advanced Technology Development Centre



Display Technologies

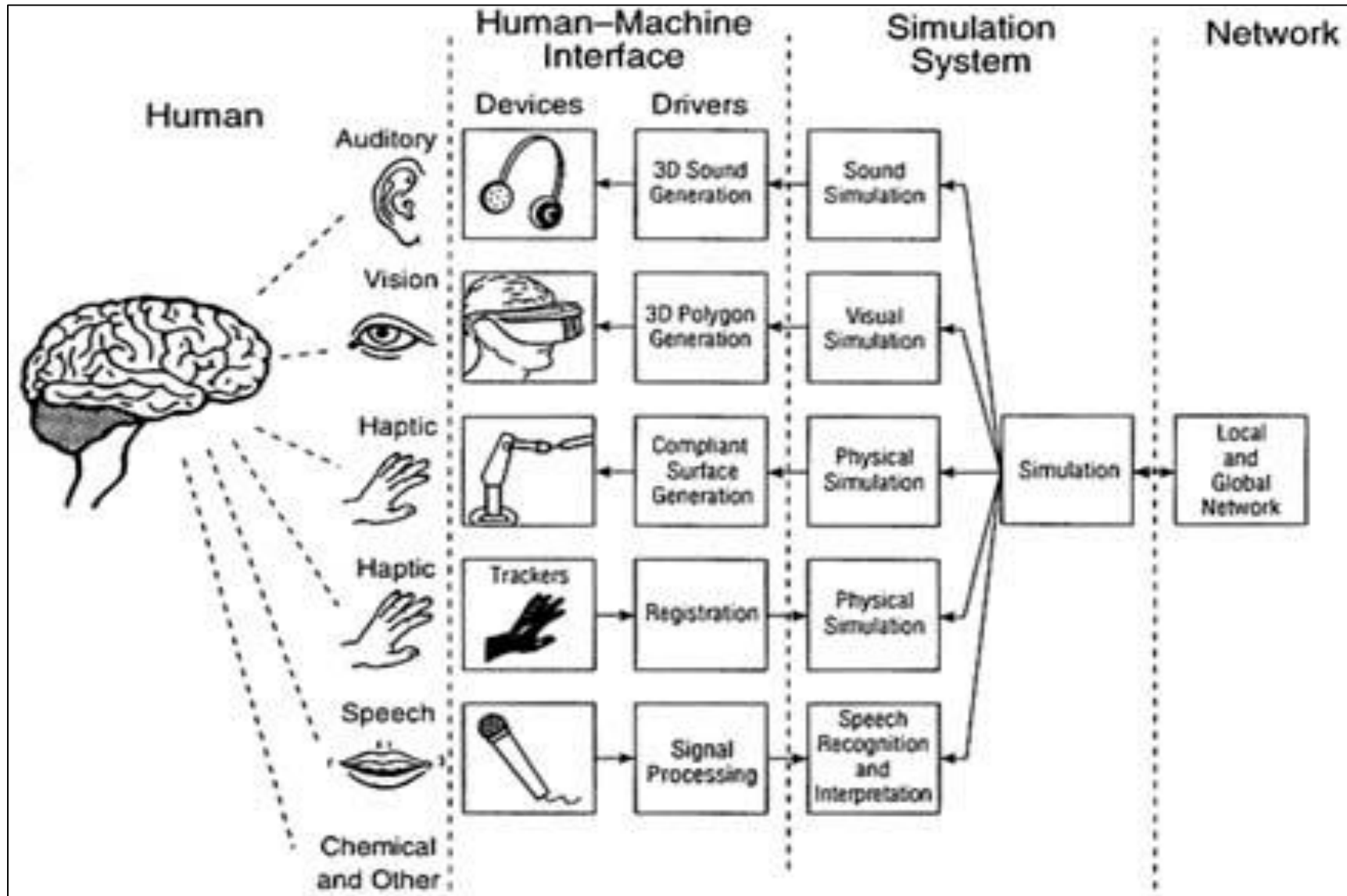
Senses



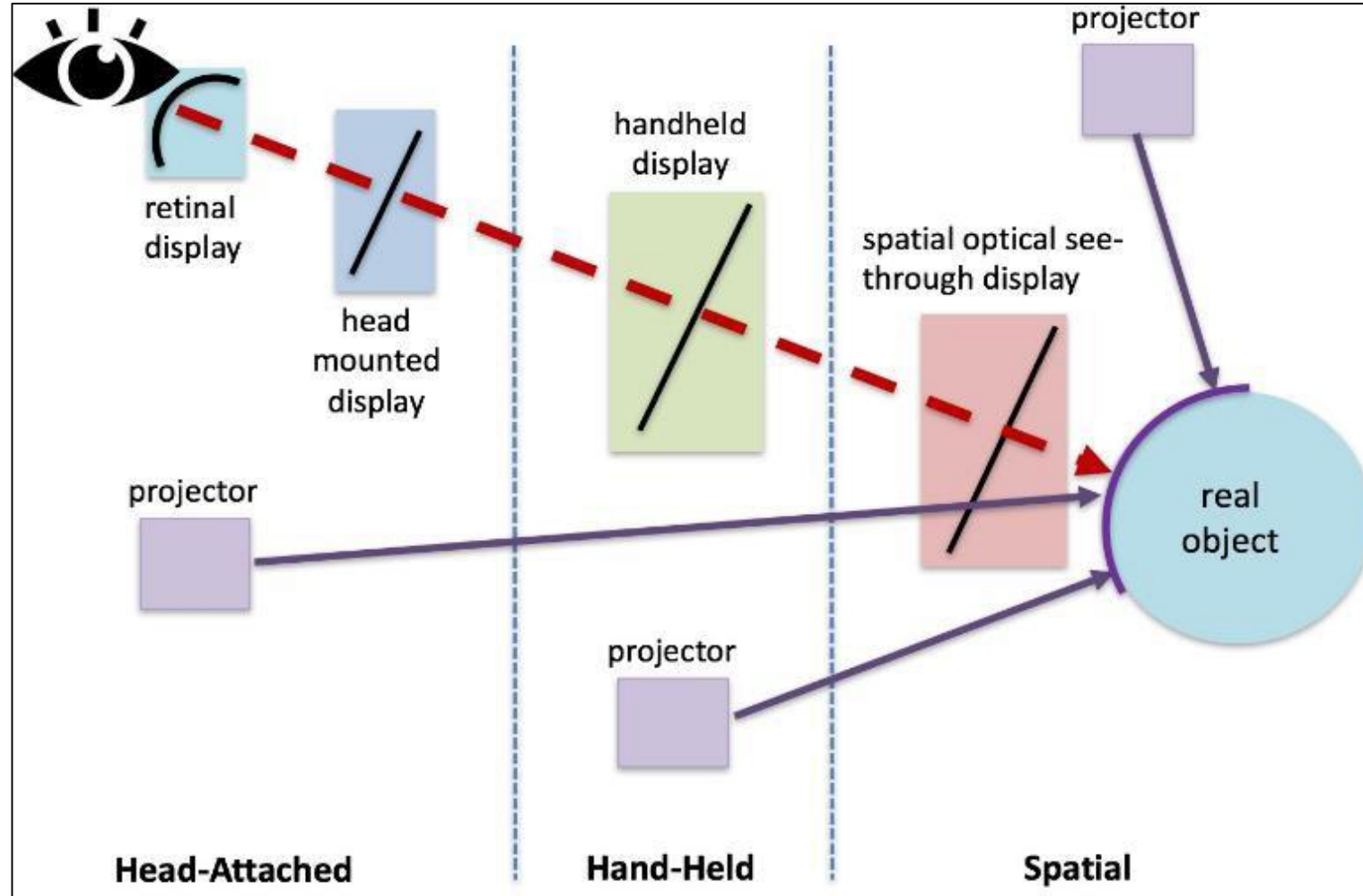
Five major senses:

- Sight (Ophthalamoception)
- Hearing (Audioception)
- Taste (Gustaoception)
- Smell (Olfacaoception)
- Touch (Tactioception)

Using Technology to Stimulate Senses



Display Taxonomy

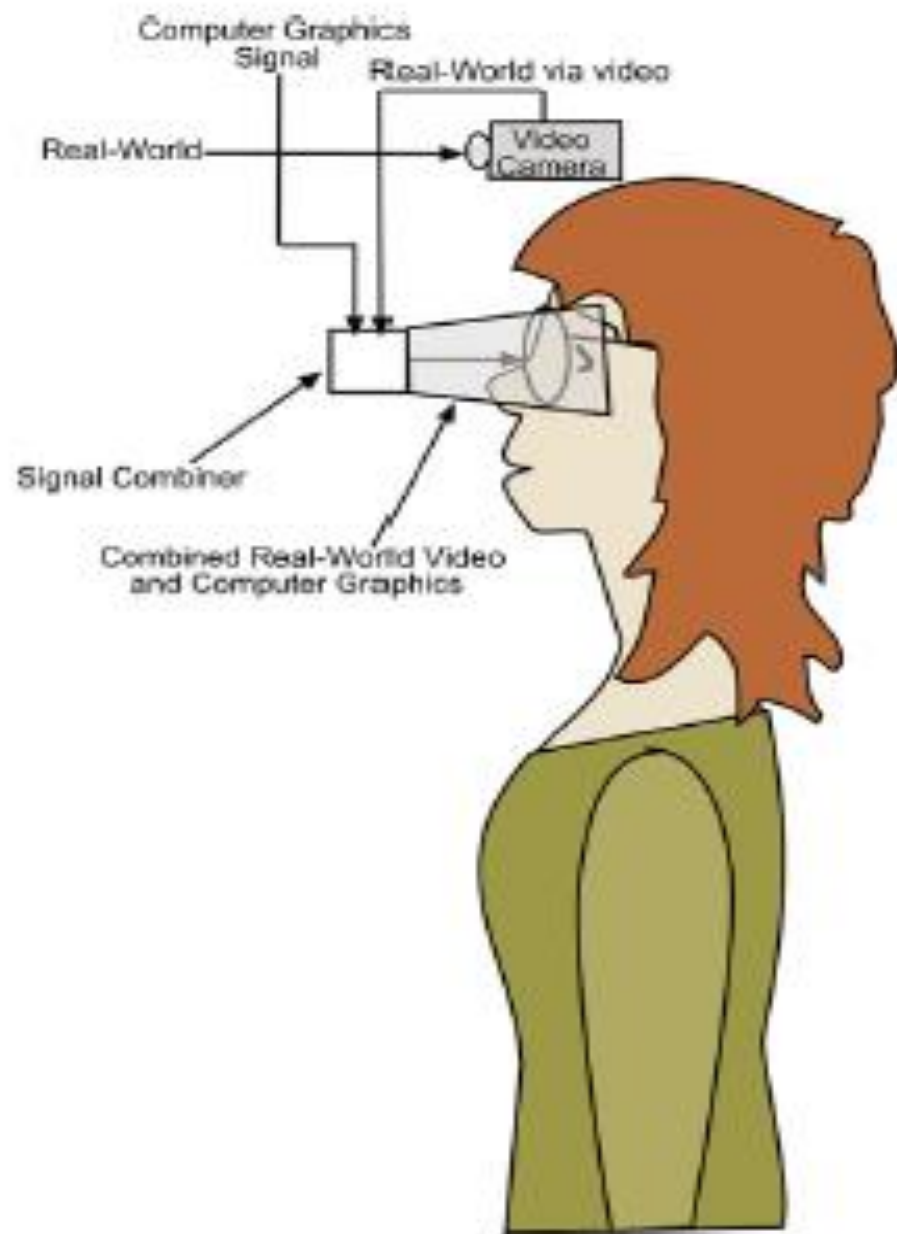
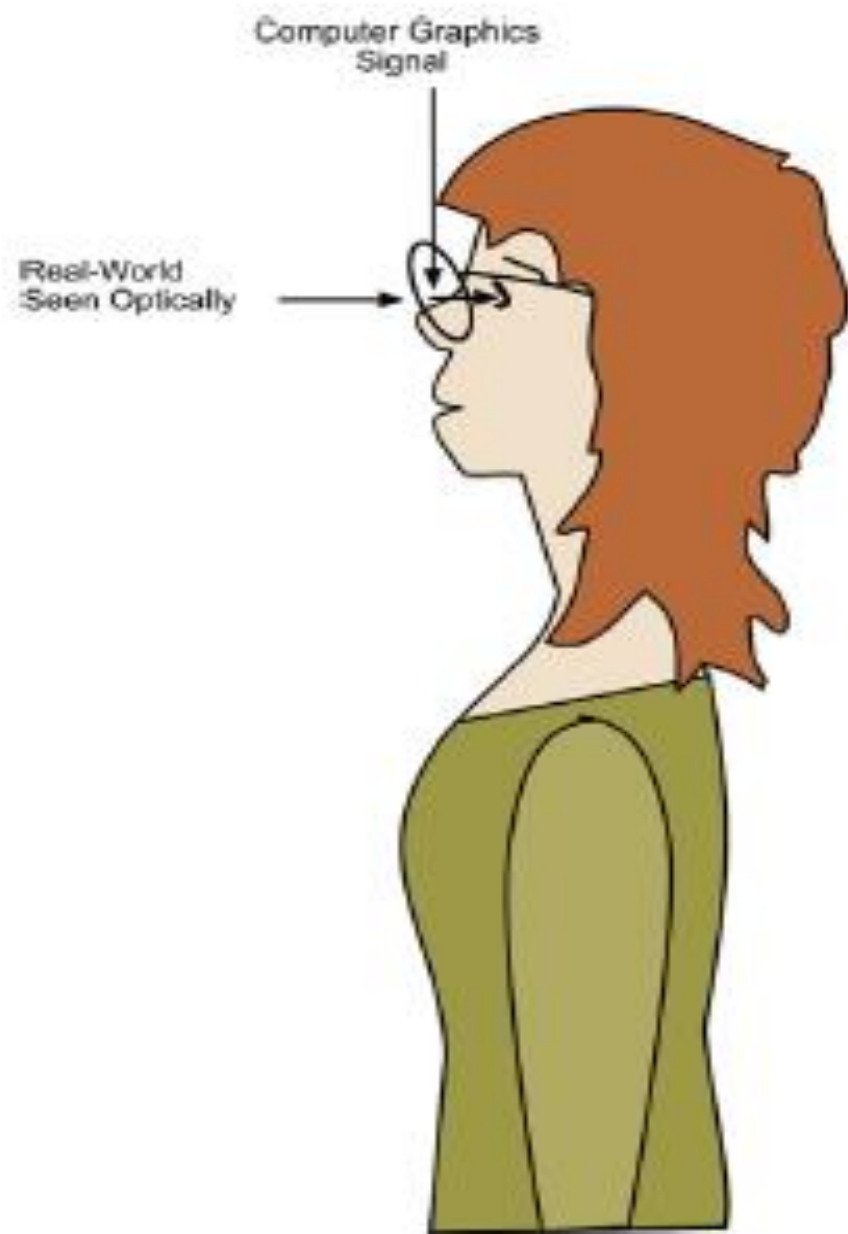


Multi-modal display

- Visual display
- Audio display
- Haptic display
- Olfactory Display
- Gustatory Display

Visual displays

- Stationary visual displays
- Visual displays that move with the participant's head
- Visual displays that move with the participant's hand or other parts of his or her body



Ocularity

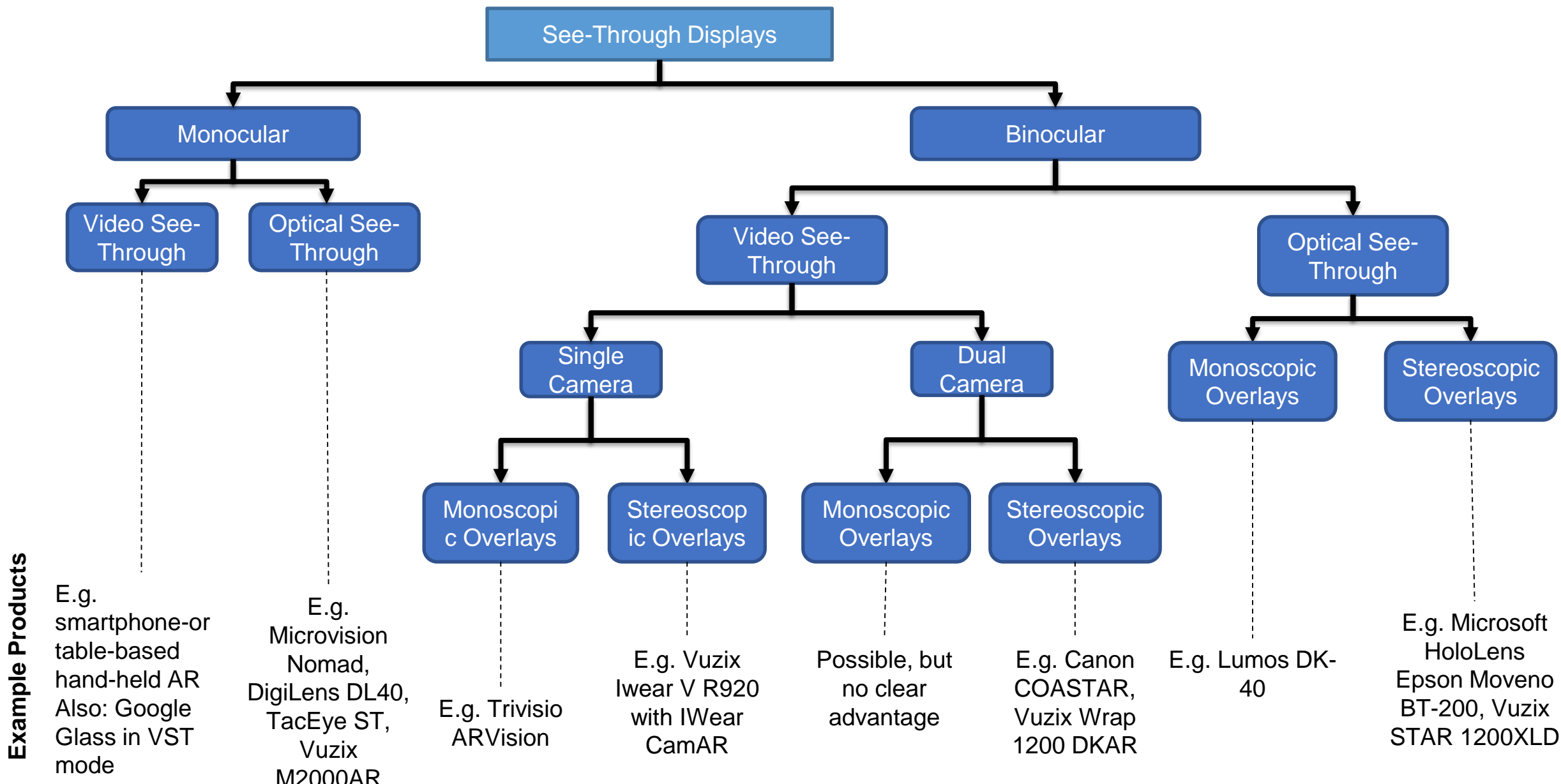
Monocular - HMD image to only one eye.

Biocular - Same HMD image to both eyes.

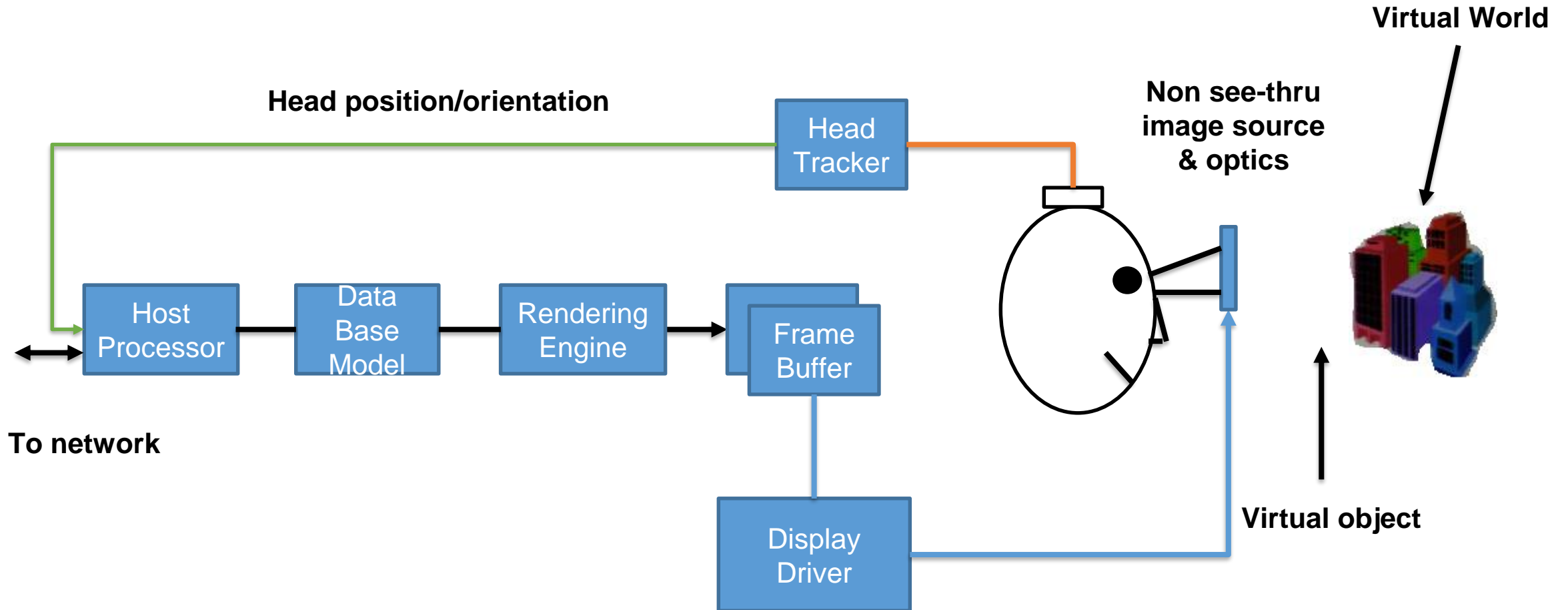
Binocular (stereoscopic) - Different but matched images to each eye.



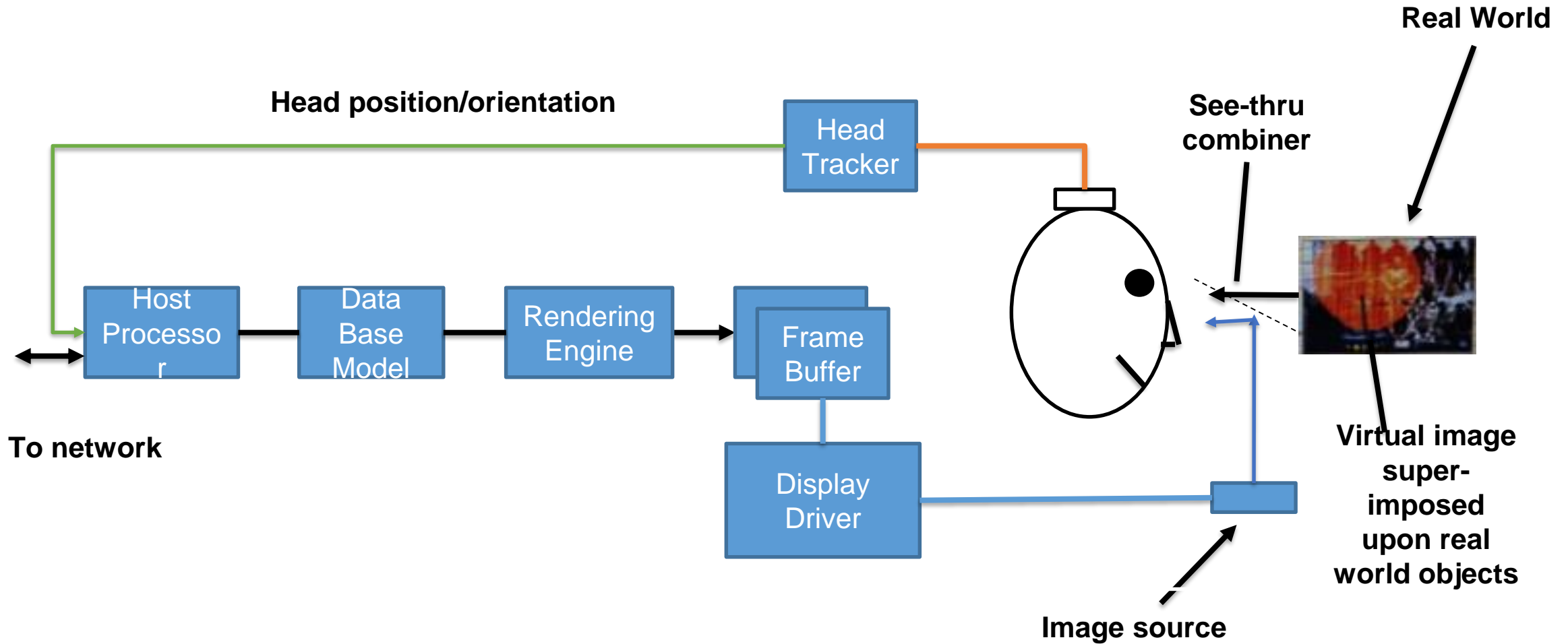
See-Through Display Taxonomy



Immersive VR Architecture



See-thru AR Architecture



Non-See-Through Displays



The Rift is a binocular HMD intended for immersive computer games. It is under development by Oculus, which was acquired by Facebook in 2014 for \$2 billion, raising the interest in HMD technology worldwide



The Samsung Gear VR is an example of a head-mounted display that uses a smartphone (here: Galaxy S6) as the main I/O and computational engine

Audio displays

- Stationary audio displays
- Audio displays that move with the participant's head
- Audio displays that move with the participant's hand or other parts of his or her body

Haptics display

- Skin sensations (taction)
- Forces (kinesthetics)

Haptics display



https://www.youtube.com/watch?v=2C2_kbjtjRU&ab_channel=HaptX

Olfactory Display



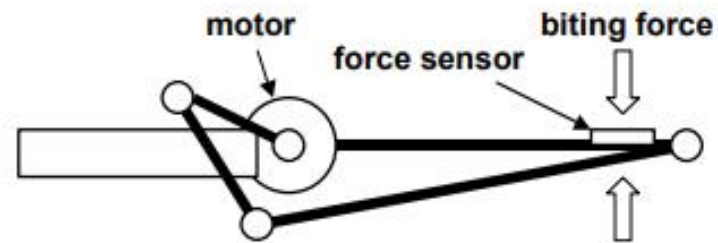
MetaCookie: An olfactory display is combined with visual augmentation of a plain cookie to provide the illusion of a flavored chocolate cookie

(https://www.youtube.com/watch?v=Oe39HQH78x4&ab_channel=Exploratorium)

Gustatory Display (Iwata food simulator)



Figure1. overall view of the apparatus



https://www.youtube.com/watch?v=38u3e_WT4H4&ab_channel=NewScientist