CSU44054/CS7GV4: ~~Augmented~~ Reality

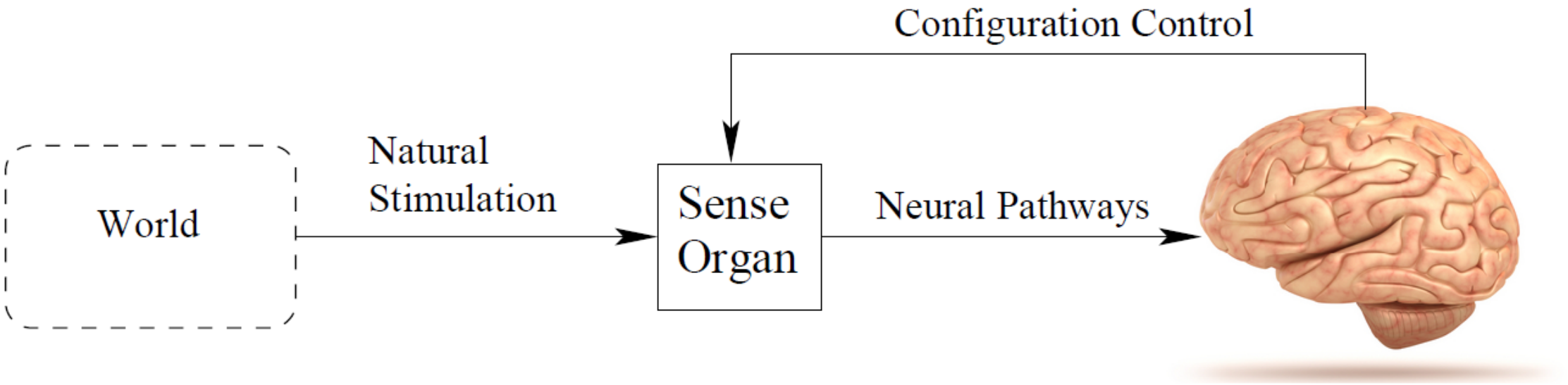
eXtended

Gareth W. Young

Birds Eye View

- Hardware
- XR Hardware

How we perceive the world.



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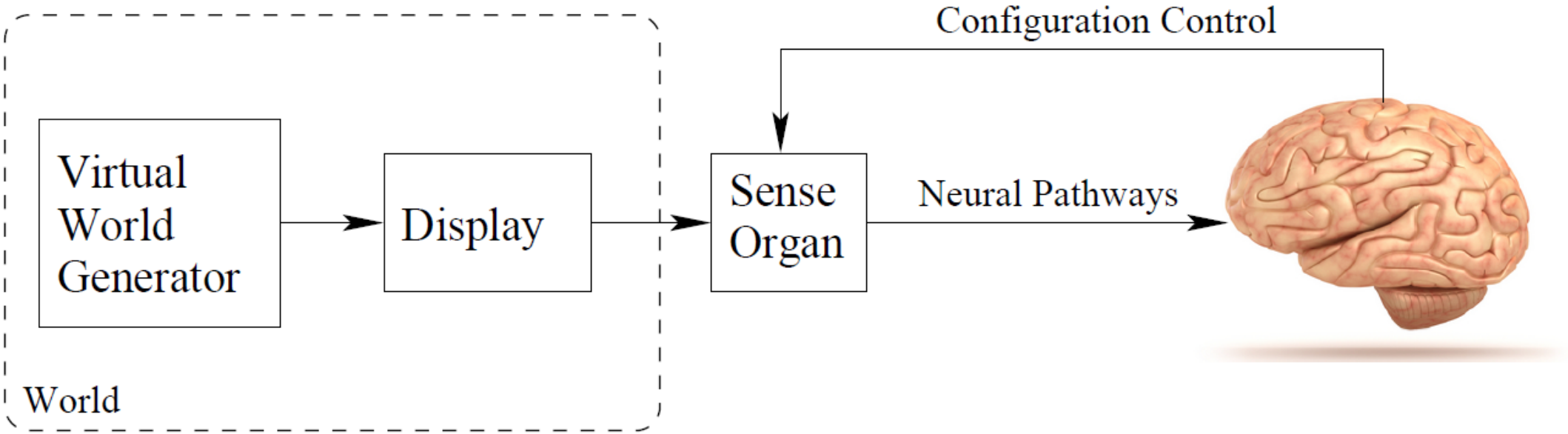

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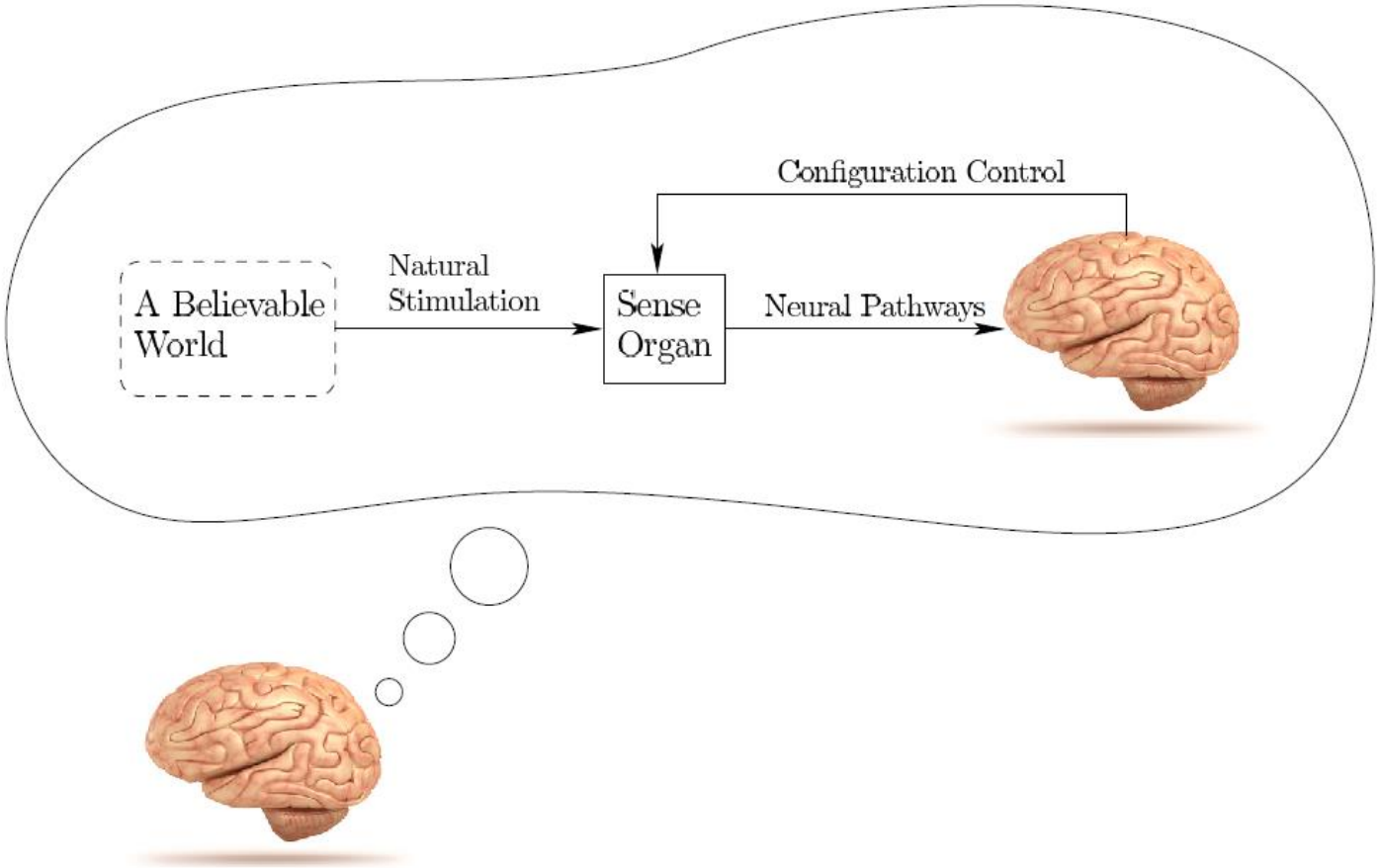
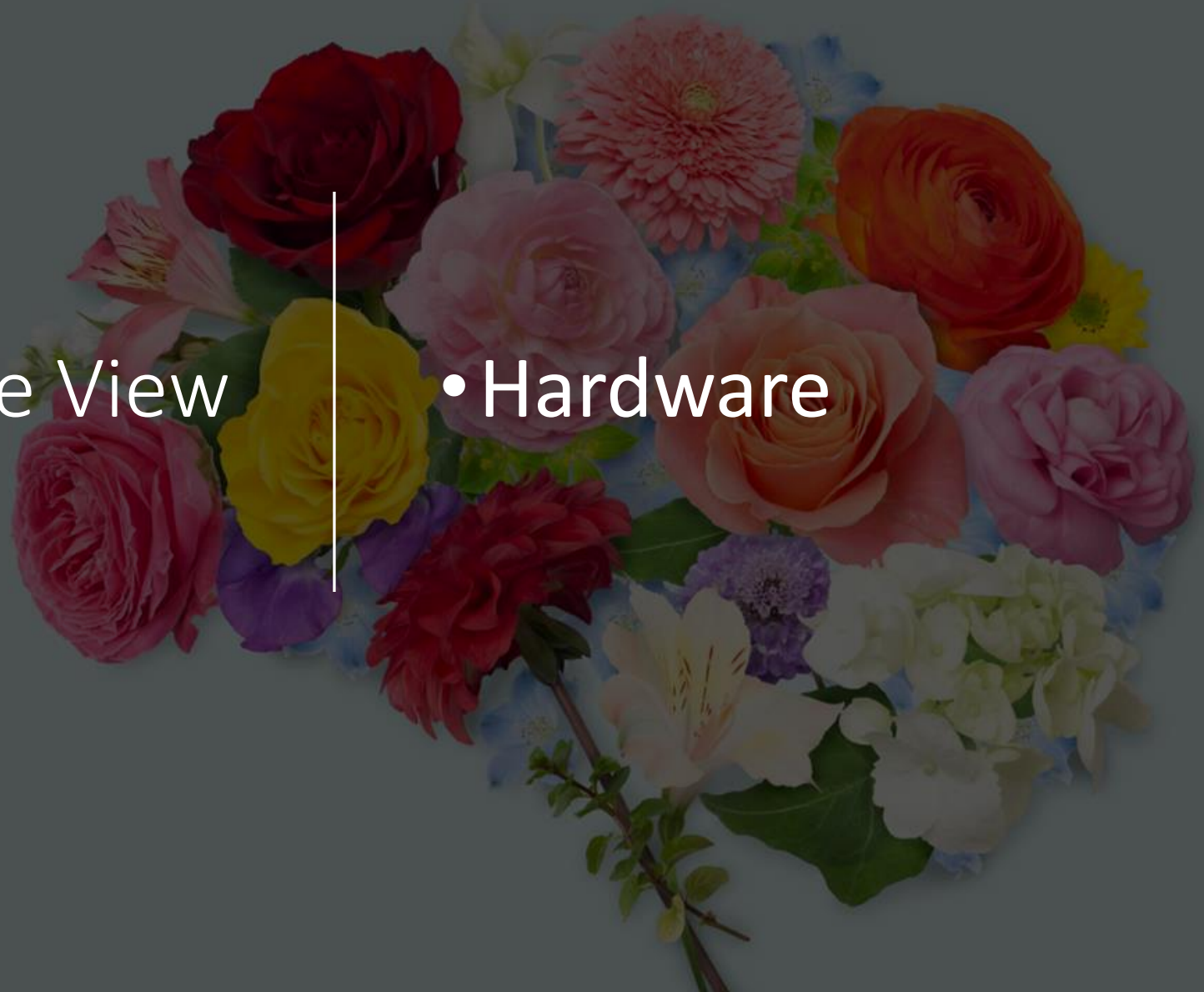
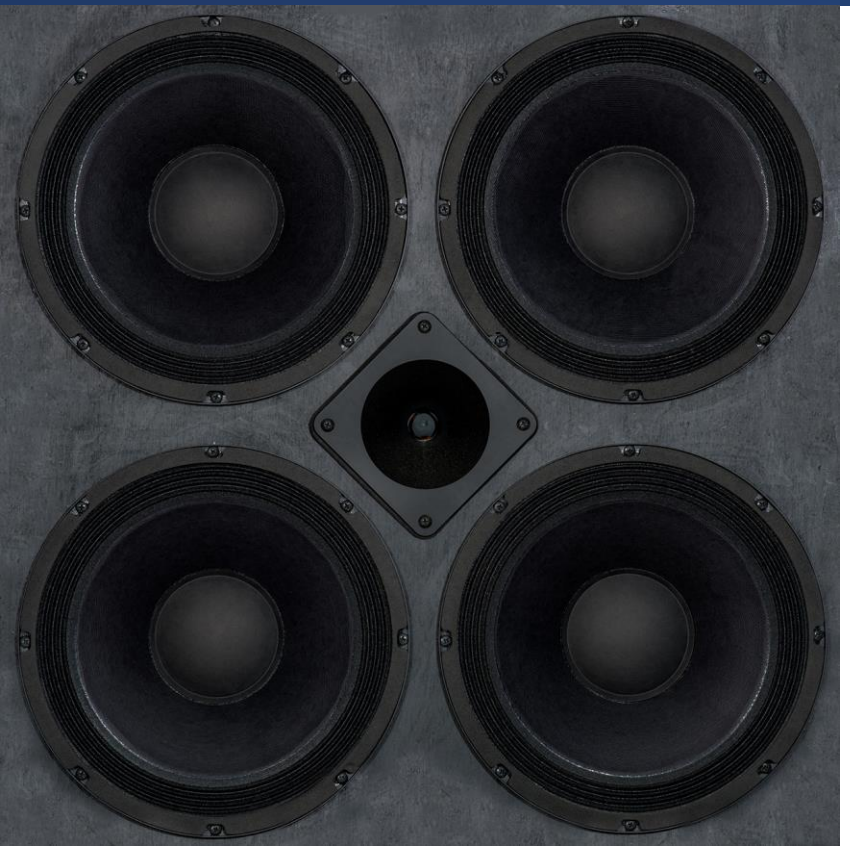


Birds Eye View

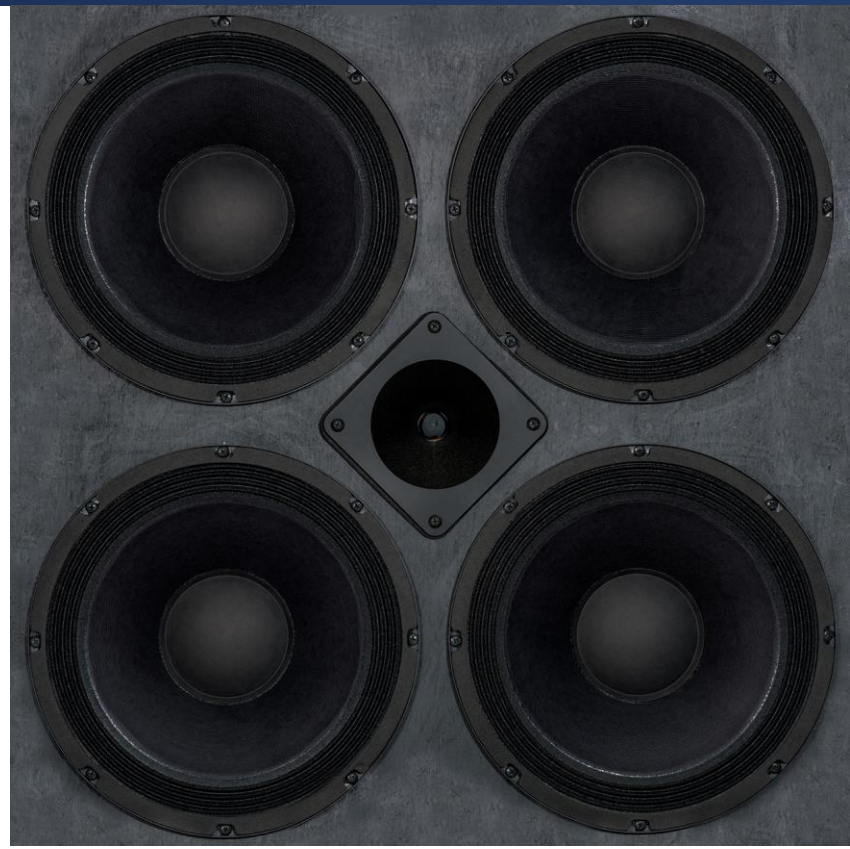
- Hardware



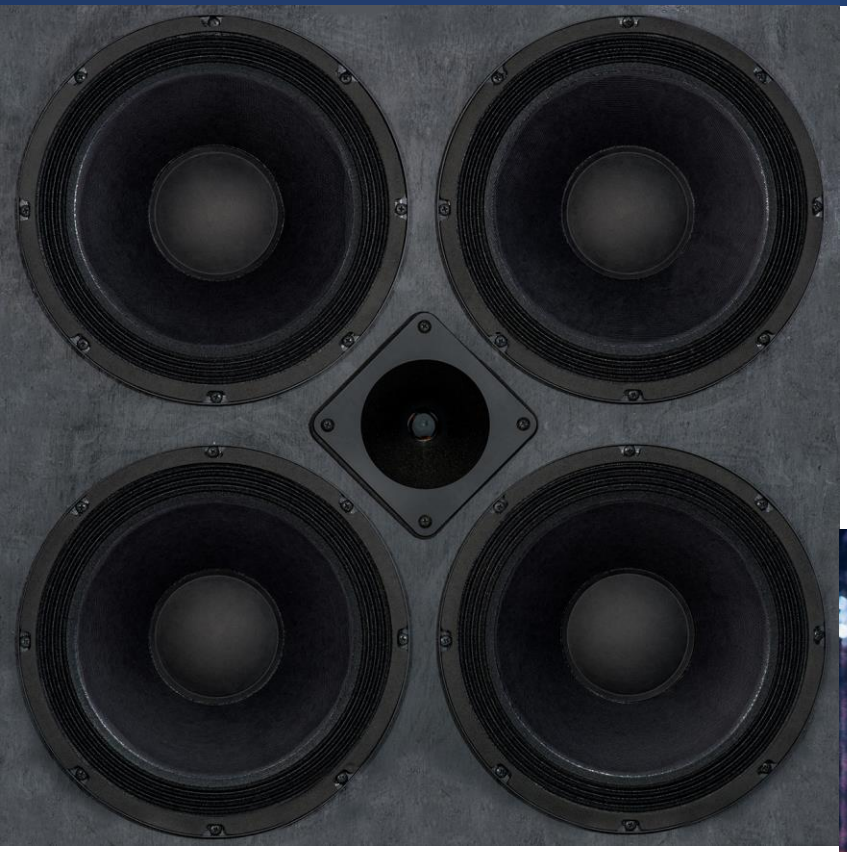
Displays and Rendering: Audio and Listening



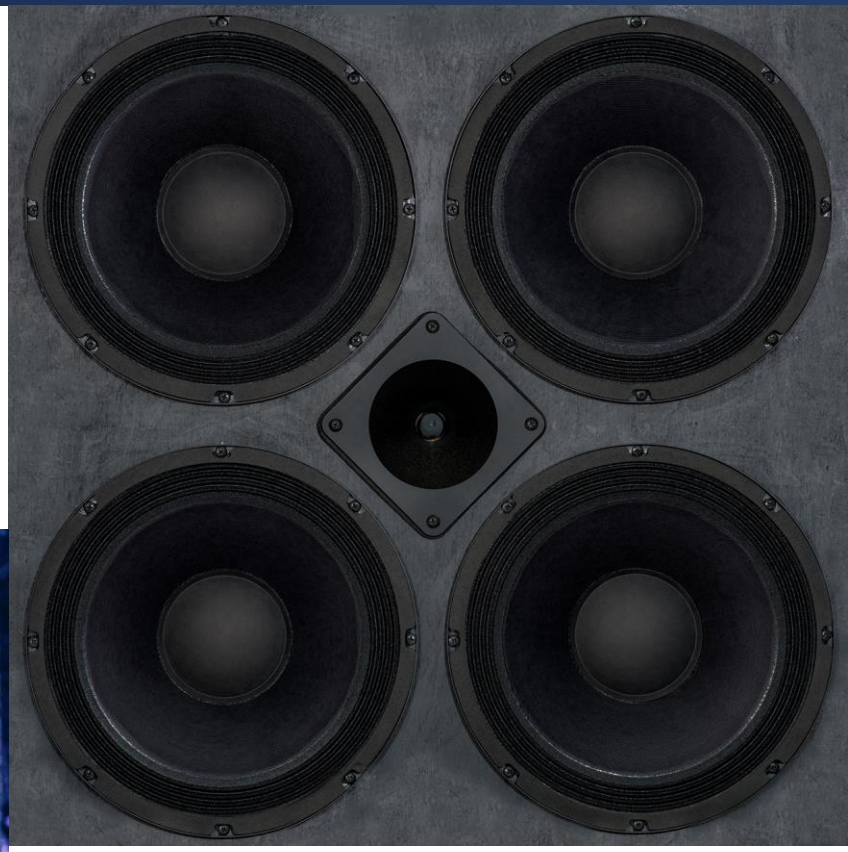
- The display is called a speaker
- Rendering produces sound for the ears



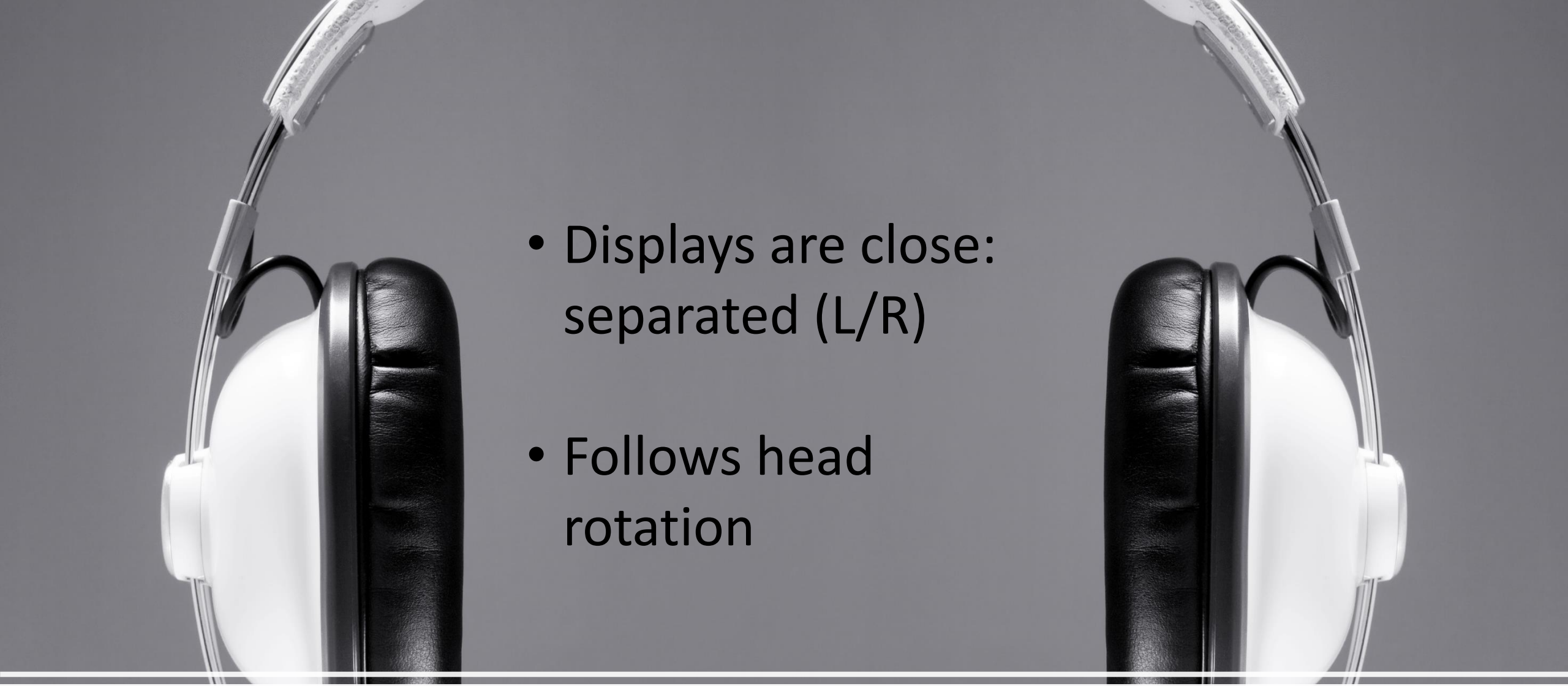
Comparing audio systems: Stereo Speakers



- Displays are far away
- Localized audio for fixed room



SUB
C
FL
FR
Surround Sound:
7.1
SL
SR
SBL
SBR

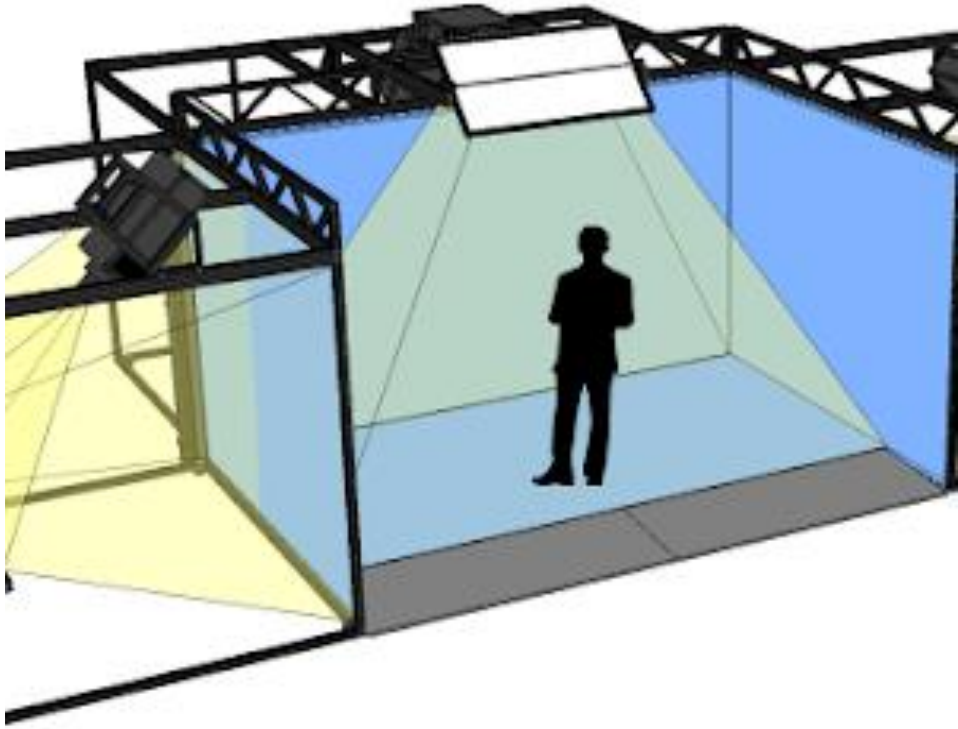


- Displays are close: separated (L/R)
- Follows head rotation

Comparing audio systems: Headphones

Displays and Rendering: Video and Seeing

- The display is called a screen or projector
- Rendering produces images on a screen



Comparing visual systems: CAVE

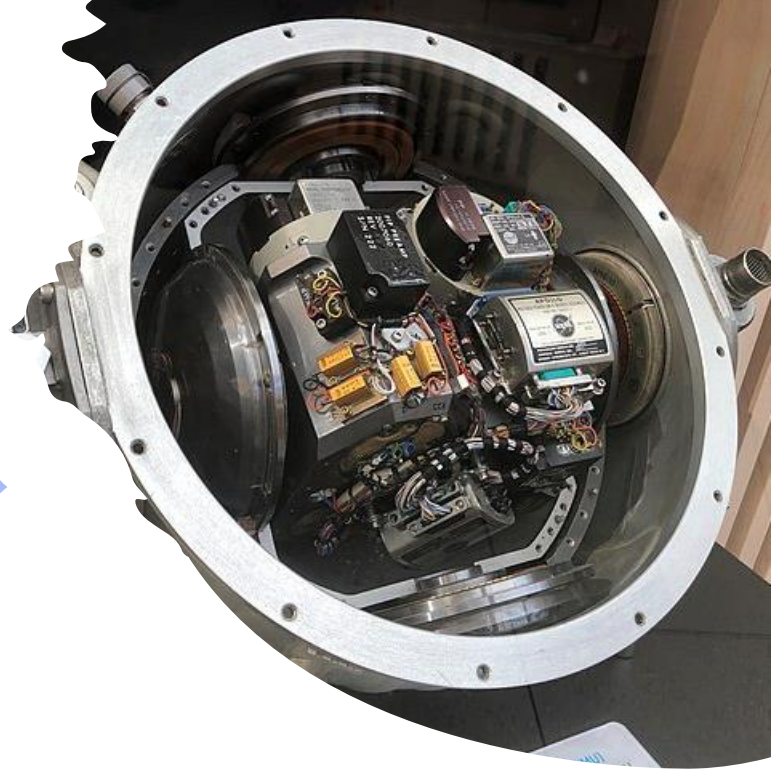
Comparing visual systems: HMDs

Audio Vs Visual

- Head tracking is not needed for speakers of CAVE systems, so why is head tracking needed for HMDs?
- Why isn’t tracking used for headphones?
- Listen to music with headphones on and turn your head. Does the music move around your head?

Birds Eye View

- XR Hardware



Tracking Hardware Components for XR

- **Inertial Movement Unit (IMU)**
- **Magnetometer**
- **Camera**
- **Depth camera**

What to track?

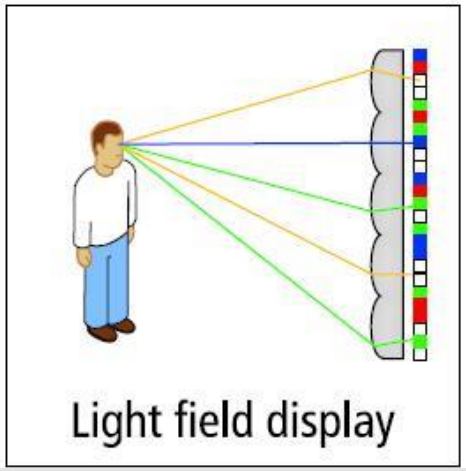
HEAD / EYES

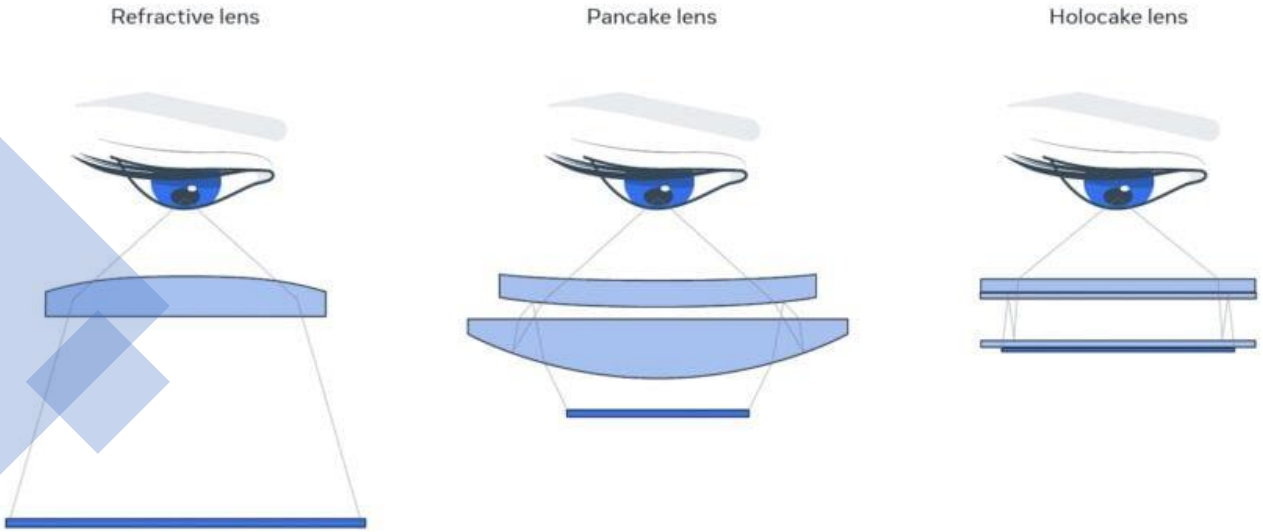
HANDS / WHOLE BODY

ENTIRE ENVIRONMENT

Display Components: Visual

- CRT / LCD / OLED + Lenses
- Light field displays
- Virtual retina display



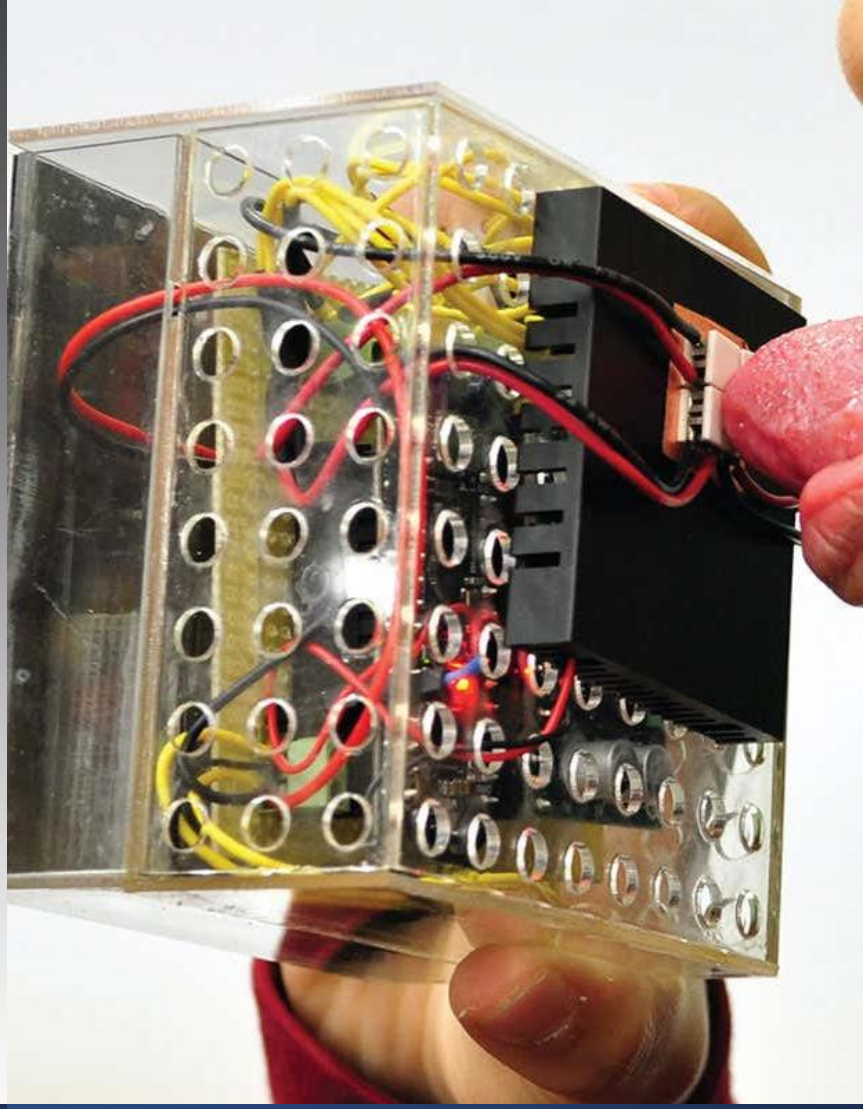


Display Components: Audio

- Speakers / Earphones / Headphones
- Bone conduction

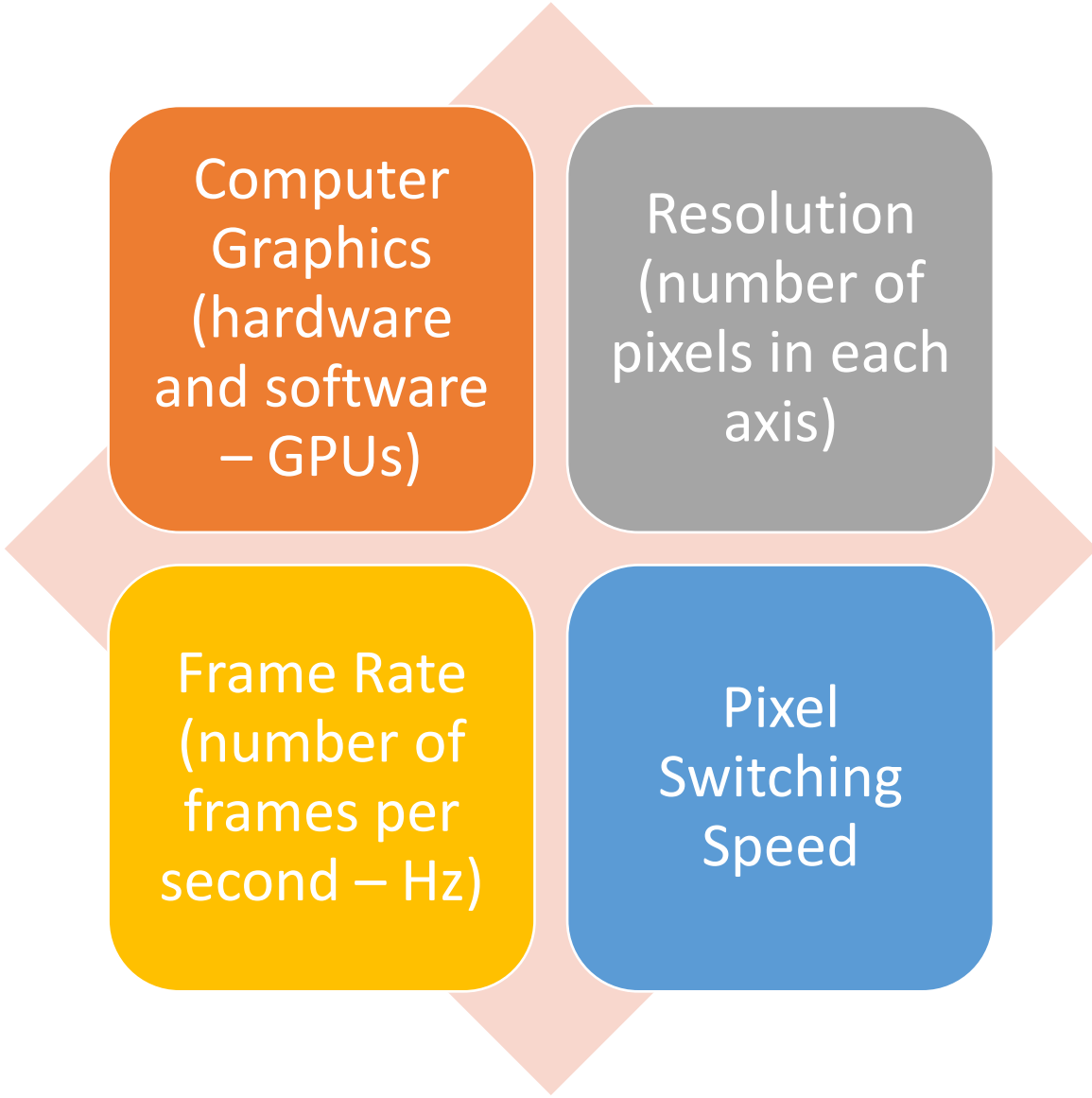
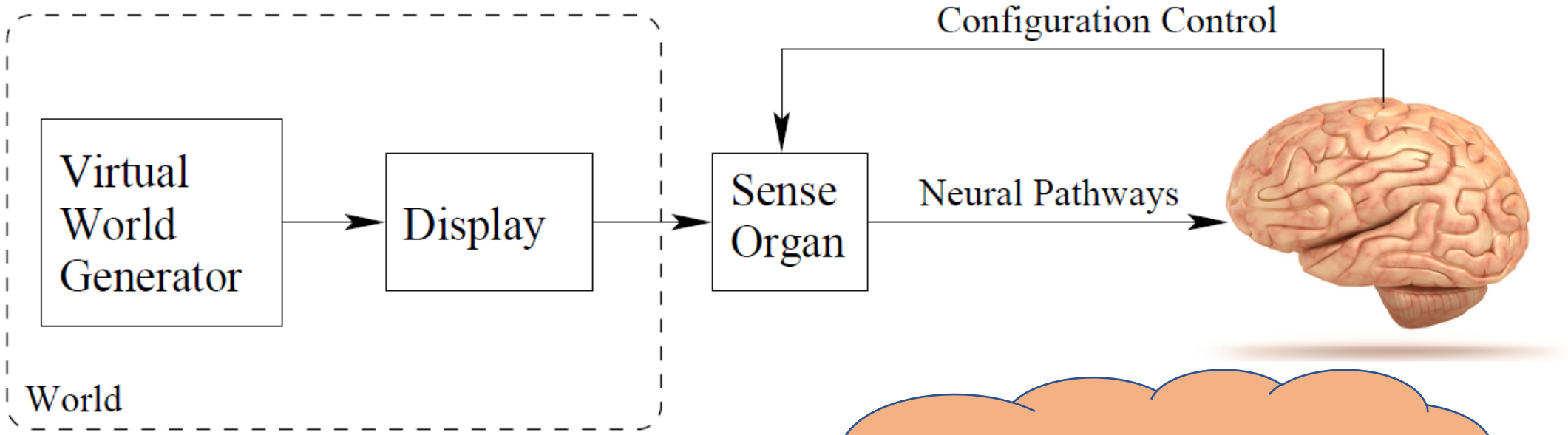
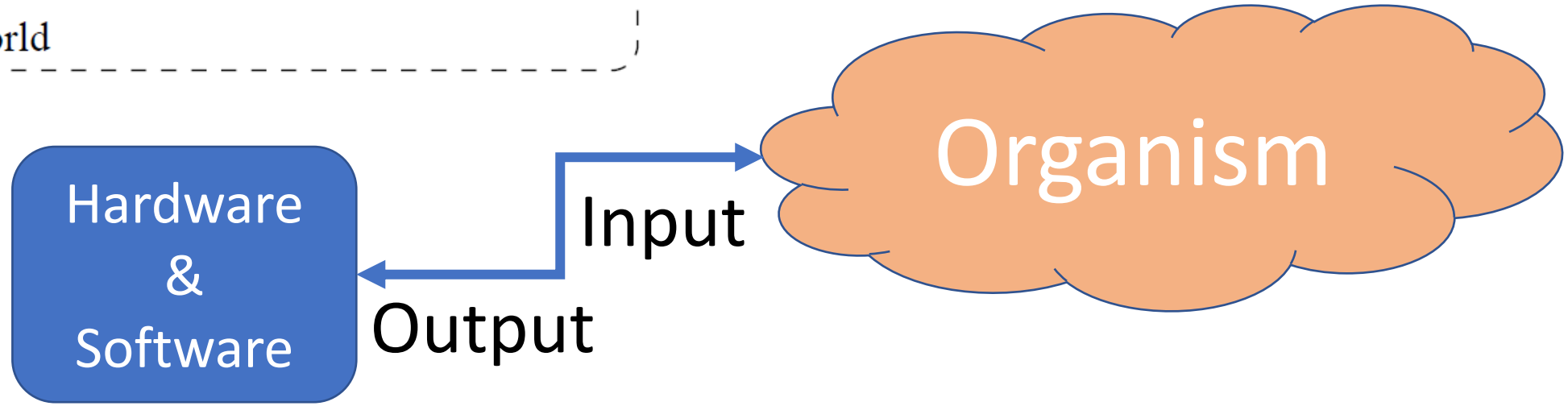
Display Components: Touch

- Haptic devices (Force / Touch)
- Keyboards, controllers, mouse, etc.



Display Components:
Smell / Taste / Vestibular

Visual Rendering for Displays



How we perceive the world.