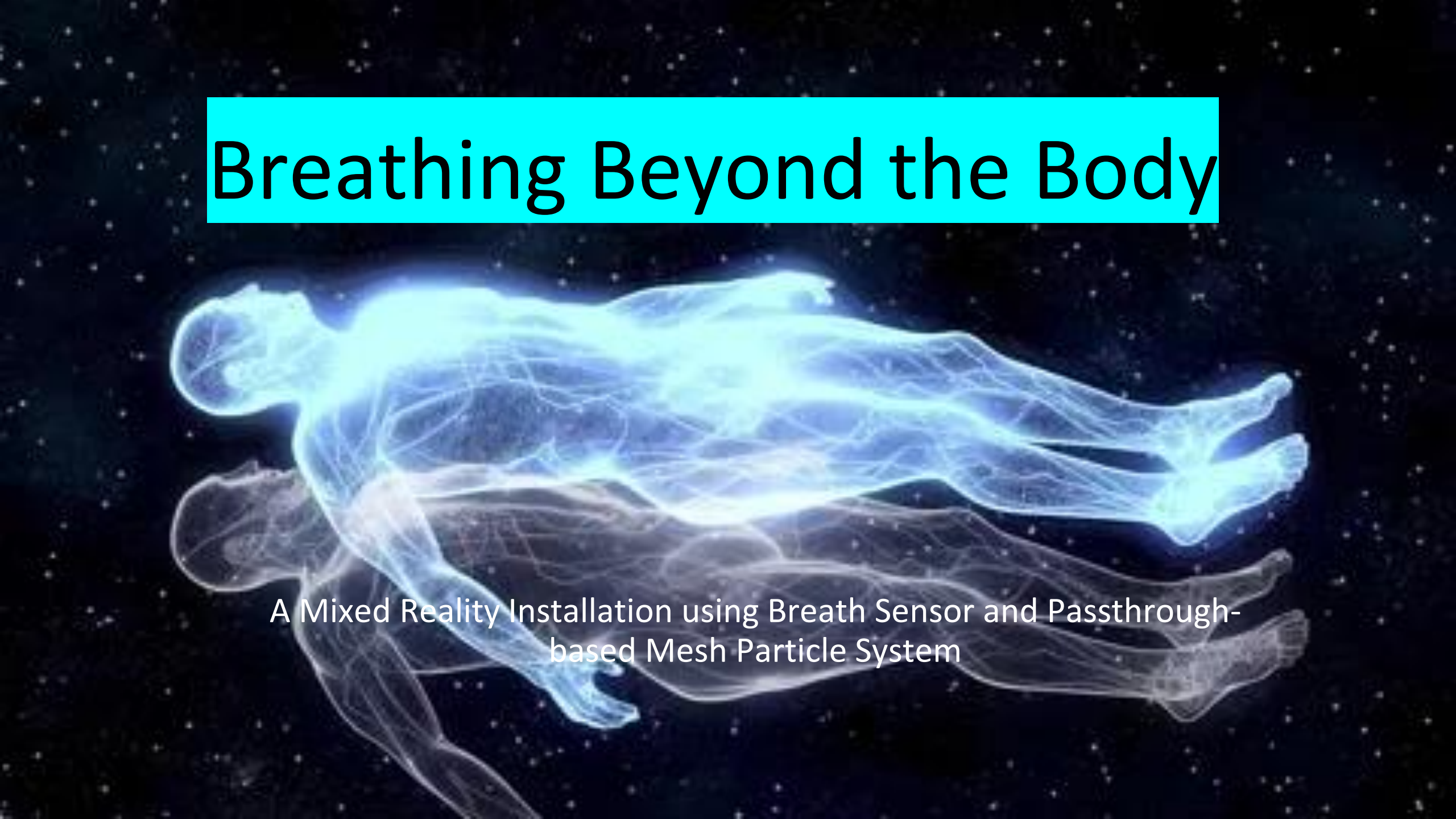
Breathing Beyond the Body



A Mixed Reality Installation using Breath Sensor and Passthrough-based Mesh Particle System

Setting

- This project visualizes the act of breathing as a bridge between the physical and the virtual body. By combining a breath sensor with a VR headset's passthrough function and a Unity VFX mesh-particle system, the installation lets users experience the sensation of leaving their own body — an Out-of-Body Experience (OOBE) in Mixed Reality.

Artistic Motivation

- The purpose of this project is to let the participant **see themselves from a third-person perspective**, evoking a state of **self-reflective and meditative awareness** similar to the *Overview Effect*—the profound shift astronauts describe when viewing Earth from space.
- By using breath as the trigger for this out-of-body transition, the work aims to expand the participant's sense of self beyond their physical boundaries, transforming a simple physiological act into a contemplative experience of detachment, observation, and reconnection.

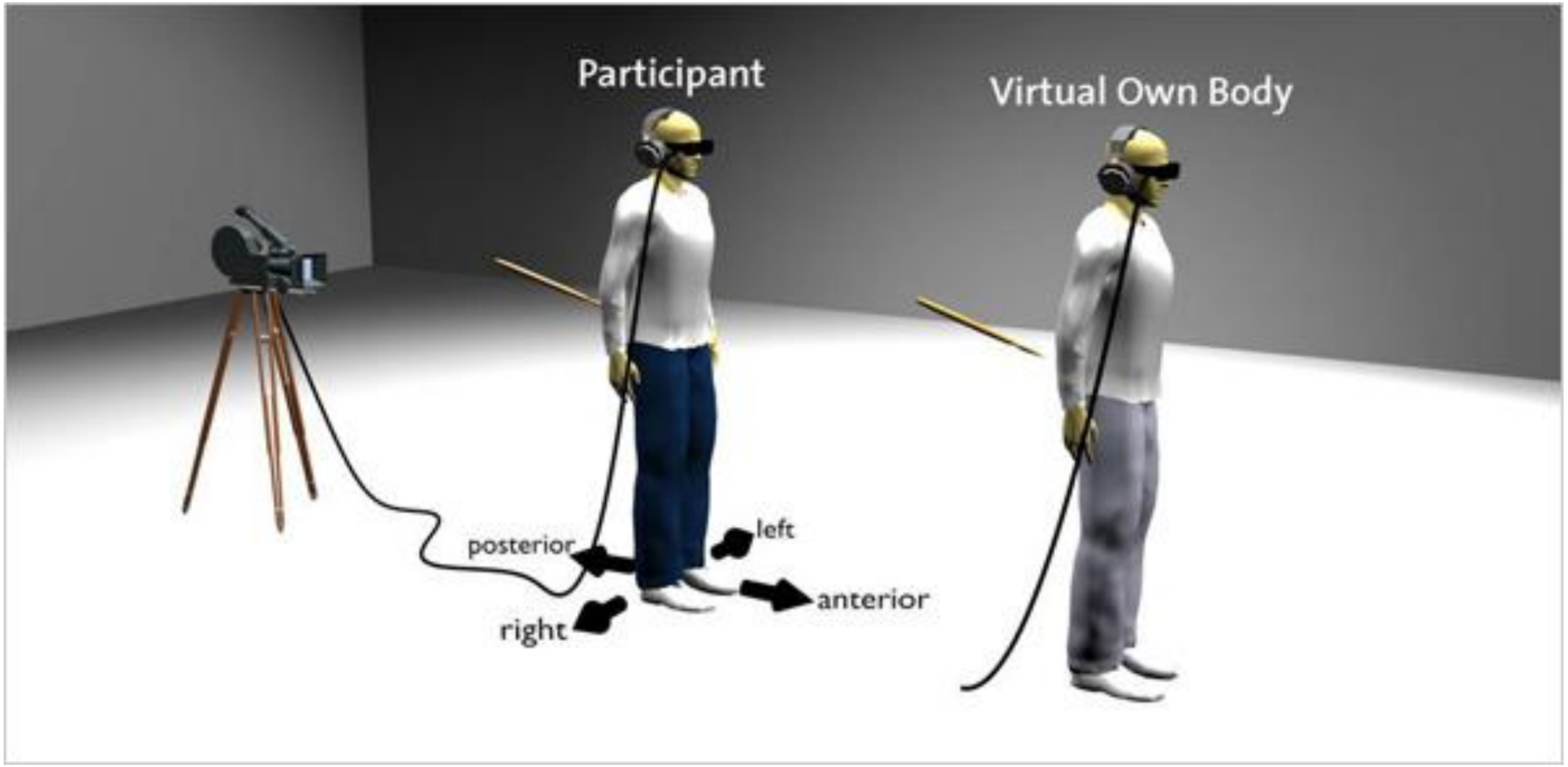
Overview effect

- The **overview effect** is a cognitive shift[Note 1] reported by some astronauts while viewing the Earth from space.[2] Researchers have characterized the effect as "a state of awe with self-transcendent qualities, precipitated by a particularly striking visual stimulus".[3] The most prominent common aspects of personally experiencing the Earth from space are appreciation and perception of beauty, unexpected and even overwhelming emotion, and an increased sense of connection to other people and the Earth as a whole.[3] The effect can cause changes in the observer's self concept and value system, and can be transformative.[3] Immersive virtual reality simulations have been designed to try to induce the overview effect in earthbound participants.[1][4]

Out of Body Experience

- An out-of-body experience (OBE or sometimes OOBE) is a phenomenon in which a person perceives the world as if from a location outside their physical body.

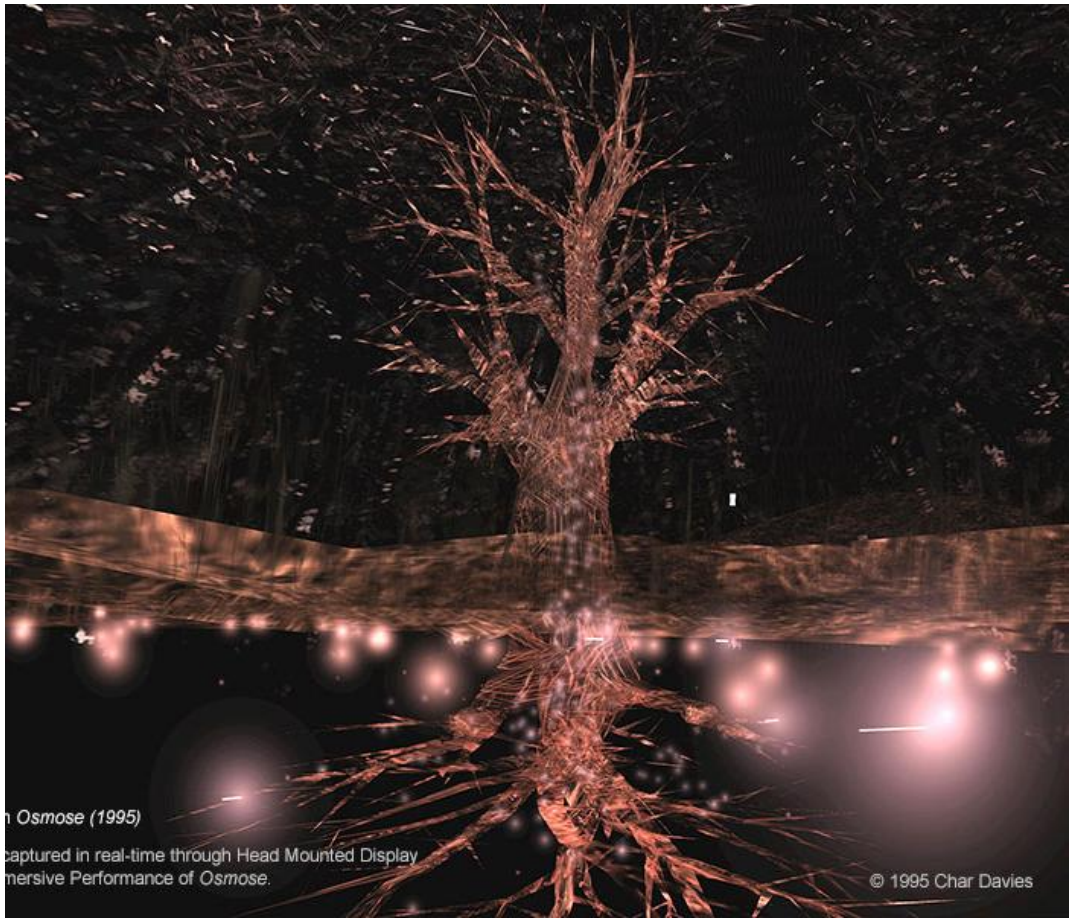
Out of Body Experience



References

- https://www.immersence.com/osmose/

- Osmose by Char Davis



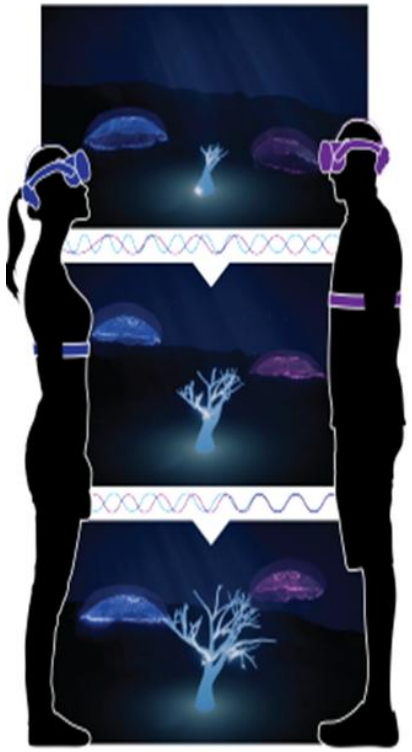
References

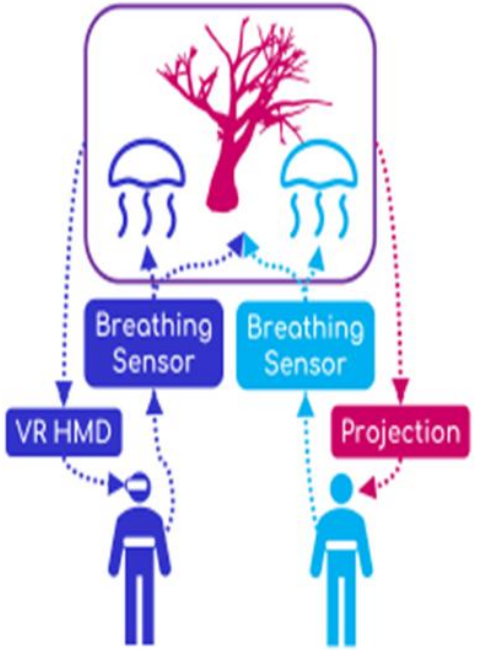
- https://www.lucymcrae.net/cares

- *Heavy Duty Love* by Lucy McRae

References

- https://youtu.be/ZffFnL1Gs-k?si=NuhJeYWGb-_SEZRj
- JEL

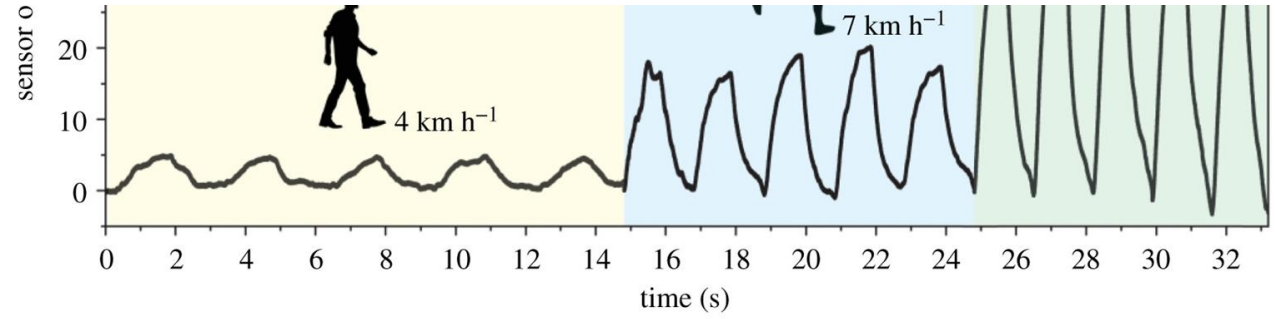


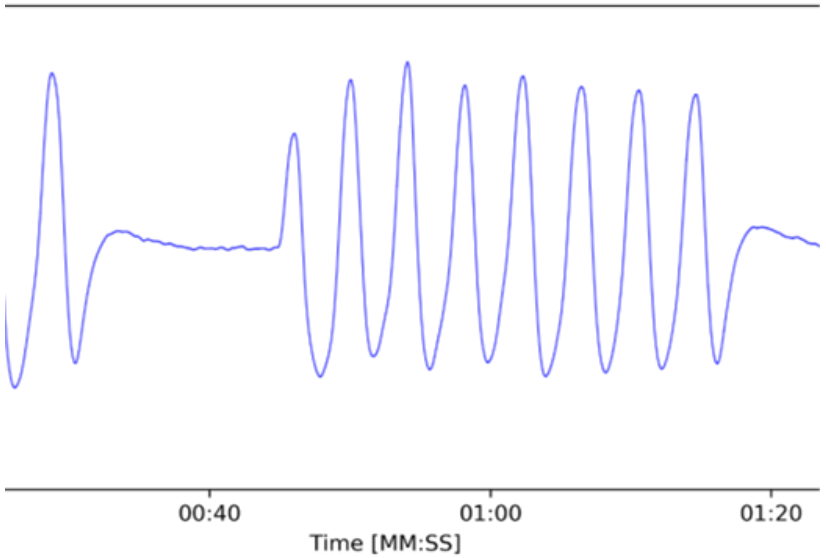


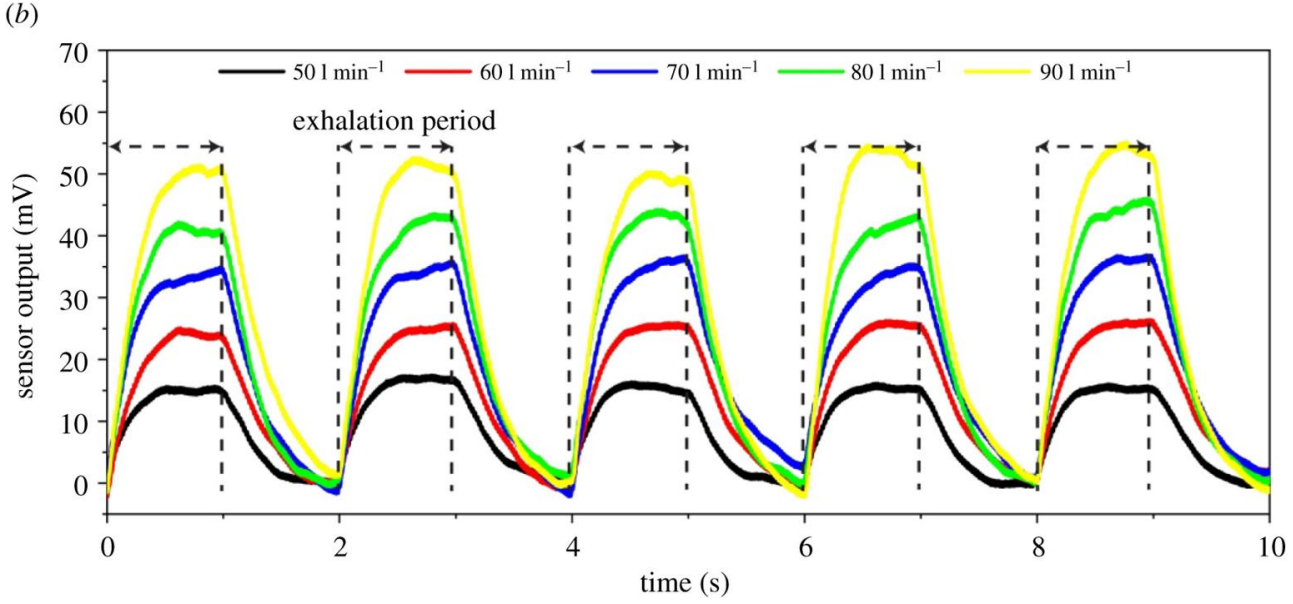
Breathing Sensor

The respiration piezoelectric Respiration (PZT) sensor is an entry-level and affordable solution for basic respiration data acquisition. This sensor consists of a wearable chest-belt with an integrated localized sensing element that measures displacement variations caused by the volume changes of the thorax or abdomen during respiratory cycles (inhaling/exhaling).
The elastic chest-belt can be adjusted in length to be applicable on different anatomies (e.g. male and/or female), body locations (e.g. thorax and/or abdomen), and thorax/abdomen circumferences. Typical applications of this sensor include respiration monitoring to determine respiration cycles, rates, relative amplitudes, and other features.

Breathing Sensor



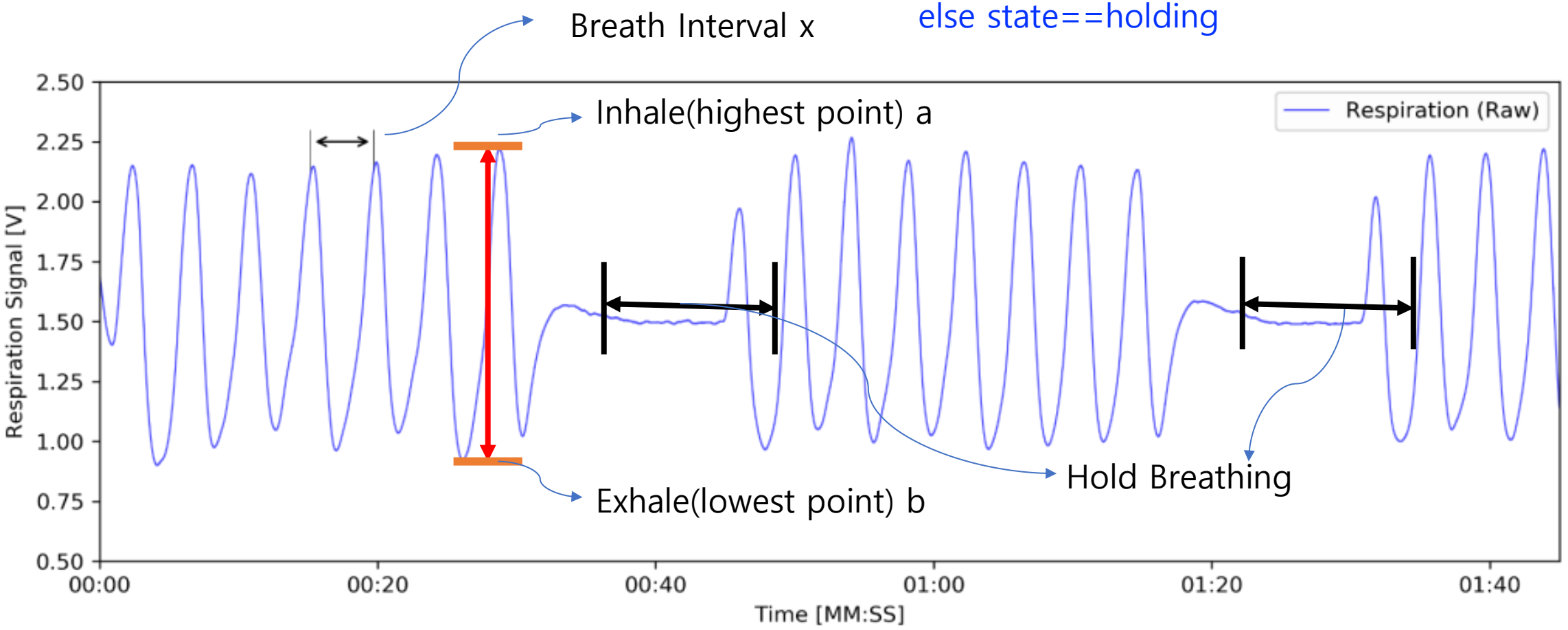




The participant wears a Head Mounted Display and a respiration sensor around their chest

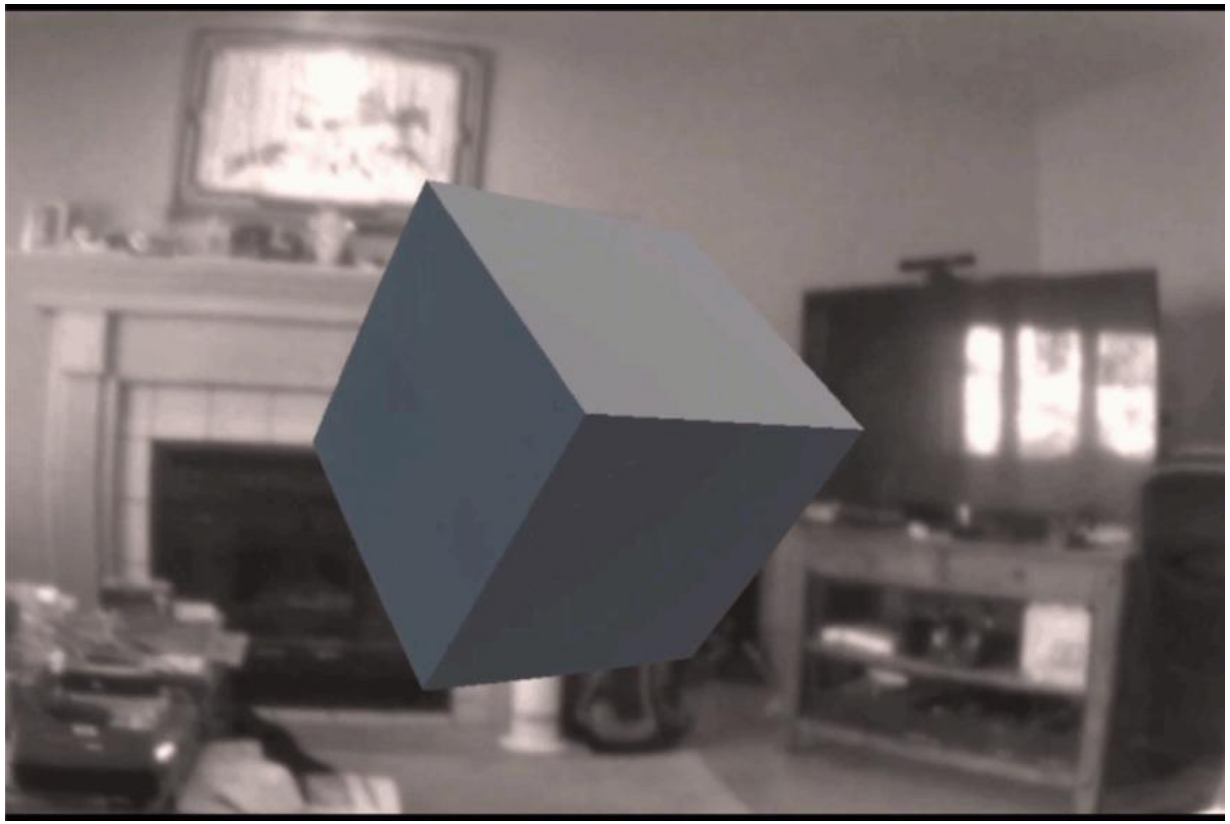
Breathing Sensor

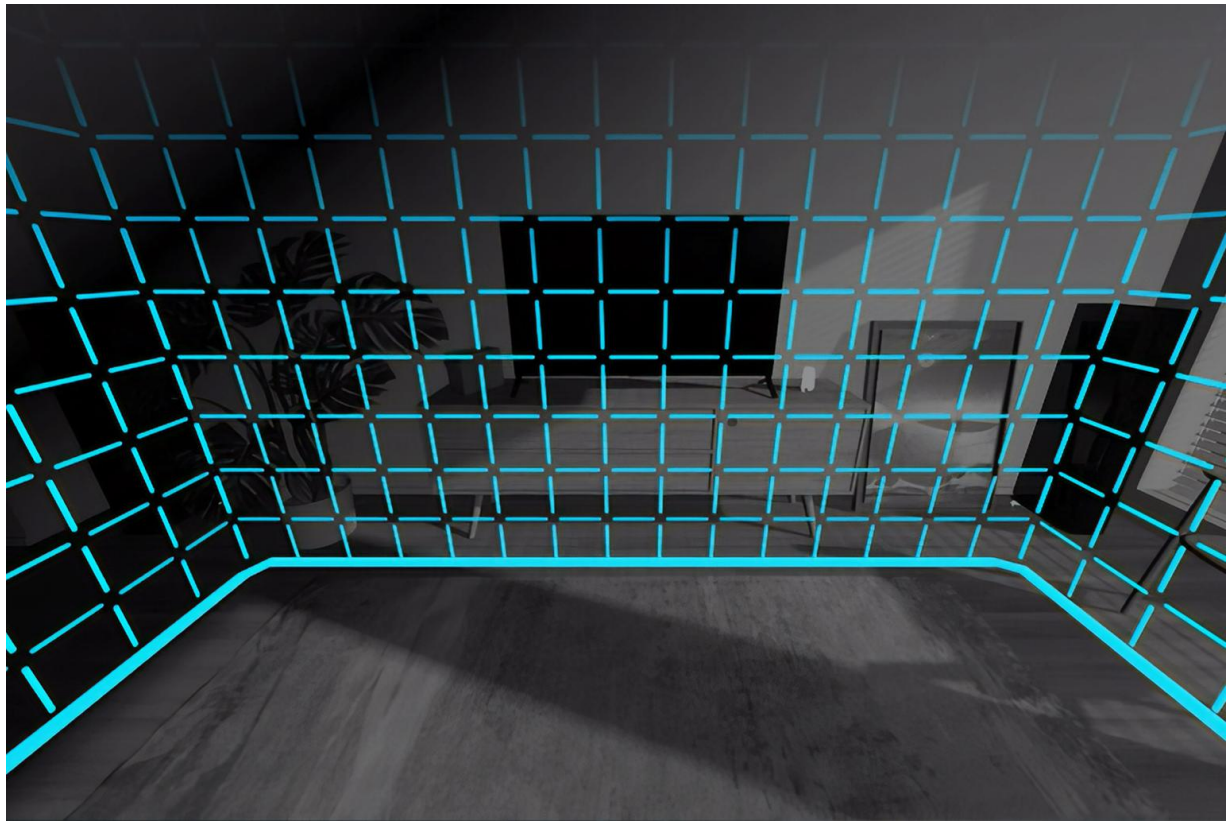
Check |a-b| per x seconds
if (|a-b| > threshold) { state== breathing}
else state==holding



Compare the height of the peak per every 3 seconds to determine breathing state

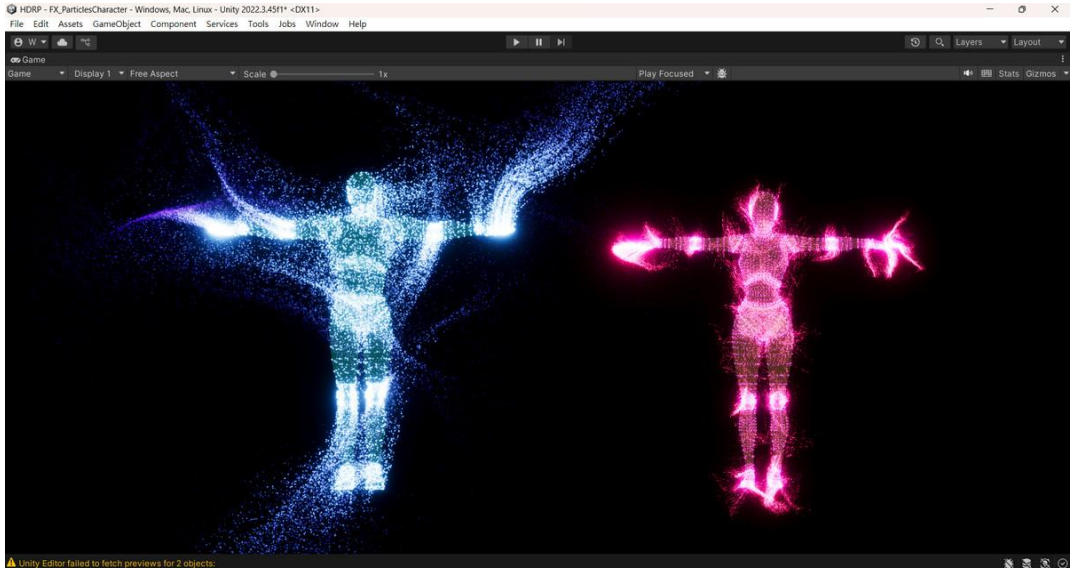
Passthrough Camera



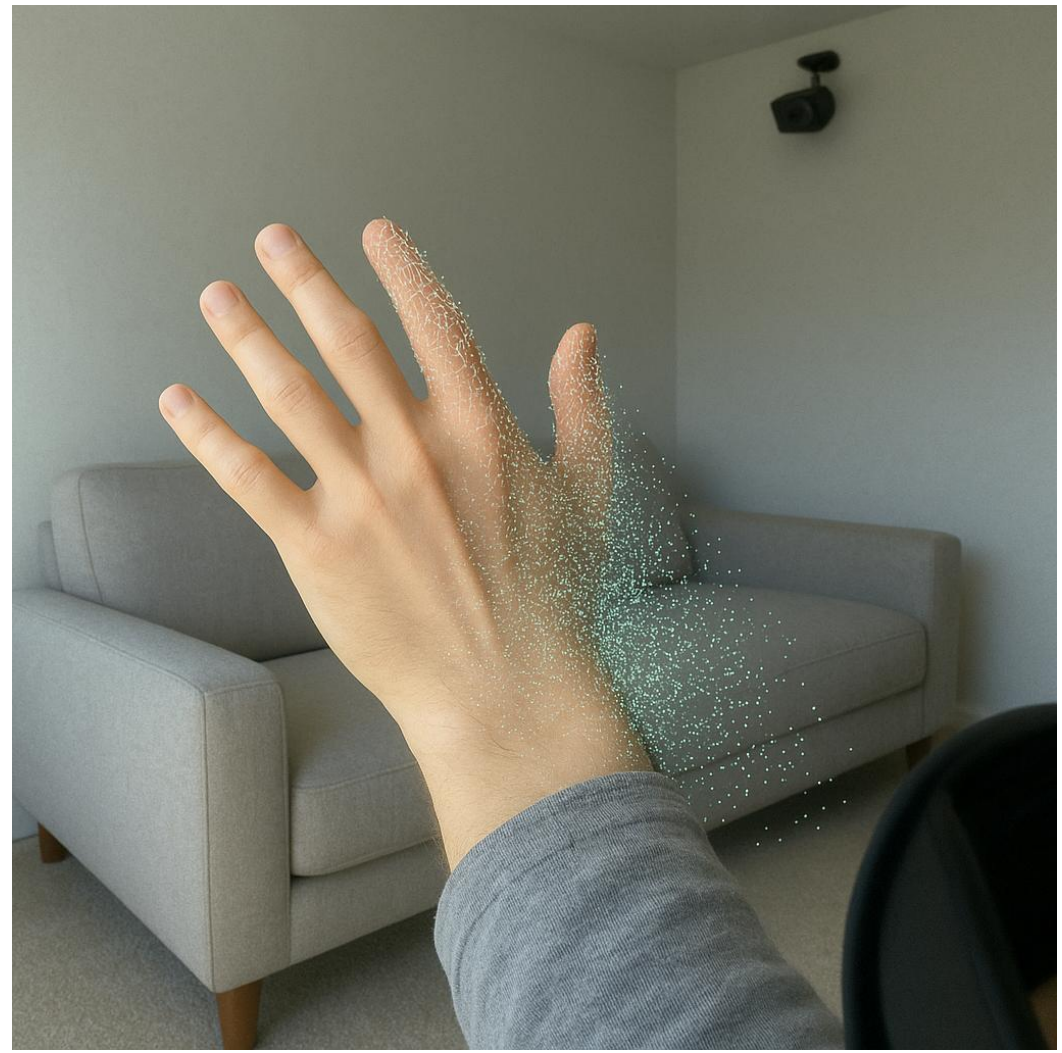


They see their own reality through the pass-through lens of the HMD device.

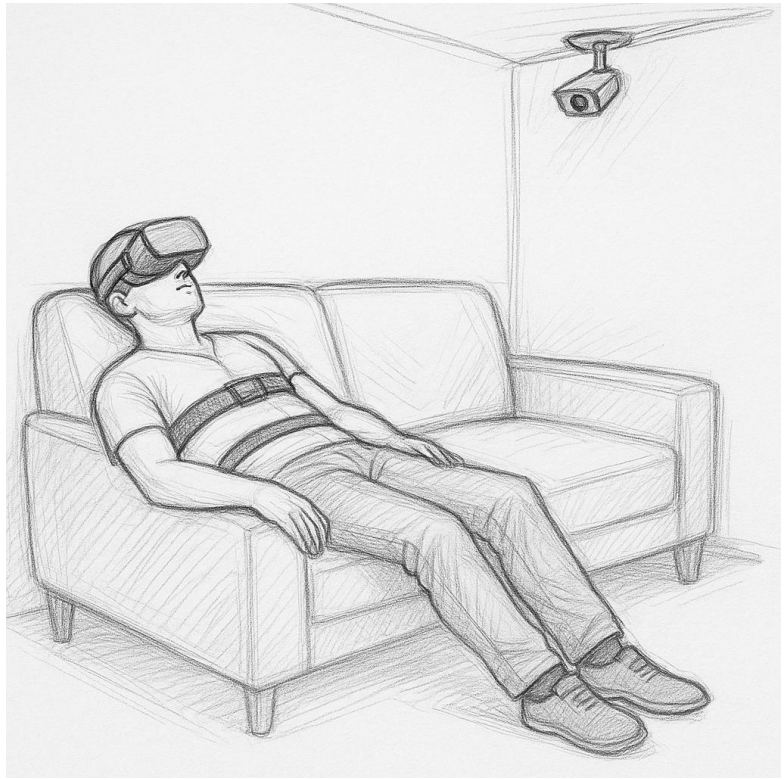
Unity VFX



- Particle system/ Mesh Particle
- https://youtu.be/uH8cmtC-CYo?si=CE7YXX-bmmrbHMib



Breath Sensor → Unity OSC Input → Passthrough MR → VFX Graph → Out-of-body Scene



Breathe Indicator

Breath Indicator

- https://youtu.be/5LhaRuJR4YU

- There is an indicator that synchronizes their breathing pattern on the HUD

Week	Focus Area	Objectives & Key Tasks	Deliverables
1	Concept Finalization & Technical Setup	• Refine artistic concept and narrative • Set up Unity with Meta XR SDK + OpenXR • Enable Passthrough and Depth API • Test initial Quest build	Concept diagram + functional MR test scene
2	Breath Sensor Integration (Input Layer)	• Connect PLUX sensor input • Implement OSC communication • Visualize real-time breath signal in Unity	Breath value displayed in real time within Unity
3	Breath–VFX Mapping Prototype	• Build basic VFX Graph (Spawn → Update → Output) • Expose parameters: _spawnRate, _velocityScale, _separation • Link real-time breath data via C# script • Test inhale/exhale-driven particle behavior	Working prototype of breath-responsive VFX
4	Mixed Reality Integration & Arm Particle System	• Sync hand/controller tracking • Apply Skinned Mesh Sampling • Align VFX with real arm in Passthrough • Experiment with Depth Occlusion for realism	MR prototype showing particles detaching from real arm
5	Out-of-Body Transition System	• Create camera transition triggered by breath intensity • Crossfade from Passthrough to virtual environment • Build 3rd-person scene (user's avatar lying below)	Full OOBE transition sequence working end-to-end
6	Sound, Lighting, and Atmosphere Design	• Design low-frequency breathing-synchronized sound • Adjust particle glow, tone mapping, and ambient lighting • Create visual fading synced with exhale • Unify overall color and sensory tone	Cohesive audiovisual experience
7	User Testing & Refinement	• Conduct small-scale user testing • Gather feedback on immersion, comfort, and emotional response • Tune sensitivity, particle density, and transition speed • Fix bugs and profile performance	Stable, exhibition-ready build
8	Exhibition Preparation & Documentation	• Write setup manual (sensor calibration + environment guide) • Record demo and installation video • Finalize presentation slides and artist statement	Final demo + documentation package ready for presentation or exhibition