Hololimb

MANAGING PHANTOM LIMB PAIN THROUGH VISUALIZATION

An Inclusive and Therapeutic Mixed Reality Solution

Advanced User Interfaces course 2024/2025
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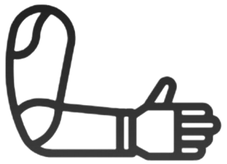
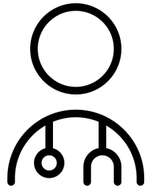
Hololimb leverages **augmented & virtual reality** to help single-arm amputees manage **phantom limb pain (PLP)** independently, with a focus on inclusivity and effective pain relief.

Goals: Highlight **inclusivity** and **therapeutic** benefits, aiming to improve quality of life through customizable, immersive sessions.

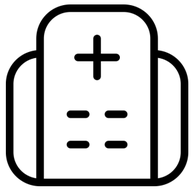
STAKEHOLDERS



People with a single-arm amputation experiencing PLP (Primary user)



Therapists (Secondary user)



Medical & Rehabilitation Community (Indirect stakeholder)

User's Family & Caregivers (Tertiary user)

NEEDS

Improving **effectiveness** & **portability** of PLP Relief Sessions

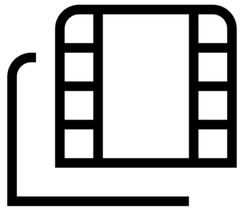
Innovative Tool for PLP Pain Relief Therapy

Non-pharma PLP Pain Relief

Ease of Use, **Relaxed** & **Enjoyable Experience**

GOALS

Usability for Consistent & Independent Use



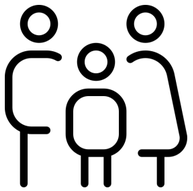
Effective **PLP**

Pain Relief Solution

Cover different patient **scenarios** to improve their relief accordingly

CONTEXT

Organizational: Family or Caregivers support in its use, especially in the initial stages. Therapist guidance if needed.



Physical: at-home indoor use.

Temporal: at-home use. Varying lengths of time-based on their needs and comfort level. (10 to 30 min)

CONSTRAINTS

User: single user, single-arm amputees, with no important visual impairments.

Physical: adequate space for VR use and limited interference.

Hardware & Tech: Meta Quest 3; must support high-fidelity tracking & rendering.

Time & Session Limits: ideal session duration may suggest 10 to 30 min.

Human/Resources: we are 4 students, disposing of limited time & resources.

STATE OF THE ART

Recent advancements in **extended reality (XR)** have enabled **innovative therapeutic solutions**.

Blending immersive digital interventions with real-world context to deliver **non-invasive, user-centered therapies,** that improve patient outcomes.

User Needs

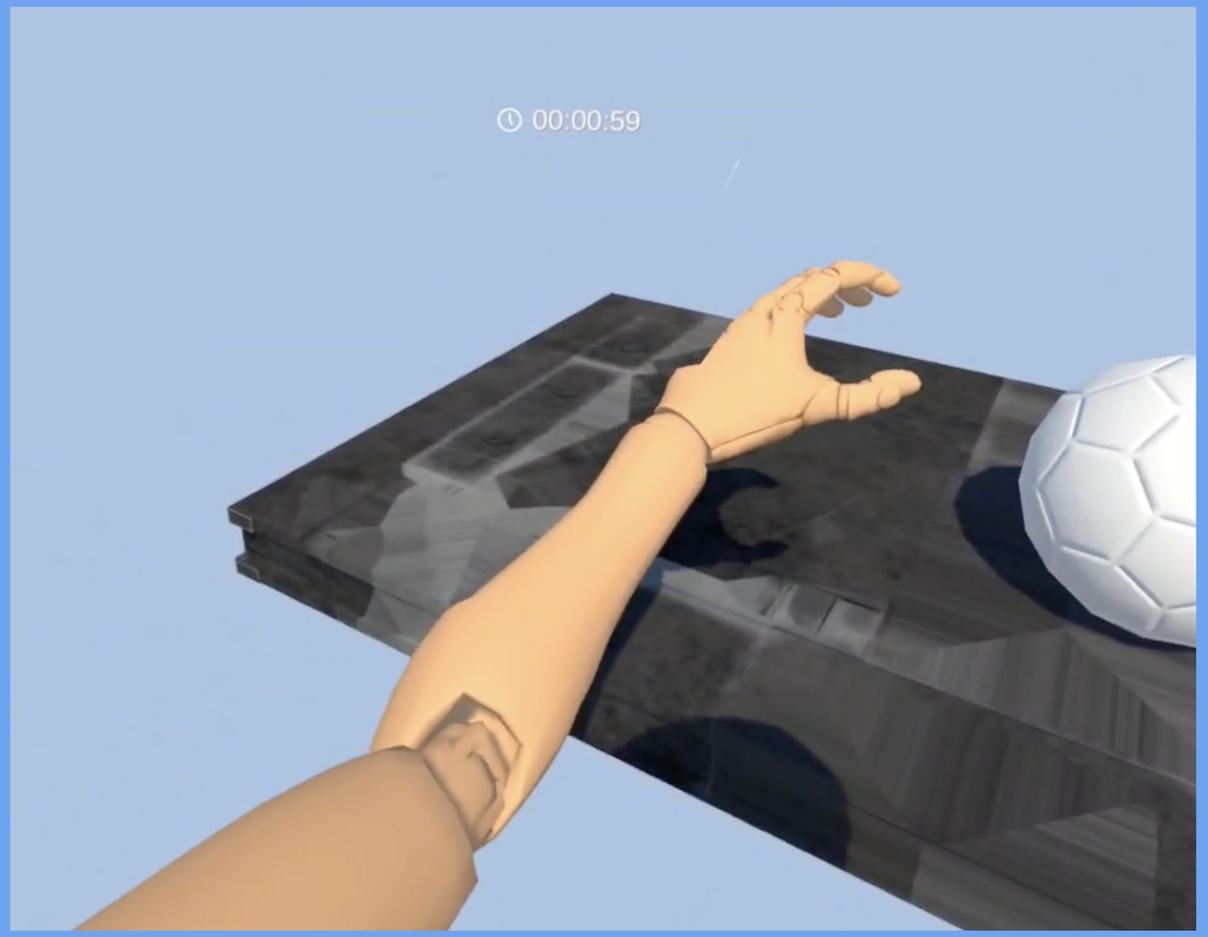
- Non-pharma **pain relief** options that users can access **independently**.
- A relaxed, **intuitive** interface for ease of use, especially for first-time VR users.
- An innovative, **customizable** experience to accommodate individual needs.

Therapeutic Goals

- Provide a **consistent, independent tool** for managing **PLP**.
- Offer an effective solution through **static** and **mirror therapy** options.

Inclusion

Emphasize how Hololimb supports **inclusivity** by allowing users to **personalize their experience**, such as adjusting limb appearance, transparency, and positioning to match individual **comfort** levels.



Scenarios & Interaction Modes

Personalization 01

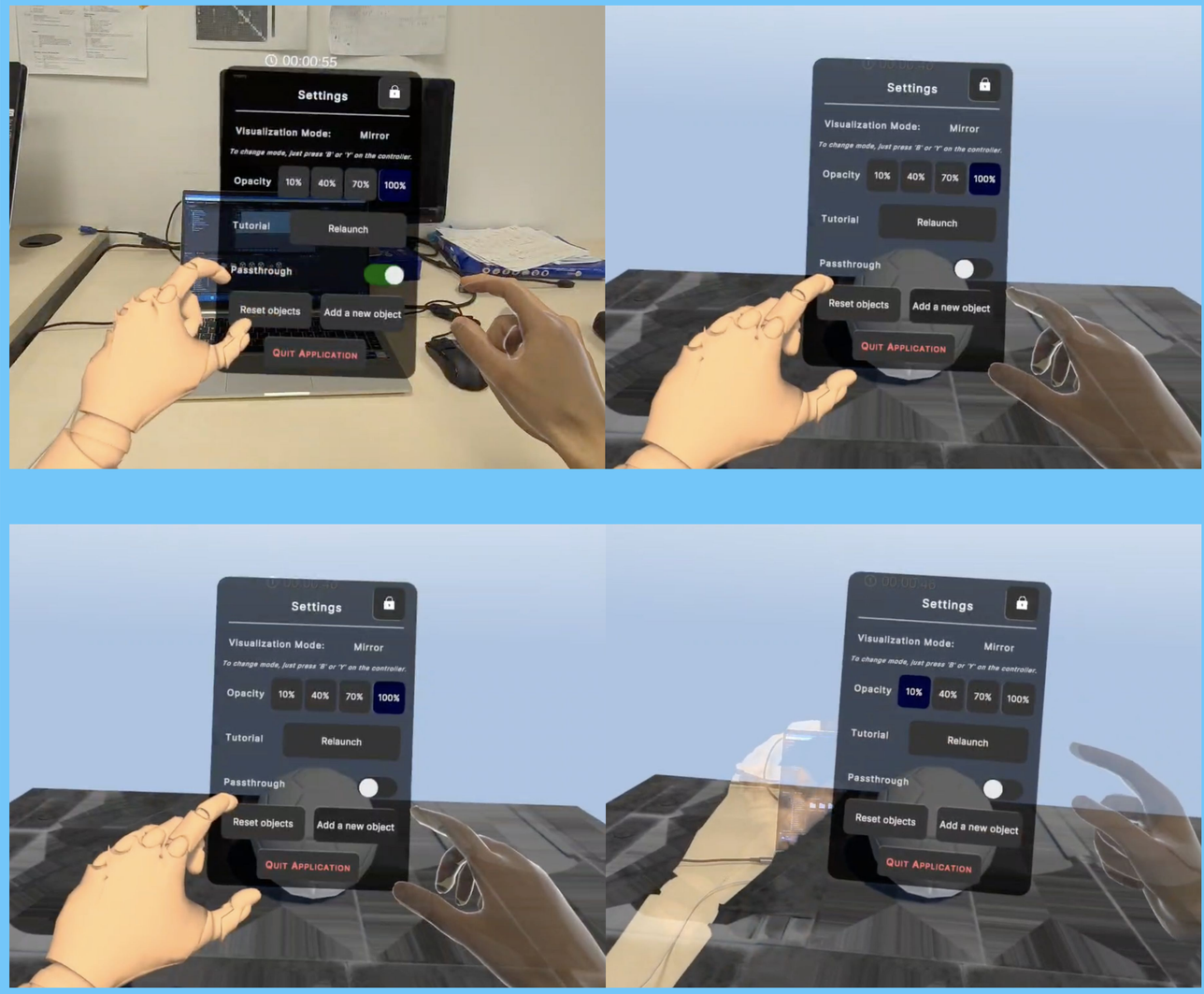
Static Visualization 02

Mirroring Mode 03

Play 04

1. Personalization

Flexibility to adjust the **environment** and **arm visibility**, enhancing user comfort and immersion.



2. Static Visualization

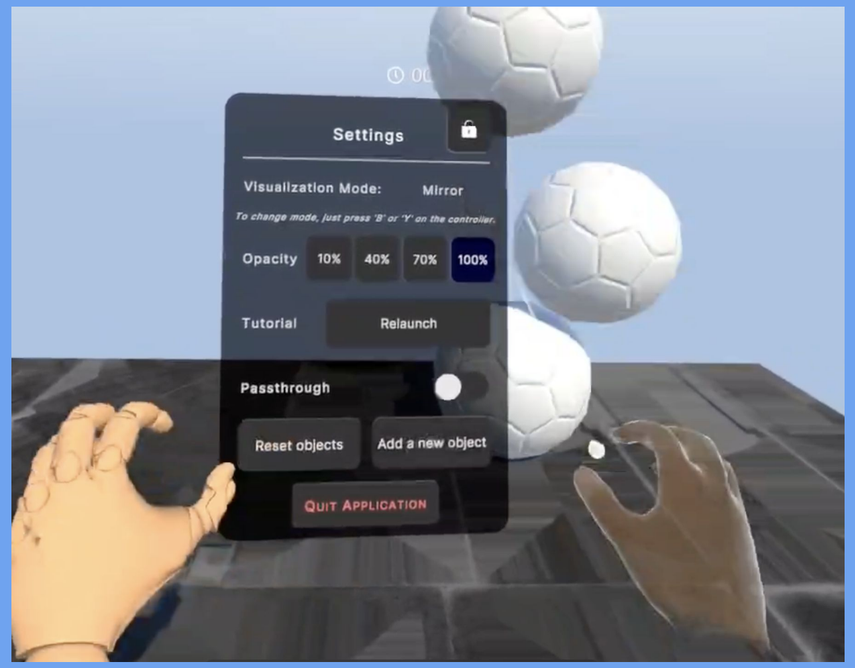
Allows the **virtual arm** to remain **stationary**, providing a simple yet impactful visualization.

3. Mirroring Mode

Mirrors the **movements** of the user’s remaining arm to create a sense of **presence** and **support mirror therapy**.

4. Play

Interactive activities with **virtual objects** for engagement and therapy.

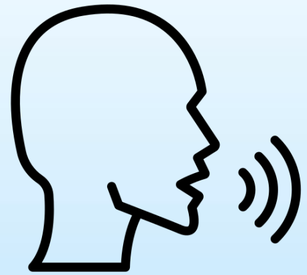


Video Demo

Future Features

Voice commands

Modify arm characteristics and start exercises through voice commands



Gamification

Add game elements and rewards to the exercises

Complex exercises

Research and implement new exercises for PLP patients thanks to this new technology

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“Empower Patients. Revolutionize Therapy. Transform Healthcare.”

Join us in transforming how patients access therapy, and be part of a pioneering solution that’s ready to make a global impact!

- ***Hololimb Team**: Xin, Matteo, Dario, Mattia*