Holographic Telepresence for Cognitive Care:

Enhancing Remote Support in Immersive XR training

Introduction

Virtual reality platforms for cognitive training have demonstrated significant potential in enhancing key cognitive functions such as memory, attention, language skills, etc [1] - although older users often face significant challenges in navigating such environments independently. To address these usability gaps, the ELICT pilot platform, developed during the 2nd SPIRIT Open Call, integrates a holographic telepresence module, allowing health professionals (HPs) to appear in real-time inside the immersive experience of a user through volumetric video, communicate with the beneficiaries, and practically aid them in the tasks they need to perform. This demonstration showcases the holographic telepresence module of ELICT - an extension of the Eligence XR cognitive training platform, featuring games focused on the aforementioned cognitive areas.
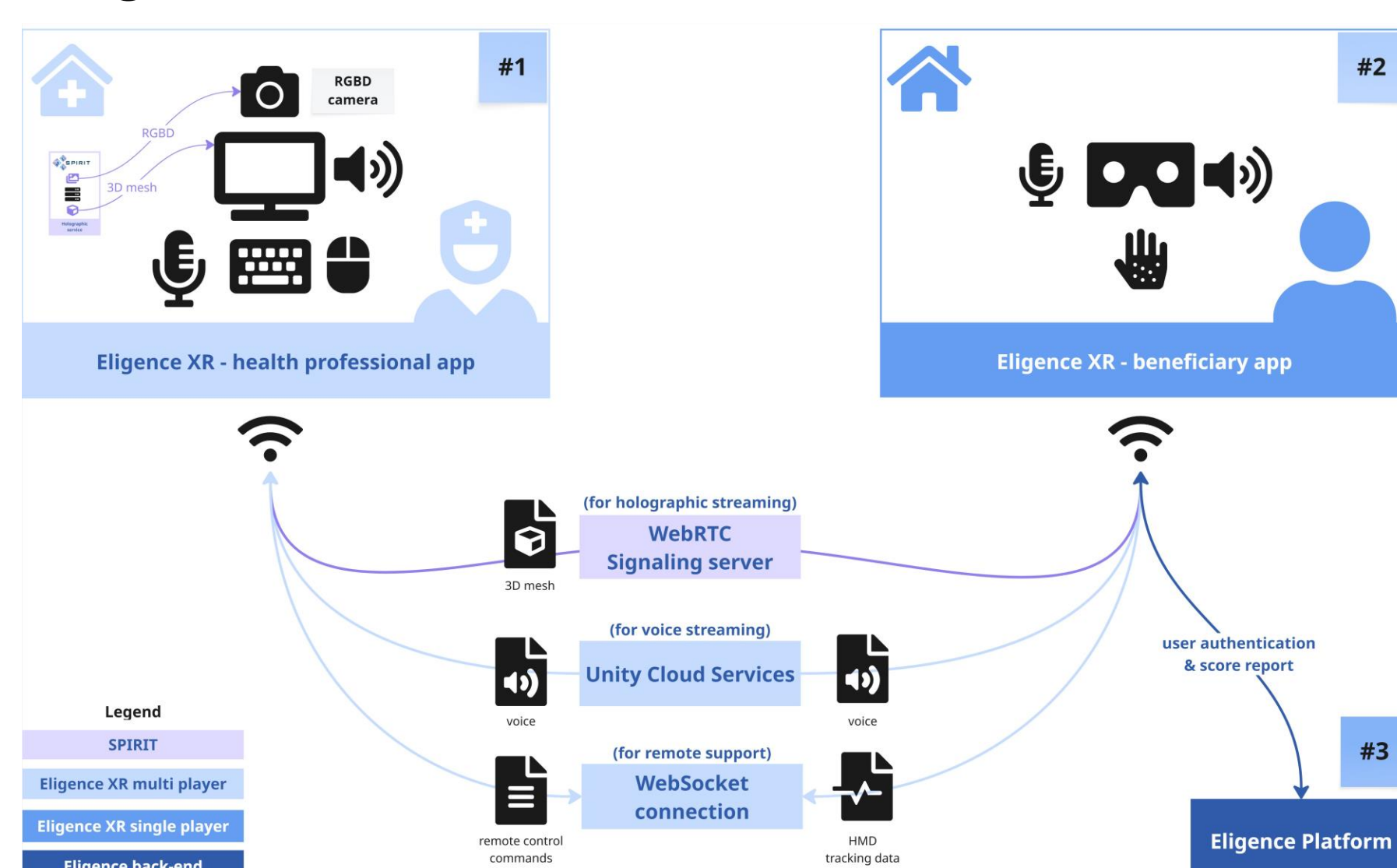

Fig.1: High-level architecture diagram

Motivation & Background

Target users—often older adults with mild cognitive impairment (MCI)—may have low digital literacy or even feelings of anxiety around unfamiliar technology. The SPIRIT platform, which powers our holographic system, enables real-time streaming of the HP's volumetric representation into the virtual space. This creates a co-present experience that includes voice, facial expressions, and gestures, aiming to enhance the user's sense of safety, and attentiveness, while offering guidance, assistance, moral support, and monitoring user performance or adjusting the games' settings [2].

Research Goals

Our demo focuses on evaluating how holographic HP presence in immersive cognitive training [3]. We are specifically investigating:

[RQ1] Does holographic presence improve users' sense of safety, trust, and engagement [4]?

[RQ2] How does holographic presence affect the perception of co-presence?

[RQ3] What are the technical and perceptual limitations of holographic presence?

Fig.2: Eligence game for cognitive exercise in 2D, XR, and with the HP's telepresence

System Description

The telepresence system consists of two components, as shown in Fig.1:

HP-side Desktop Application: A non-immersive interface used by HPs that provides live view of the user's VR perspective, tools to remotely adjust game settings, trigger prompts, facilitate game progress, or assist in navigation, and the 3D camera integration to stream a volumetric hologram of the HP.

User-side VR Application: The immersive XR environment where the user can either play games or schedule consultation sessions with their HP, who HP appears as a 3D holographic avatar with natural movement and spatial presence.

Methodology

In partnership with Alzheimer Athens, we are engaging a group (N ≈ 30) of older adult users who will interact with the holographic streaming solution inside a VR consultation environment.

Participants will evaluate HS aspects, such as Quality (visual fidelity & perceived latency) and integration into the digital space, as well as overall user experience dimensions, including usability, simulation sickness, technological acceptance, behavioral intention, and social co-presence.
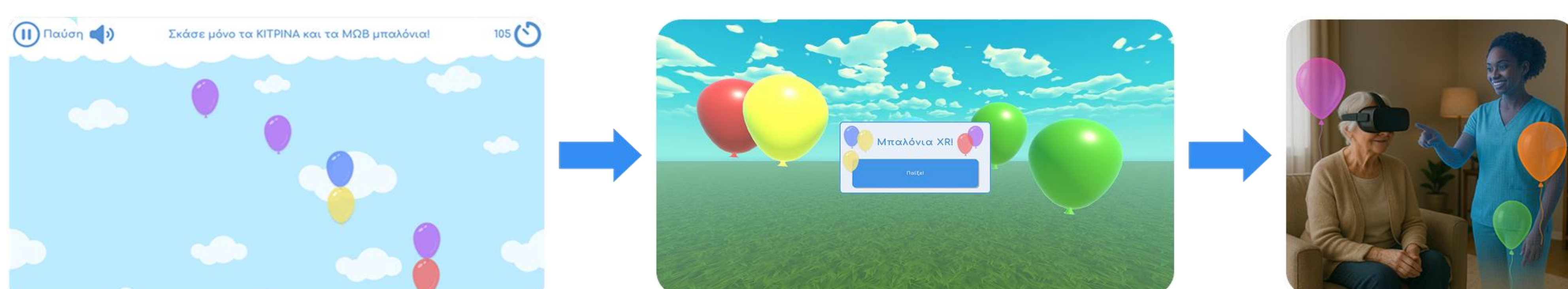
Conclusion & Future Work

Early feedback highlights the emotional value and perceived safety that holographic presence can provide.

Future work can focus on the technical challenges faced during the project:

• Maintaining **low-latency** and **synchronization** between gesture/audio/video streams.

• Ensuring **stable placement** of the hologram in 3D space.

• Balancing **visual realism** with performance requirements on affordable VR headsets.

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