Intelligent XR for Education

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XR

XR4ED

https://xr4ed.eu/

The Ultimate Fusion: Extended Reality Meets Artificial Intelligence

12th September 2024

XR **XR4ED**
eXtended Reality for EDucation

XR4ED Consortium

- 11 partners
  - Cyprus, France, Spain, Germany, Greece, Ireland, Luxemburg, and Romania
- Budget EUR 7,664.154 M

https://cordis.europa.eu/project/id/101093159

XR4ED Objectives

- **Design**, **create** and **maintain** a sustainable on-demand education platform
  - Mobilising the EdTech and XR community from the EU
  - Providing a central access point to existing solutions
  - Contributing to a leading position for Europe in cutting-edge while ensuring the European values of privacy, ethics, and inclusiveness

Funded by the European Union

XR4ED Concepts

- XR Game authoring tool
  - Will be enabled with new technologies based on needs of the users
- XR DevOps platform
  - Web-based application which integrates with multiple 3rd party tools to provide DevOps services but also with collaborative tools
- XR Avatars
  - Users will select among different appearances and animation types depending on the goals of the lessons so enhance student learning performance
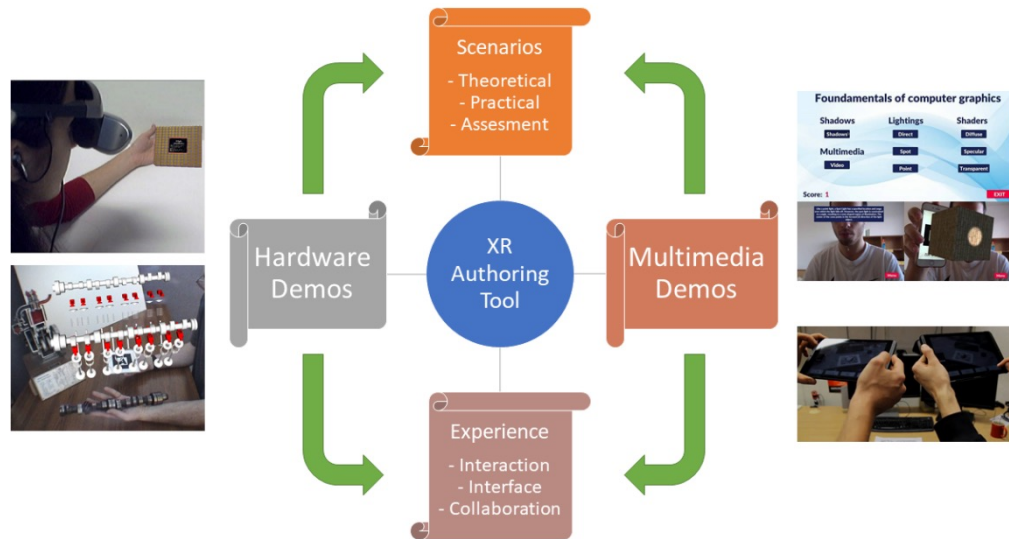

Liarokapis, F., Anderson, E. Using Augmented Reality as a Medium to Assist Teaching in Higher Education, Proc. of the 31st Annual Conference of the European Association for Computer Graphics (Eurographics 2010), Education Program, Norrkoping, Sweden, 4-7 May, 9-16, 2010. (ISSN: 1017-4656)

XR4ED Methodology
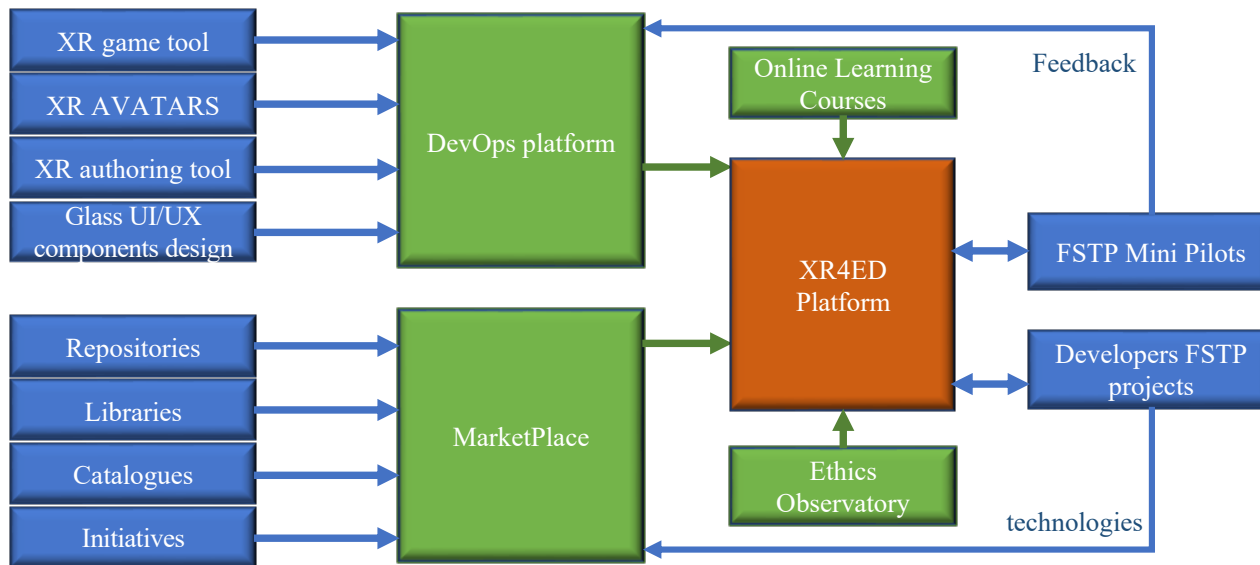
Marketplace

- Will provide a unique opportunity to offer a variety of (digital) solutions and capabilities, built by the Consortium partners and open to third-parties, for the XR content, services, and tools
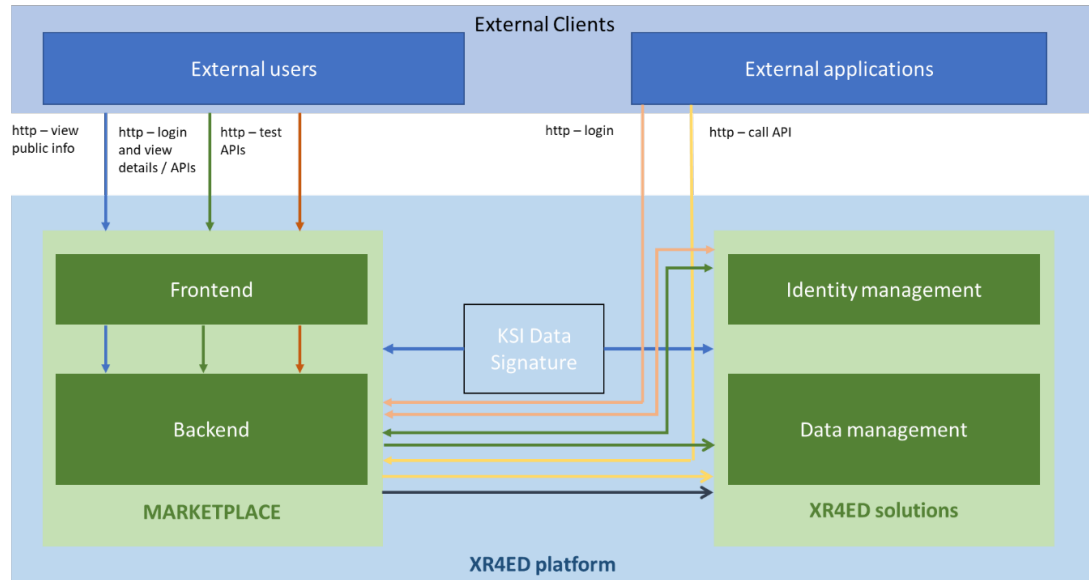
Results

Avatars for Immersive XR

- Importance of user representation
- Communication with body language
- Animation impact
- Embodiment?
- Presence?

AvatarGo: Self-avatars for HMD

- High embodiment

Eurographics short paper 2022.
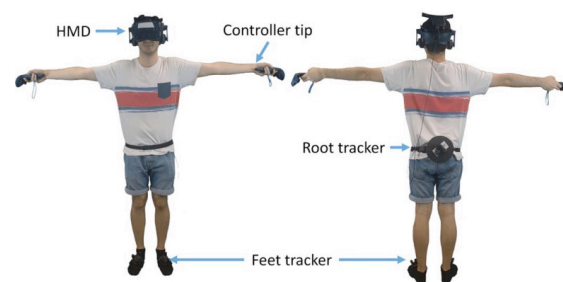J. Pontón, E. Monclús, N. Pelechano

Self-Avatars for all HMDs. Challenges:

01.

Rapidly evolving technology
Compatible across different HMDs
Be prepared for HMDs and trackers that
are not yet in the market!

02.

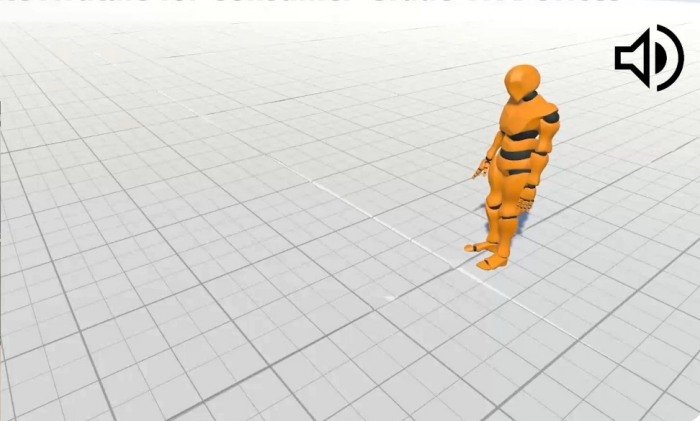**Animation fidelity.**
Avoid jittering, unrealistic poses, …
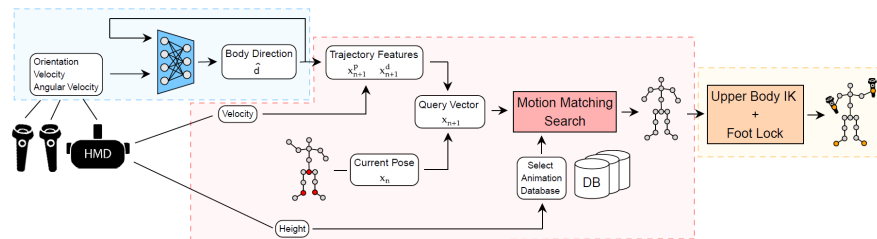
03.

Sparse input data.
#trackers, DoF, …

Animation from sparse data

Combining Motion Matching and Direction Prediction to Animate Avatars for Consumer-Grade VR Devices

Just 1 or 3 trackers (HMD+hand-held controllers)
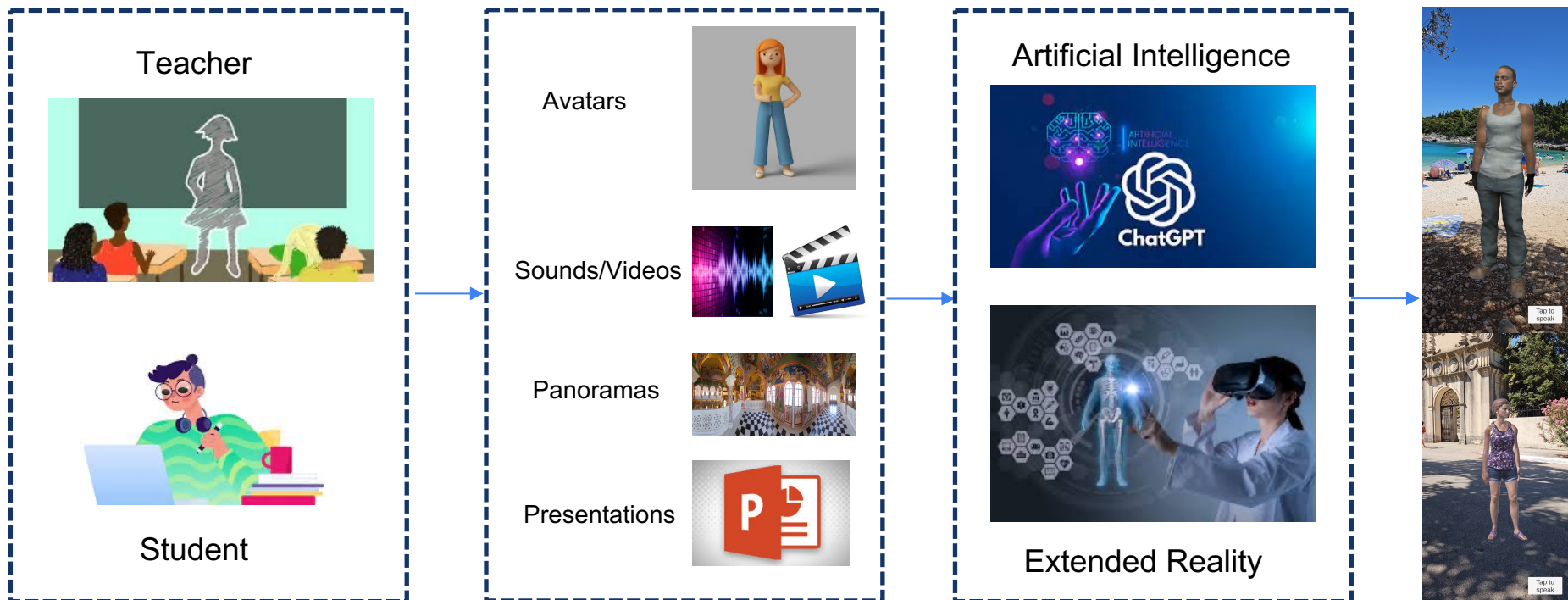
1. Predict torso orientation with NN

2. VR Motion matching for locomotion

SCA 2022. J. Pontón, et al.

Learning from human motion

Overview of the Intelligent XR Assistant

Teacher

Student

Avatars

Sounds/Videos

Panoramas

Presentations

Artificial Intelligence

ARTIFICIAL INTELLIGENCE

ChatGPT

Extended Reality
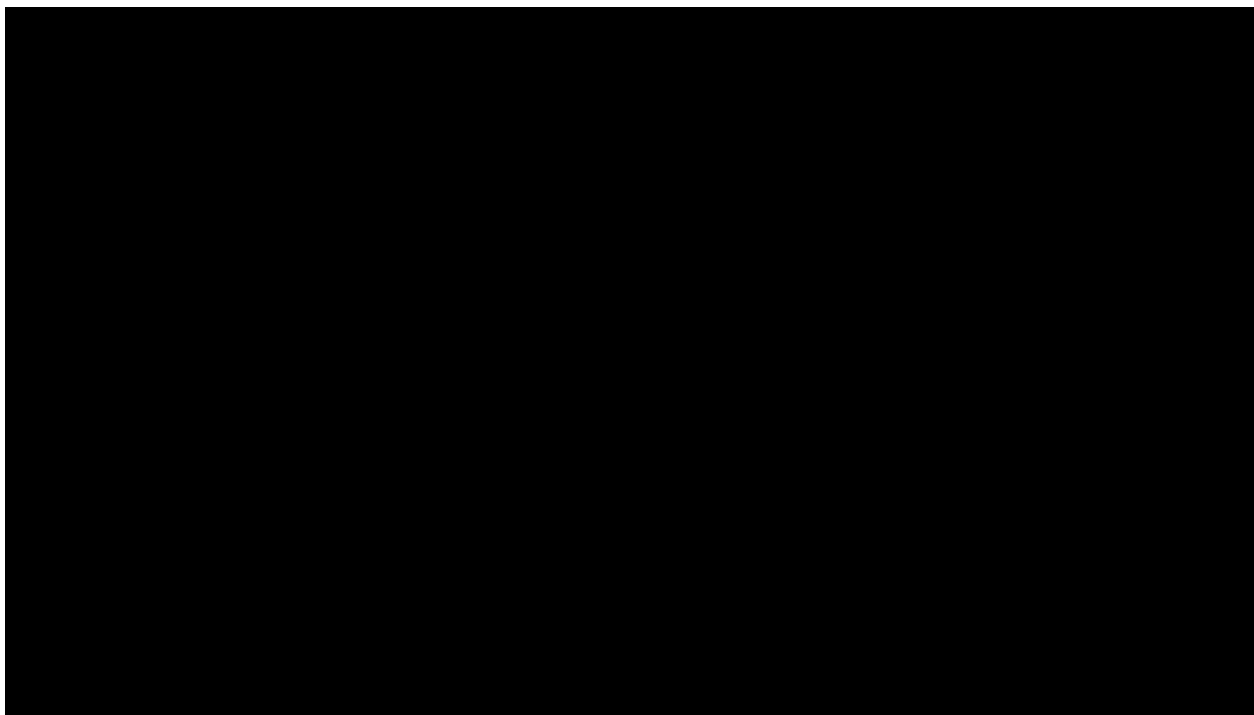
Tap to speak

Tap to speak

Intelligent XR Assistant Functionality

- The functionality of the application supports four main categories including:
  - Speech Interaction and Multilingual Support
  - Avatar Gestures and Animations
  - PowerPoint and Video Integration
  - Panoramic Environment
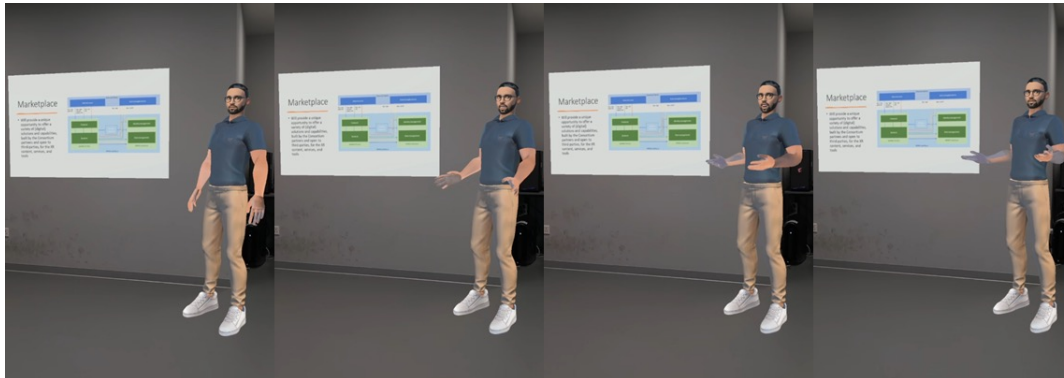
Gaze-Related Eye & Head Motions for Avatars

Krejsa, J., Kerouš, B., Liarokapis, F. A Model for Eye and Head Motion for Virtual Agents, Proc. of the 10th International Conference on Virtual Worlds and Games for Serious Applications (VS-Games 2018), IEEE Computer Society, Würzburg, Germany, 5-7 September, 1-4, 2018. (DOI: 10.1109/VS-Games.2018.8493406)

Intelligent XR Assistant Collaboration

- The collaborative part operates on a classic host-client model, wherein the host initiates a server on their device allowing client devices to connect
- The host's device manages the presentation of the avatar, including interfacing with OpenAI's ChatGPT for slide explanations
- When the avatar is scheduled to speak, the host device sends a message across to all connected clients containing the predetermined sentences for the avatar
  - Upon receipt, each client device independently engages a speech synthesis service to generate the spoken audio
  - This audio is simultaneously played back along with synchronized gestures and lip-sync animations; the specific gesture animations are designated by numerical identifiers contained within the host's message
  - Each client generates its lip-sync animation independently

Funded by the European Union

Intelligent XR Assistant Videos

Qualitative Evaluation

- Evaluated into three different occasions
  - Teachers (CYENS)
  - Professionals (Immersive Tech Week expo)
  - Researchers (Eurographics 2024)
- The sample of the participants covers an age range between 20 to 60 with a total of 65 participants
  - 50 male and 15 female
- In all occasions, the procedure followed was the same

Summary of Qualitative Evaluation

	Teachers (#20)	Professionals (#35)	Researchers (#10)
Positive Feedback	• Impressed by real-time interactive responses. • Appreciated multi-lingual support • Liked the ability to control the presentation pace • Valued mobile and tablet compatibility	• Potential in all education levels. • Valued interactive responses, multilingual support, and content customization • Appreciated compatibility with HMDs and mobile devices	• Liked GUI features, eye gaze, head movement, and lip synchronization • Noted that realistic avatars are not crucial to avoid the uncanny valley effect
Negative Feedback	• Worried about job security due to AI capabilities • Ethical and privacy issues • Concerns about fake information • Desired better avatar customization and body language animations.	• Desired more realistic virtual human representations • Wanted more variety in animations and graphics • Suggested collaborative features and haptics for physical interaction	• Wanted more variety in body language animations • Noted lack of soft and hard shadows • Interested in using AI for generating animations and teaching material • Suggested customizing LLMs for education

Thank you for your Attention

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