VR4VET

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Overview of Virtual Reality Technology for Career Counselors and Vocational Trainers

Lecture

VR4VET Consortium | 2024

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Summary

This introductory lecture explores the fundamentals of Virtual Reality technology and its practical applications in career guidance and vocational training. The lecture explains how the technology works and what effect it aims to create for the users. It covers key concepts such as immersion, tracking, interaction, navigation, embodiment, and AI integration.

The lecture highlights how VR can create authentic, engaging, and effective learning environments.

Learning objectives

By the end of this lecture, participants will be able to:

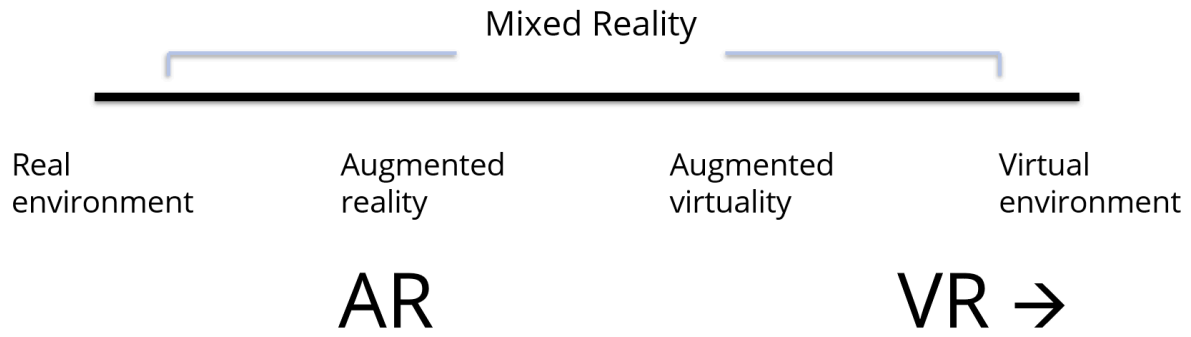
- Define Virtual Reality and explain its core principles, including sensory replacement and the reality-virtuality continuum.
- Describe the concept of immersion and its significance in enhancing learning and engagement within Virtual Reality environments.
- Explain the role of tracking technologies in Virtual Reality, including how they contribute to realism and reduce cyber sickness.
- Identify various interaction methods in Virtual Reality, such as hand tracking, gesture recognition, and controller-based input, and assess their relevance to vocational training scenarios.
- Compare navigation techniques in Virtual Reality, including teleportation and locomotion, and evaluate their impact on user comfort and realism.
- Discuss the concept of embodiment and the use of avatars and AI characters to support collaborative and personalized learning experiences.
- Explore practical use cases of Virtual Reality in education and, in particular, in career guidance and vocational education.

1. Understanding Virtual Reality: A Technological Foundation

Virtual Reality (VR) is a transformative technology that replaces the physical world with a digital or synthetic environment. Its core objective is to create a compelling illusion for users—making them feel as though they are fully immersed in a different reality.

In VR, sensory input is replaced by digital one. While most people associate VR with visual experiences (e.g., wearing headsets), it can also include other senses, such as sound and touch, but also a sense of balance and the user's own position in space. The more senses VR can engage, the stronger the illusion becomes.

A useful framework to understand VR is the Reality-Virtuality Continuum, which ranges from the real world on one end to fully immersive virtual environments on the other[1]. As we move along this continuum, more of the physical world is blocked out and replaced with digital content. On the far end, VR technology aims to completely replace the user's perception of the real world with the perception of the digital, virtual world.



2. Immersion: The Heart of VR Experiences

Immersion is the sensation of being present in a virtual environment. It's not a new concept—storytelling, theater, and even circus performances have long aimed to immerse audiences. However, modern VR technology has elevated immersion to new levels.

In vocational training and career guidance, immersion is crucial. For example, a job interview simulation in VR can replicate the pressure and dynamics of a real interview. In another example, a virtual workplace simulation can help learners understand workflows without being physically present.

[1] Milgram, Paul, and Fumio Kishino. "A taxonomy of mixed reality visual displays." IEICE TRANSACTIONS on Information and Systems 77, no. 12 (1994): 1321-1329.

Immersion enhances learning by engaging users emotionally and cognitively, making experiences more memorable and impactful.

3. Tracking: Making VR Responsive and Realistic

For VR to feel real, it must respond to user movements. This is achieved through tracking—the technology that monitors head, hand, and body movements.

VR systems use two main tracking methods:

- External, where independent sensors are placed in the corners of a room, facing inwards to track the user.
- Internal, where the tracking sensors are built into the headset and able to track the user by scanning the room.

Accurate tracking is essential to avoid cybersickness, a form of motion sickness caused by delays or mismatches between physical movement and virtual experience of the same movements. Fast, precise tracking helps users feel stable and reduces discomfort.

In vocational training scenarios, tracking allows users to:

- Interact with tools and equipment.
- Move naturally within simulated workspaces.
- Collaborate with others in shared virtual environments.

4. Interaction and Navigation: Engaging with the Virtual World

Interaction in VR mimics real-world behavior. For example, VR users can pick up virtual objects in the same (or similar) way as they would pick up and carry physical objects in the real world. Users can also interact with user interface elements, such as menus and buttons. VR systems usually include controllers that allow to interact with the environment. Modern VR systems support hand tracking, eliminating the need for controllers and making interactions more intuitive. Hand tracking allows to use hand gestures such as swiping, tapping, and clicking, similar to those found on smartphones and tablets. This is especially valuable in training scenarios where realism matters—like operating machinery or performing medical procedures.

Navigation in VR is important, as most VR spaces are larger than the physical spaces where the users can use. So, the users need to move through these VR spaces. Navigation in VR can be achieved through:

- Teleportation (jumping from one location to another)
- Smooth locomotion (walking or driving within the virtual space)

Designing environments that match the user's physical space can reduce motion sickness and improve comfort. For example, a 2x2 meter play area can be mapped to a workstation simulation, allowing users to move naturally, at least within this area.

5. Embodiment and AI Integration: Enhancing Presence and Support

In VR, users are represented by avatars—customizable digital personas. This visual embodiment enhances social interaction, especially in collaborative training scenarios.

Avatars can be:

- Realistic representations of the user
- Neutral or anonymous
- Non-human characters for creative or role-based training

Artificial Intelligence (AI) can be used to control the behavior of so-called non-player characters in VR applications. AI-powered characters add further value. They can:

- Provide instructions.
- Simulate human interactions.
- Respond to voice commands.

For example, an AI guide in a VR training module can point to equipment and explain procedures, offering a more engaging experience than reading a manual.

6. Use Cases in Career Guidance and Vocational Training

This section provides examples of how VR applications can support career guidance and vocational training:

VR allows to create authentic learning environments that look realistic and where the users can engage in realistically simulated activities, receiving feedback to their actions.

- Simulate real-world scenarios like navigating a city or working in a lab
- Practice language skills in a natural context (e.g., asking for directions)

VR allows to simulate realistic situations that include difficult conversations, such as job interviews:

- Users can experience realistic interview settings.
- The immersion and immediacy allow to learn how to manage stress and respond effectively.

VR allows for exploration for remote places, enabling such scenarios as tours and field trips:

- Visit hard-to-reach locations like the Arctic or industrial sites.
- Learn from experts via immersive storytelling.

VR can enrich collaborative learning through presence, spatial awareness, more natural representation of users, and richer communication:

- Conduct meetings in virtual rooms with greater spatial awareness, using non-verbal cues and gestures.
- Use virtual collaboration tools, such as whiteboards
- Collaboratively exploring complex shared objects.

Adding the possibilities of AI to the VR-based learning experience allows to create greater variety and more natural interaction, especially with virtual humans. It is possible to use speech recognition and speech generation to allow a more natural spoken interaction with non-player characters in VR. It is also possible to use large language models to power the 'thinking' of the non-player characters in VR.

- Create realistic and varied role-playing scenarios where some roles are played by the AI.
- Allows creating flexible conversations with virtual humans as part of almost any realistic VR experience

Conclusion: The Future of VR in Career Development

VR is no longer a futuristic concept. It is a practical tool for immersive learning in various contexts in formal and informal educational scenarios. By combining sensory engagement, responsive environments, and AI-driven interaction, VR allows to create and use powerful experience for career guidance and vocational training.

As technology continues to evolve, educators and counselors have an exciting opportunity to design meaningful, effective, and inclusive learning environments using VR.