Extended Reality for Cabin Safety I

A Translational Study of Extended Reality Technology in Training and Research

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Definitions

- **Translational Study (Research): The bridge between academic research and real life benefits.**
- **Extended Reality (XR): The overarching terminology used to reference current and future reality-based technology.**
  - Current XR technology consists of:
    - Augmented Reality (AR)
    - Mixed Reality (MR)
    - Virtual Reality (VR)

Background

- **Primary goal: Review the Electronic Emergency Evacuation Aid for Aircraft Passengers (ELEVAID)**
- **To work toward goal:**
  - Understand XR's past, present, and future
  - Understand how XR is being applied and the results

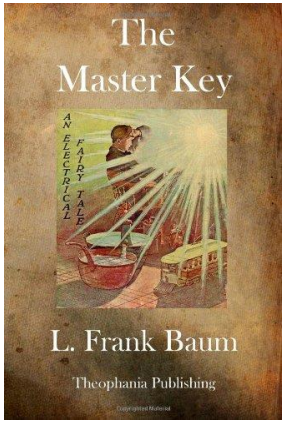
Overview of XR Types: VR Evolution

Overview of XR Types: Modern VR

- **Conventional (non-immersive) and Immersive VR (CVR / IVR)**

Figure 1: Treadmill training with VR system
The system includes a camera based motion capture (modified Microsoft Kinect) and a computer-generated simulation. The camera (red rectangle) records the movement of the participant's feet (the red rectangle) while they walk on the treadmill. These images are transferred into the computer simulation and projected to the patient in real time on a large screen during training (red rectangle). Progression of the intervention is modulated by the speed of the treadmill, the duration of the walking bouts within a given training session, and the size and frequency of the virtual obstacles and the distractors. Participants walked while wearing a safety harness to prevent falls during training. VR=non-immersive virtual reality.

Overview of XR Types: AR Evolution



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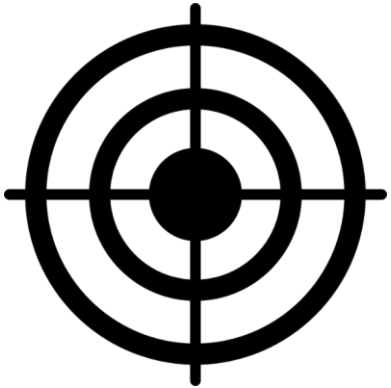
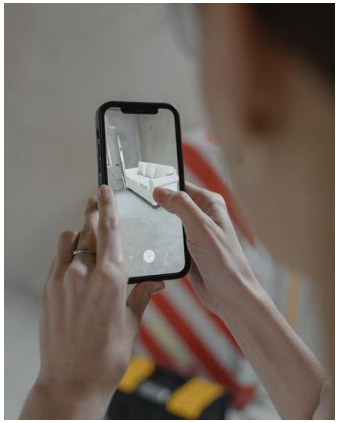


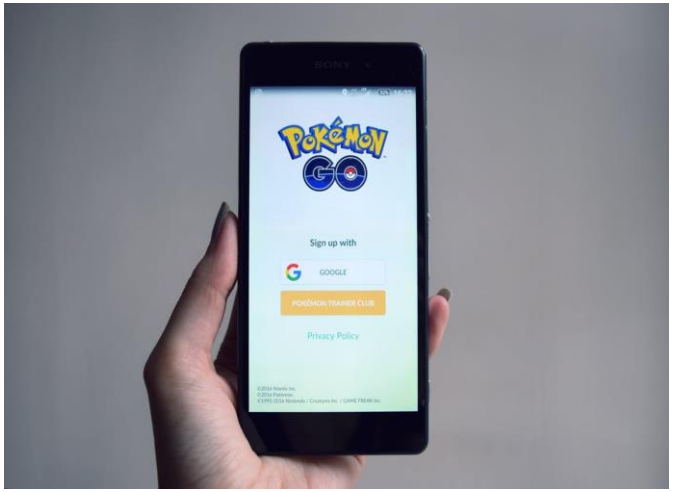
1918



Today

Overview of XR Types: Modern AR

- **Passive and Active AR (P-AR / A-AR)**



Overview of XR Types: MR

- **Newest to the market**
- **Interactive digital overlay**

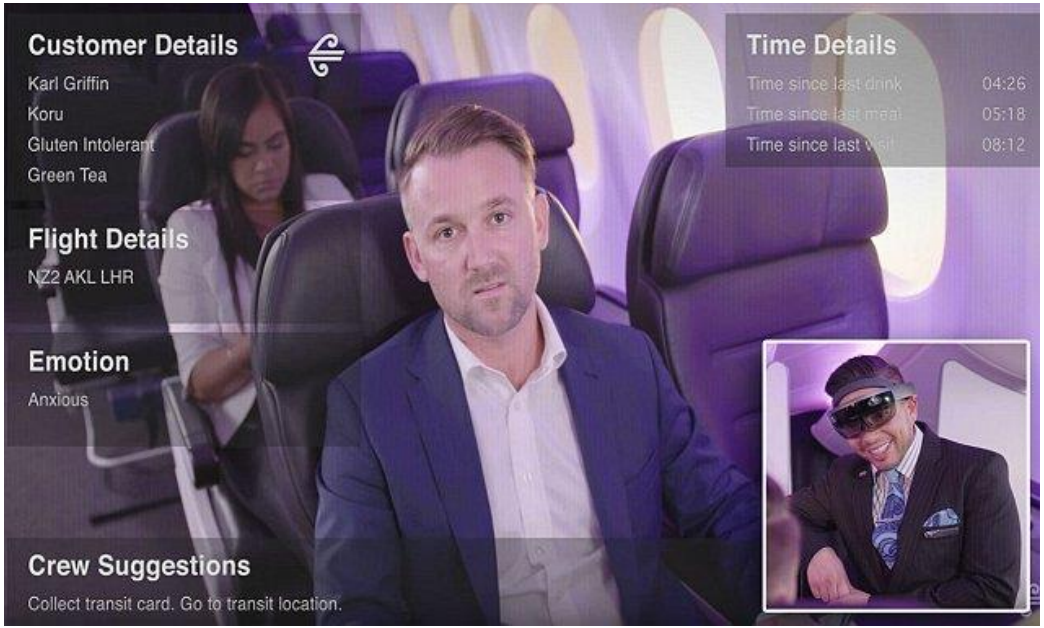


Photo: Daily News / Air New Zealand

XR Technology Use

Entertainment

Collaboration and Training

Fitness

Escape

XR of the Future

XR Application and Effectiveness

- **Effective when used as clinical intervention for combat-related PTSD** (Comer, 2016)
- **Significant improvement in mobility** (Cano Porras et al., 2018; Mirelman et al., 2016)
- **Effective in training various scenarios across an array of industries** (Noguchi, 2019; Novicio, 2021)
- **Cognitive overload in IVR can hinder learning** (Frederiksen et al., 2020)

Lessons Learned: Reducing Cognitive Load

- **Becoming familiar with training materials prior to using XR** (Meyer et al., 2019).
- **Using AR where the digital overlays provide clues, hints, or directions** (Paskoff et al., 2015).
- **Establish and adhere to learning goals and objectives** (Frederiksen et al., 2020; Ormrod, 2016).

ELEVAID Software Evaluation

- **Collaborative development between University of Udine and FAA**
- **CVR tool for evacuation, scenarios are either loaded or created**
- **Avatar controlled by keyboard and mouse**

ELEVAID Example

Results

- **Not a suitable tool for evacuation research**
- **Could be a valuable tool for passenger education**

Questions and Discussion

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