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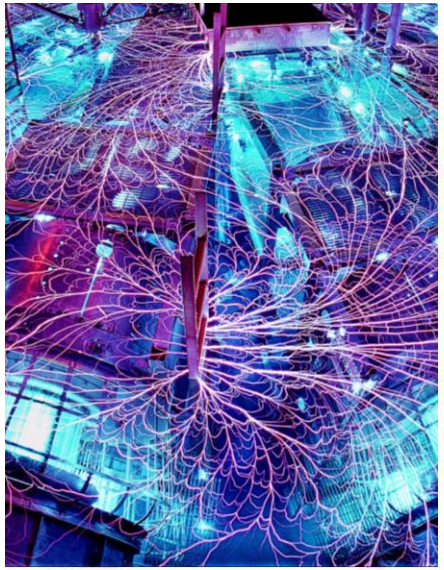

XR@Z

A look back and into the future

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Background

What

Scale workforce, capture knowledge, and enhance training for Z Operational teams so workers could train concurrently and transfer knowledge through technological mediums

Where

Sandia National Lab's Z machine is Earth's most powerful pulsed-power facility and X-ray generator. Z compresses energy in time and space to achieve extreme powers and intensities, found nowhere else on Earth. The Z machine uses currents of about 26 million amps to reach peak X-ray emissions of 350 terawatts and an X-ray output of 2.7 megajoules

When

Founded in 2019. Over the past years, XR at the Z Machine facility has blossomed from a simple “what-if” thought into a quickly established technology solution space providing academic and industry artifacts thanks to collegiate collaboration and management support

Why

FASTER-TIME-TO-SCIENCE! Over time, the Z Machine has increased in shot complexity and usage demand. Z Operational teams need efficient solutions to quickly teach the complexities around shot configuration in order to meet the demand while ensuring safety and security

How

Through XR - Extended reality (XR) is a term referring to all real-and-virtual combined environments and human-machine interactions generated by computer technology and wearables. It includes representative forms such as augmented reality (AR), mixed reality (MR) and virtual reality (VR) and the areas interpolated among them

A look back…

Internal Collaboration

- XR Software Simulation (XRSS) team at Sandia

Publications/Presentations

- Paper on XR Training
  - *"Extended Reality for Enhanced Training and Knowledge Capture" (SAND2020-2361 C)*
- Conferences

Discovered and Developed XR Software Products

- MenuFramework
- Sequential Training ToolKit – STTK
- Exploration ToolKit – ExTK

External Parties Interested

- Use of Copyrighted XR Software Products
- Collaboration

Demo: XR software products

Demo: Developer’s perspective

Walk-through of using ExTK and STTK from the Developer’s perspective

XR Software product feature review

Format

- .unity file
- Declarative Folder Structure
  - Resources
  - Editor
  - Scripts

Features

- Drag and Drop
  - Scenes
  - Models
  - Animations
- Adjustable
  - Animation Speeds
- Audio/Visual
  - Item Descriptions

Unity IDE Layout

- Inspector Pane Extensions
- Scenes

Toolbar Assistants

- “How to use” Helper
- GameObject Creation
- Model Animator
- State Machine Generation
- Dynamic Inspector Generation

Demo: End-user’s perspective

ExTK - V8 Engine Demo on HoloLens 2

Demo: End-user’s perspective

STTK - V8 Engine Demo on HoloLens 1

Demo: End-user’s perspective review

Enhanced User Interface

- Interactive Model
- Immersive Play Space

Enhanced User Experience

- Gesture Enabled
- Audio Feedback
- Voice Recognition

A look into the future…

Z Training Facility

- Integration with training materials
- XR Training Workstations
- XR Training Room

Extension of XR Software Products

- Alignment over real-world objects
- Database
- Concurrent multi-user
- Expanded testing capabilities
- Automated integration for procedural information
- Training analytics
- Cloud integration (Azure)

Initial Public Release of XR Software Products

- August 2021
- GitHub
- MIT License (Converted from Commercial)

Integration with other Program/Project efforts

- Simulated Z (Digital Twin)
- Complimentary XR Efforts (Internal and External)

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Questions?

THANK YOU!