Presented at the FIG Working Week 2023,
28 May - 1 June 2023 in Orlando, Florida, USA

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Protecting Our World, Conquering New Frontiers

XR-Reality for intuitive BIM-based as-built documentation

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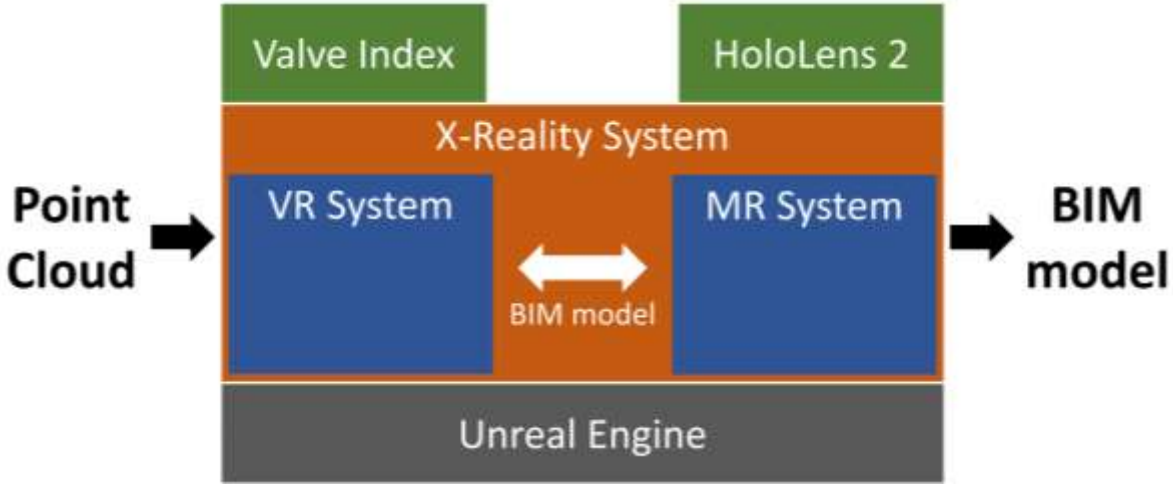
Motivation

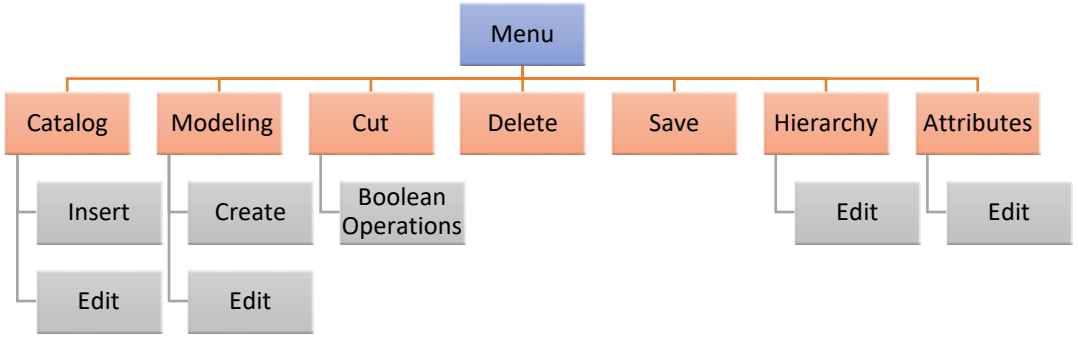
- BIM is hardly used for **existing structures**, but has many advantages in **operational phase**
- Required Scan-to-BIM process is still **costly** and **difficult**
- Idea: **X-Reality** (XR) and **automations** for optimized and intuitive as-built documentation

Supported by:
Federal Ministry for Economic Affairs and Climate Action
on the basis of a decision by the German Bundestag

X-Reality BIM System

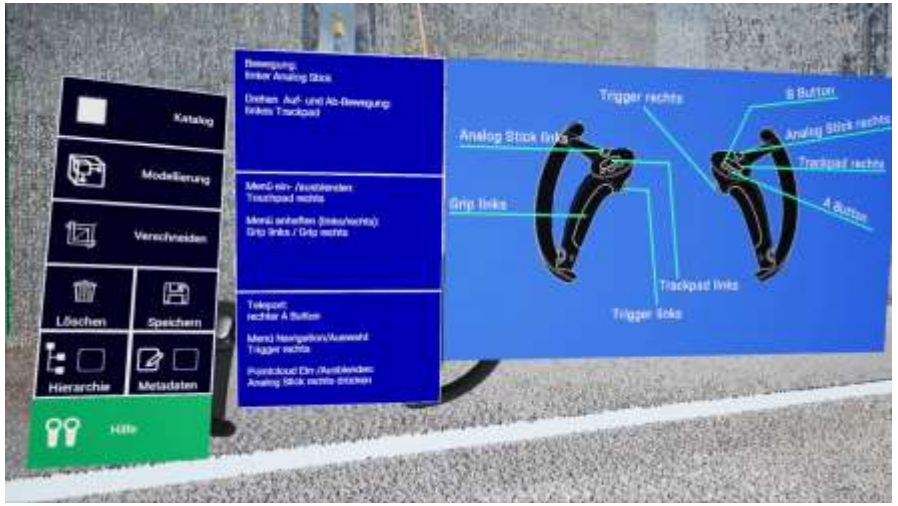
- Virtual Reality (VR) for **location-independent** modeling
- Mixed Reality (MR) for **on-site** as-built **documentation** and **inspection**
- BIM model is **interchangeable** between VR and MR
- **Uniform** user interface (GUI)





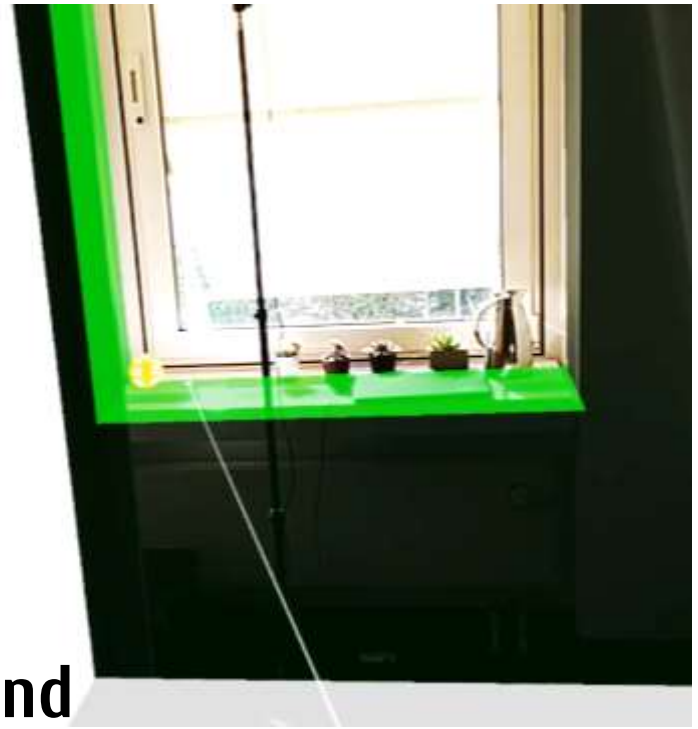
Virtual Reality (VR)

- Off-site modeling from **point cloud** in **immersive 3D** environment
- **High-performance rendering** with octree data structure
- **Walking**, **teleportation** and **flying** enable fast modeling of any size object



Mixed Reality (MR)

- On-site modeling in context of **reality** means **higher detail**
- BIM model from VR is visualized **georeferenced in reality**
- HoloLens 2 headset for **more freedom → hands free**
- **Gesture-based** and **voice command** modeling

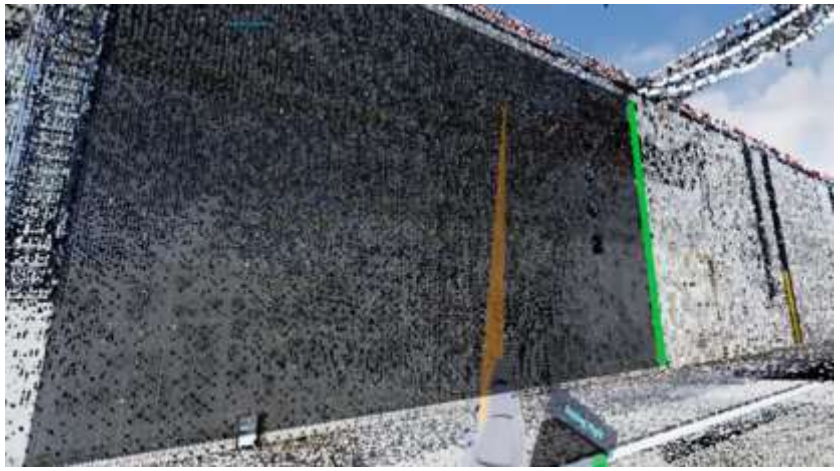


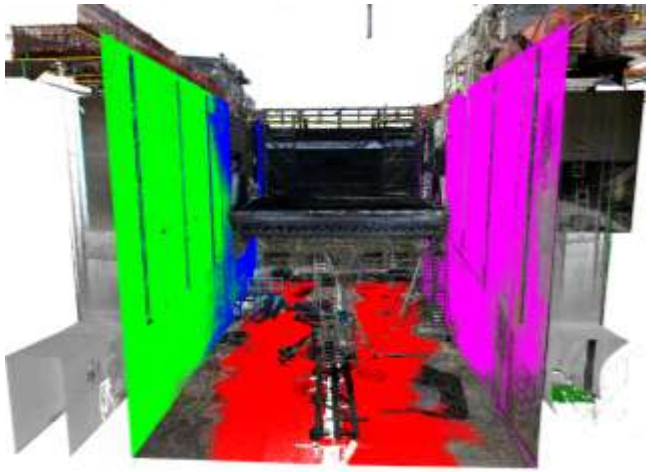
Registration in Reality

- BIM model needs to be **placed correctly** (registered) in world space
- Solved with **corresponding points** in BIM model and reality for transformation
- Method **integrates seemlessly** into HoloLens 2 pose tracking

Modeling Geometry

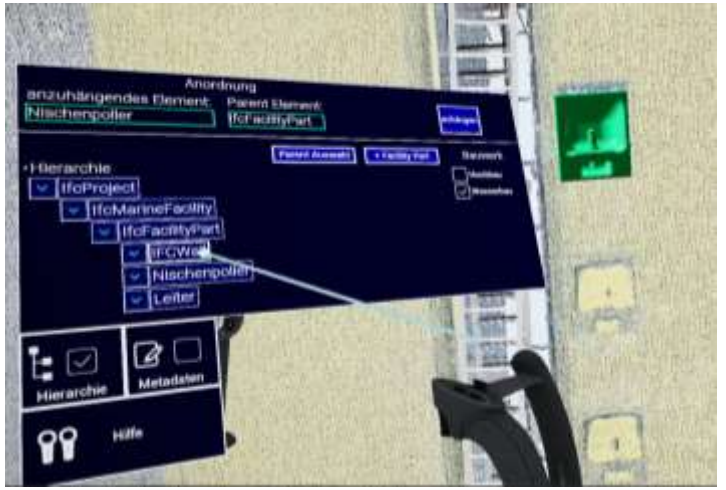
- **Three types** of modeling
  - **Free** modeling
  - **Parametric** modeling
  - Object **catalog** modeling
- **Tools**
  - **Automatic** plane detection
  - **Boolean** operations
  - **Editing** (Transformations)





Building Information Modeling

- Based on **IFC4.3** → Buildings / Ports and Waterways
  - Object **type**
  - Object **relationships**
  - Object **attributes**
- **Fully editable** by controller/hand or voice command interaction



Non-proprietary Interface

- **IFC4.3-based export** interface enables **exchanging** BIM model to any BIM viewer or BIM authoring software
- **All object information** is exported, including geometry, relationships and attributes

Thank You!

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