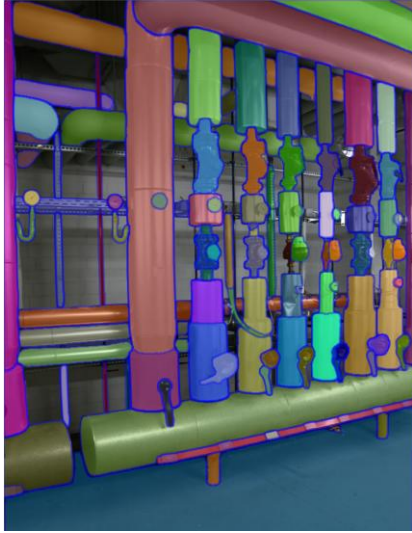


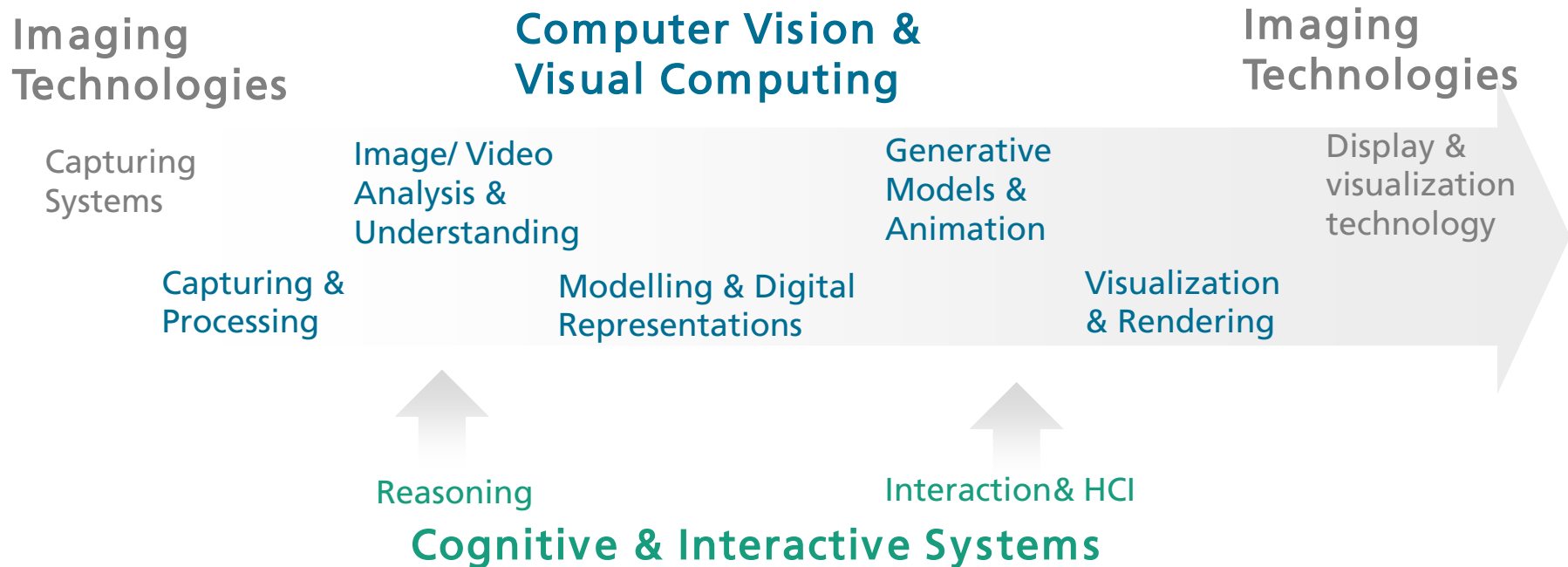
KI FÜR BAUFORTSCHRITTSKONTROLLE UND MATERIALERKENNUNG

Peter Eisert, Fraunhofer HHI



Vision & Imaging Technologies @ HHI

Innovative research along the entire video processing chain

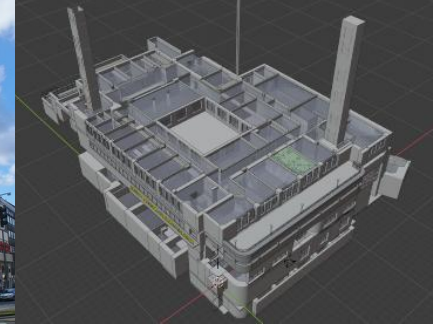


AI-based Research for Construction

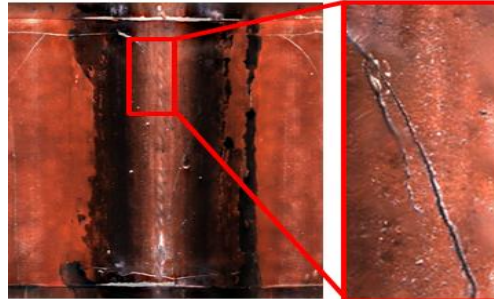
Vision & Imaging Technologies Department @ HHI



AR based assistance tools



creation of BIM models for existing buildings



automatic damage inspection



scanning of buildings and construction sites



Edge-Computing, KI und 5G-Campusnetze in nomadischer
Anwendung für das Management von Baustellen



DIE PARTNER



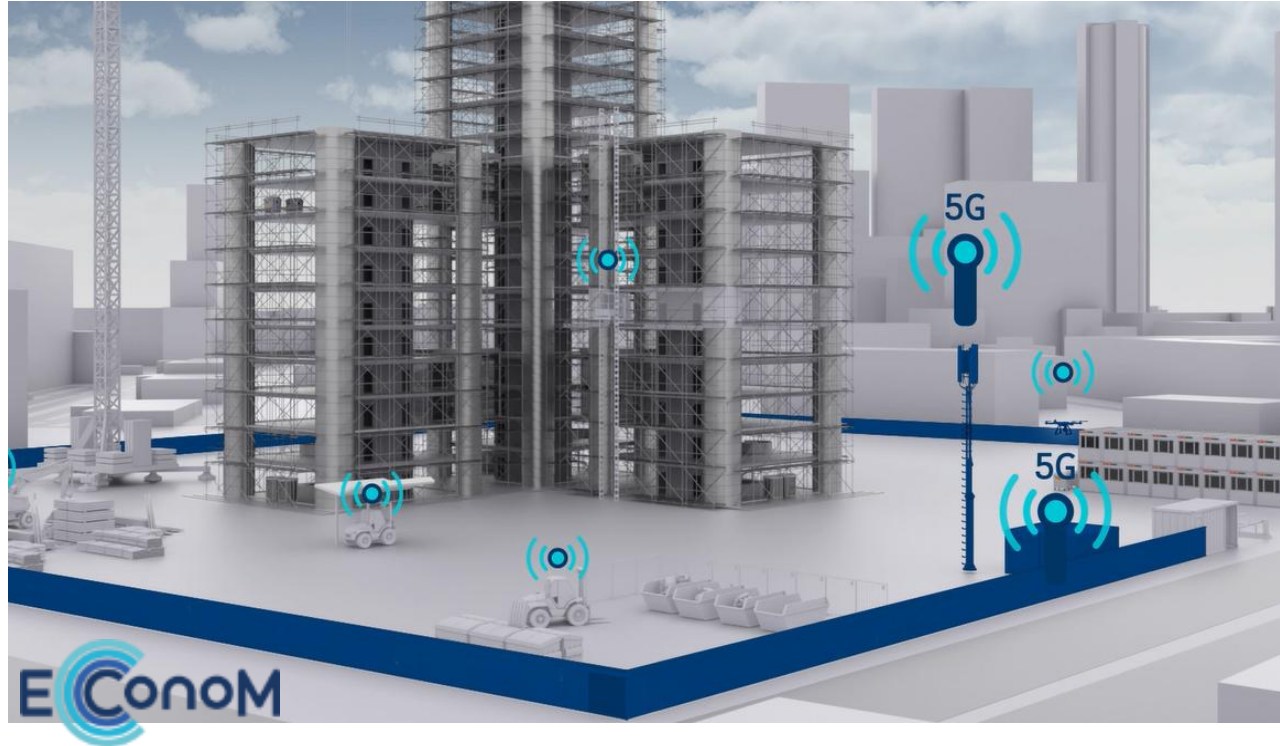
Gefördert durch:



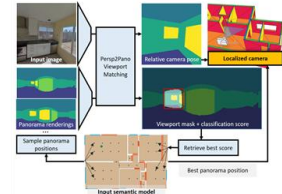
aufgrund eines Beschlusses
des Deutschen Bundestages



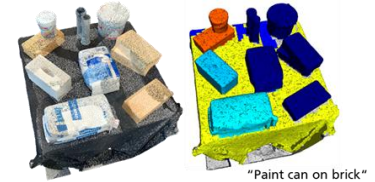
EConoM: AI based Management of Construction Sites



progress monitoring



Indoor Localization, [Gard et al., ECCV 2024]



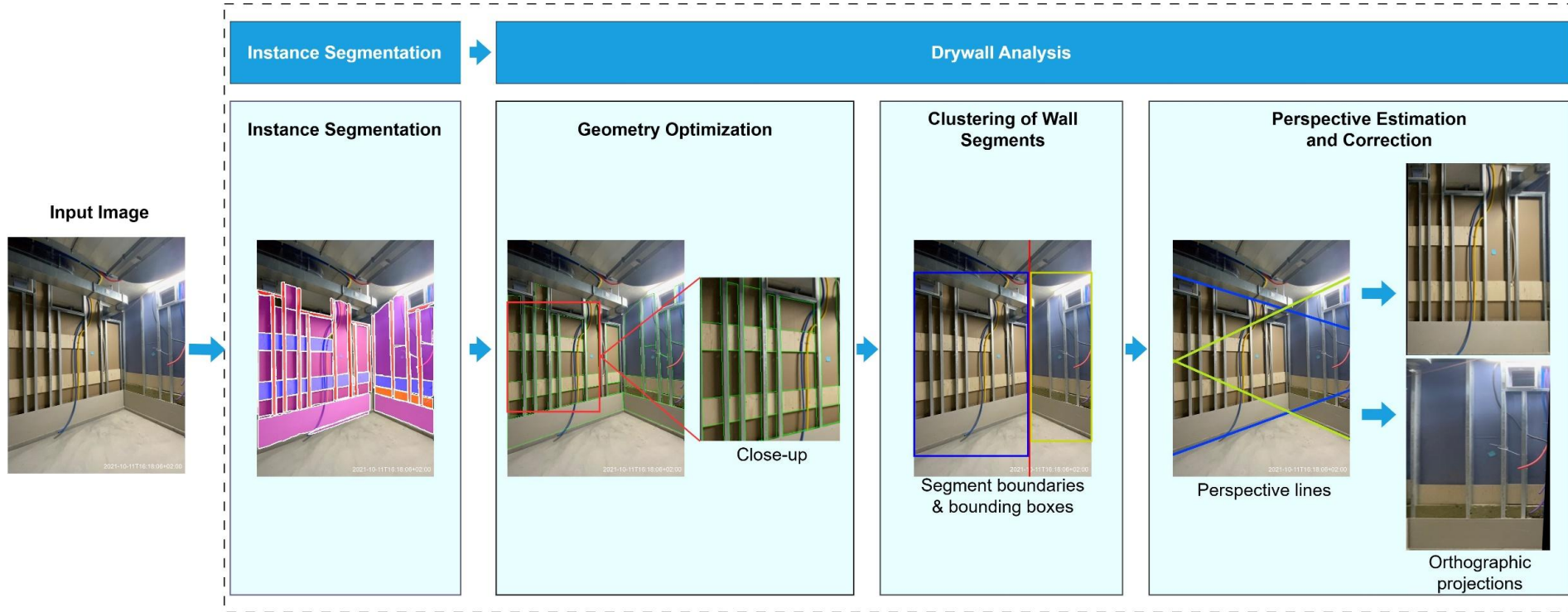
LLM-guided Material Estimation, Localization and Quantification

Progress and Quality Estimation for Drywalls

- Automatic determination of construction progress
- Segmentation and validation of materials and elements
- Determination of positions and geometric deviations from initial plans



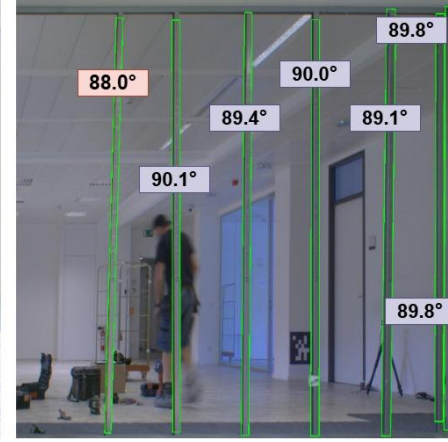
Analysis Pipeline



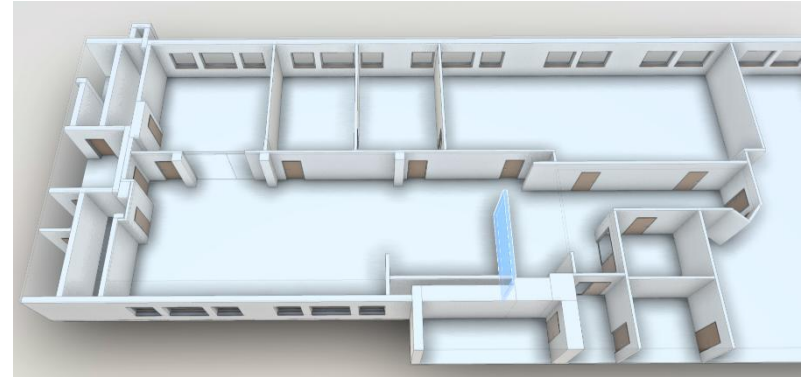
Progress and Quality Estimation for Drywalls



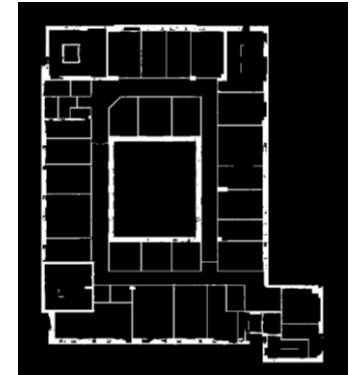
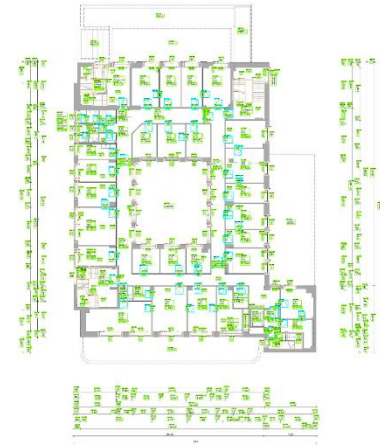
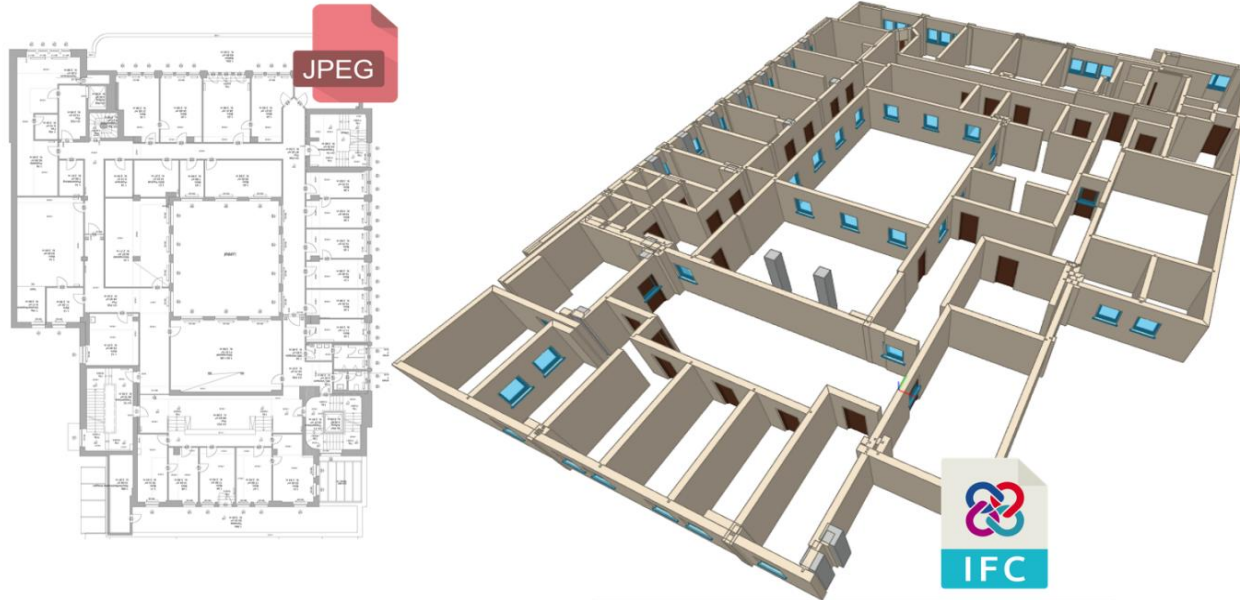
Rectification and Measurement of Orientation



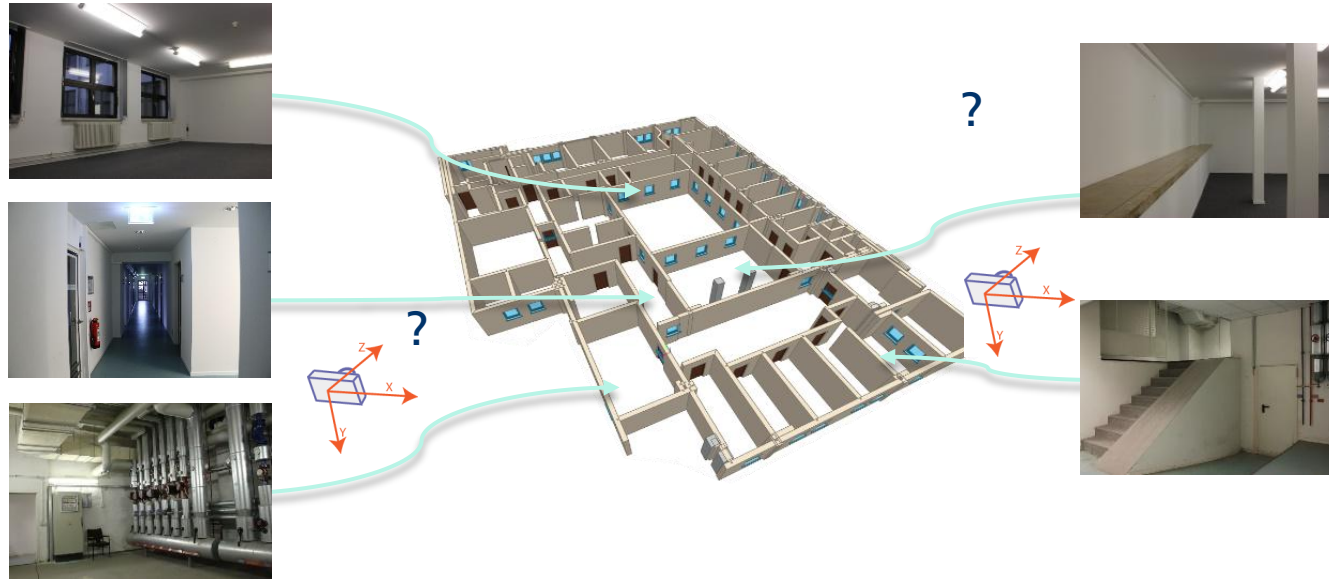
Localization of Drywalls



Creation of BIM Models from 2D Plans



Localization of 2D images within the generated model



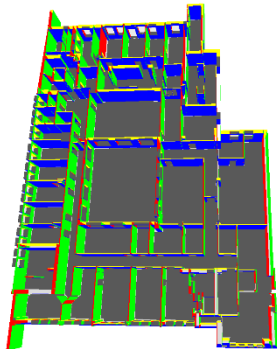
Estimate the 3D position and 3D orientation of a camera with respect to a 3D scene model.

SPVLOC: Semantic Panoramic Viewport Matching for 6D Localization (ECCV 2024)

INPUT



Camera image

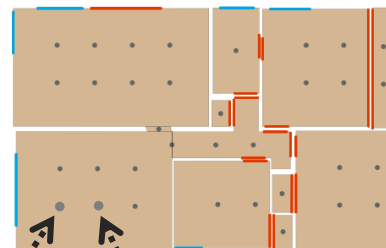


Semantic 3D model

Represent spaces as a set of
rendered semantic
panorama images



Input semantic model

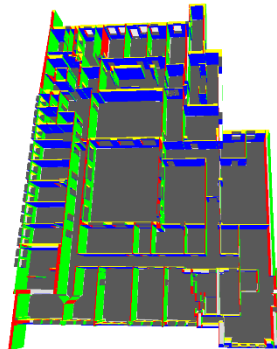


SPVLOC: Semantic Panoramic Viewport Matching for 6D Localization (ECCV 2024)

INPUT

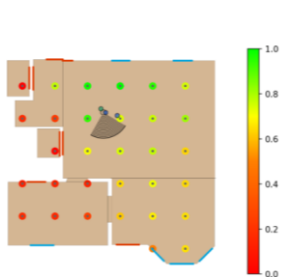


Camera image



Semantic 3D model

Rank predictions to
estimate 6D pose

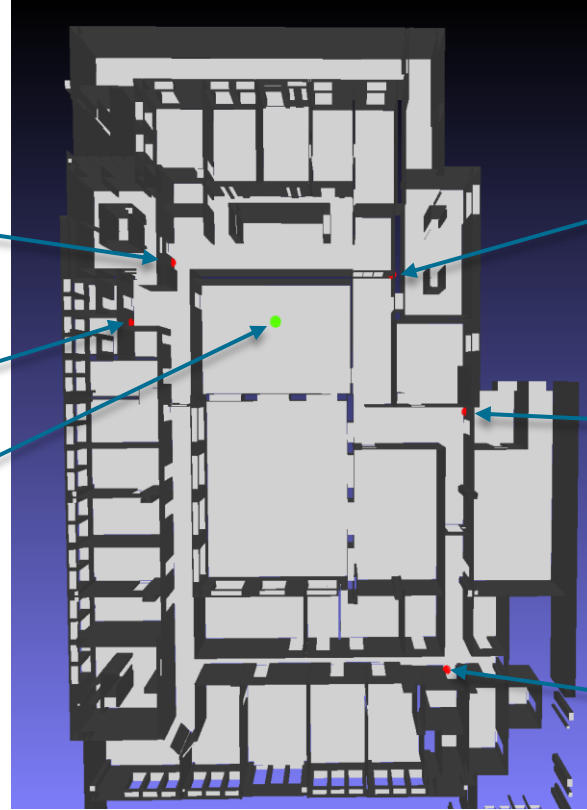
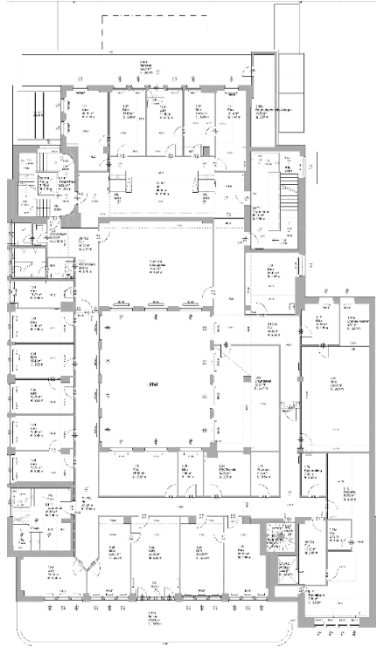


Output

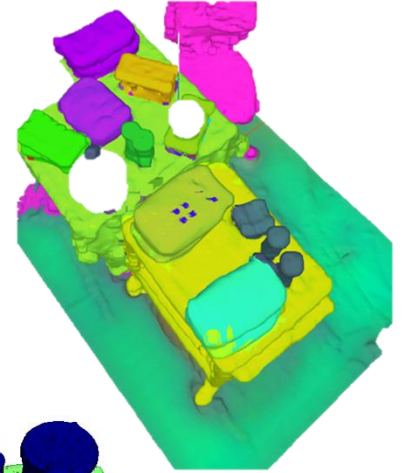


6D camera pose
(position and orientation)

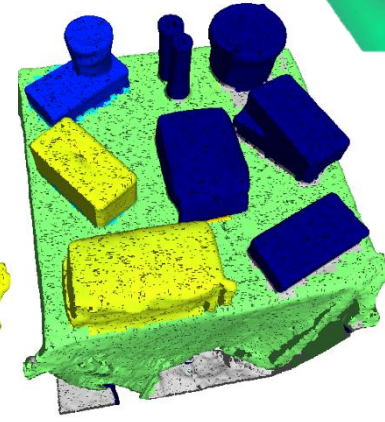
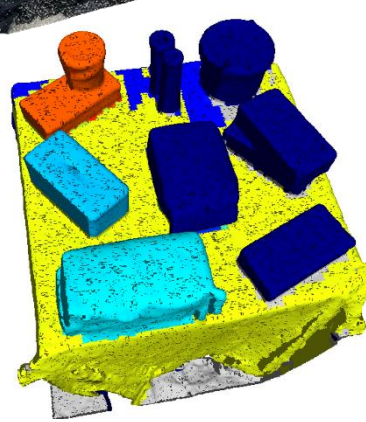
Object Detection and Localization in the BIM Model



Material Detection, Localization and Quantification

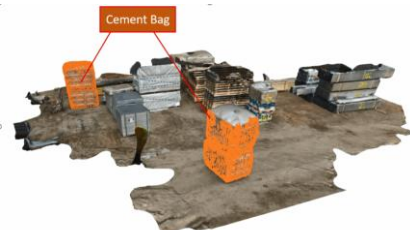


"Paint can
on brick"

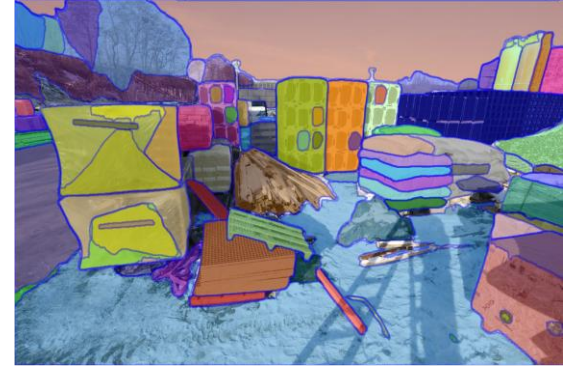
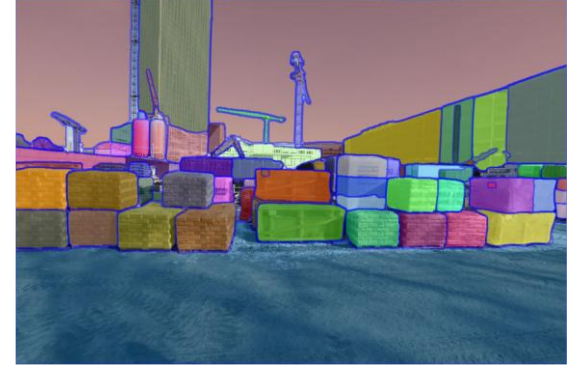
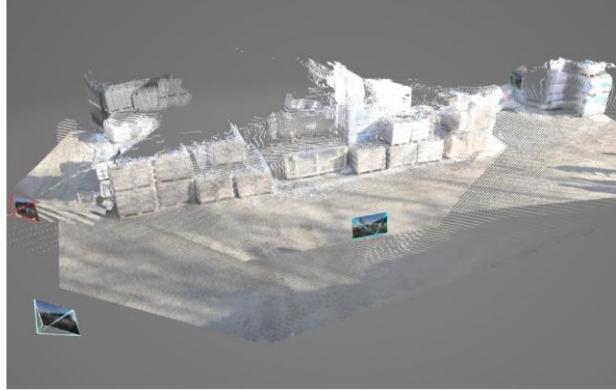


"Cement bag"

Semantic Material Detection



Test @ Estrel Tower



Conclusions

- AI is an interesting tool for the optimization of processes
- Often requires large datasets for training
- Foundation models can help in handling previously unseen objects
- Examples of AI services
 - Progress monitoring / quality inspection of drywalls
 - Indoor localization of images for information transfer into BIM model
 - Material detection and quantity / volume measurement
- AI provides various chances for construction beyond LLMs

Fraunhofer-Institut für Nachrichtentechnik, Heinrich-Hertz-Institut, HHI

WE PUT SCIENCE INTO ACTION.

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10587 Berlin

