



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

FIG WORKING WEEK 2023

28 May - 1 June 2023 Orlando Florida USA

Protecting
Our World,
Conquering
New Frontiers

Scan vs. BIM

Patch-based construction progress monitoring using BIM and 3D laser scanning (ProgressPatch)

Felix Gruner, Enrico Romanschek, Daniel Wujanz and
Christian Clemen

University of Applied Science Dresden, Germany



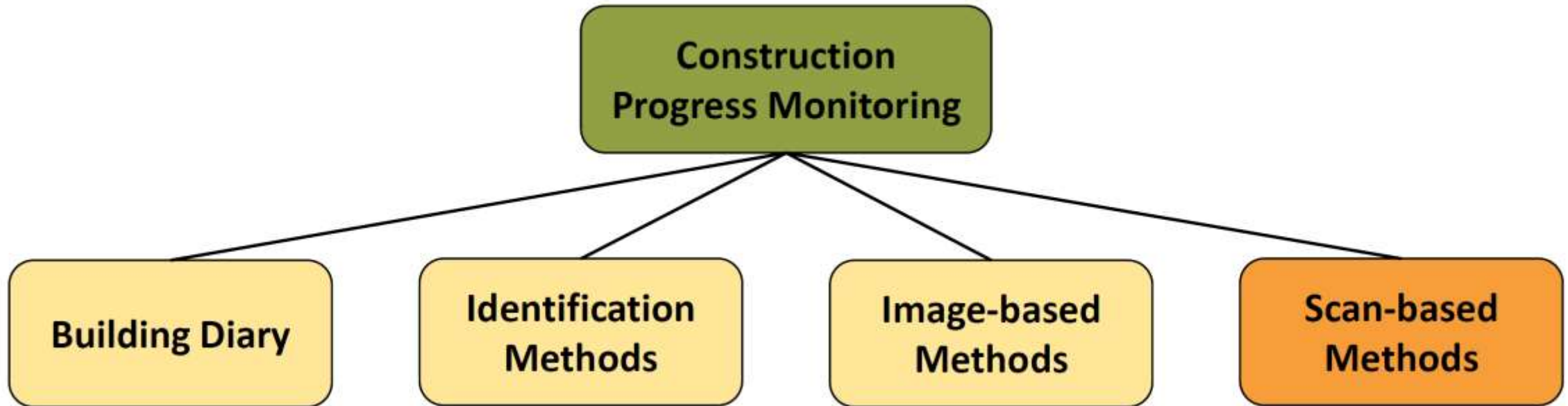
Organized By



Diamond Sponsors



Scan vs. BIM - a possibility of construction progress monitoring



Why patch-based?

- Buildings have a large number of planar Faces
- Patch-based relative registration is used in practice → Scantra
- **Error budget** of scanner, calibration and registration have an impact onto the outcome of monitoring → considered within a **stochastic model**
- **Fast calculations** through plane parameters

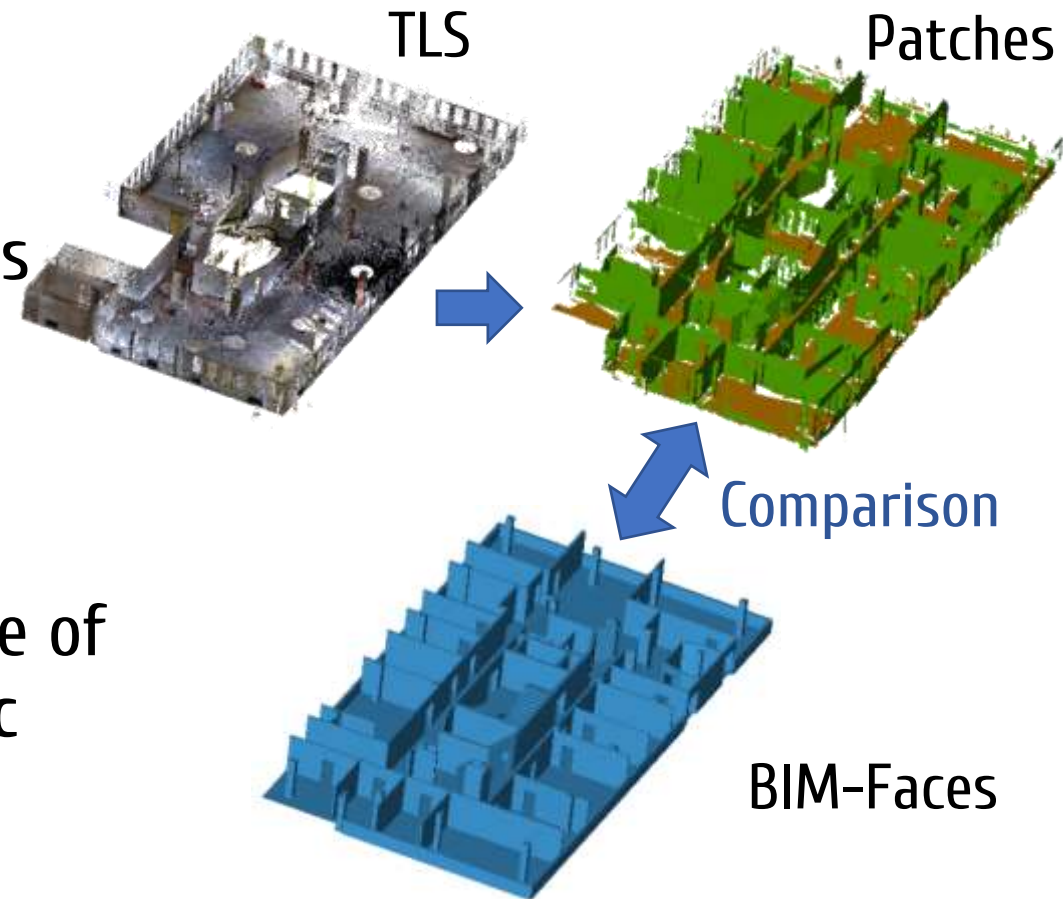
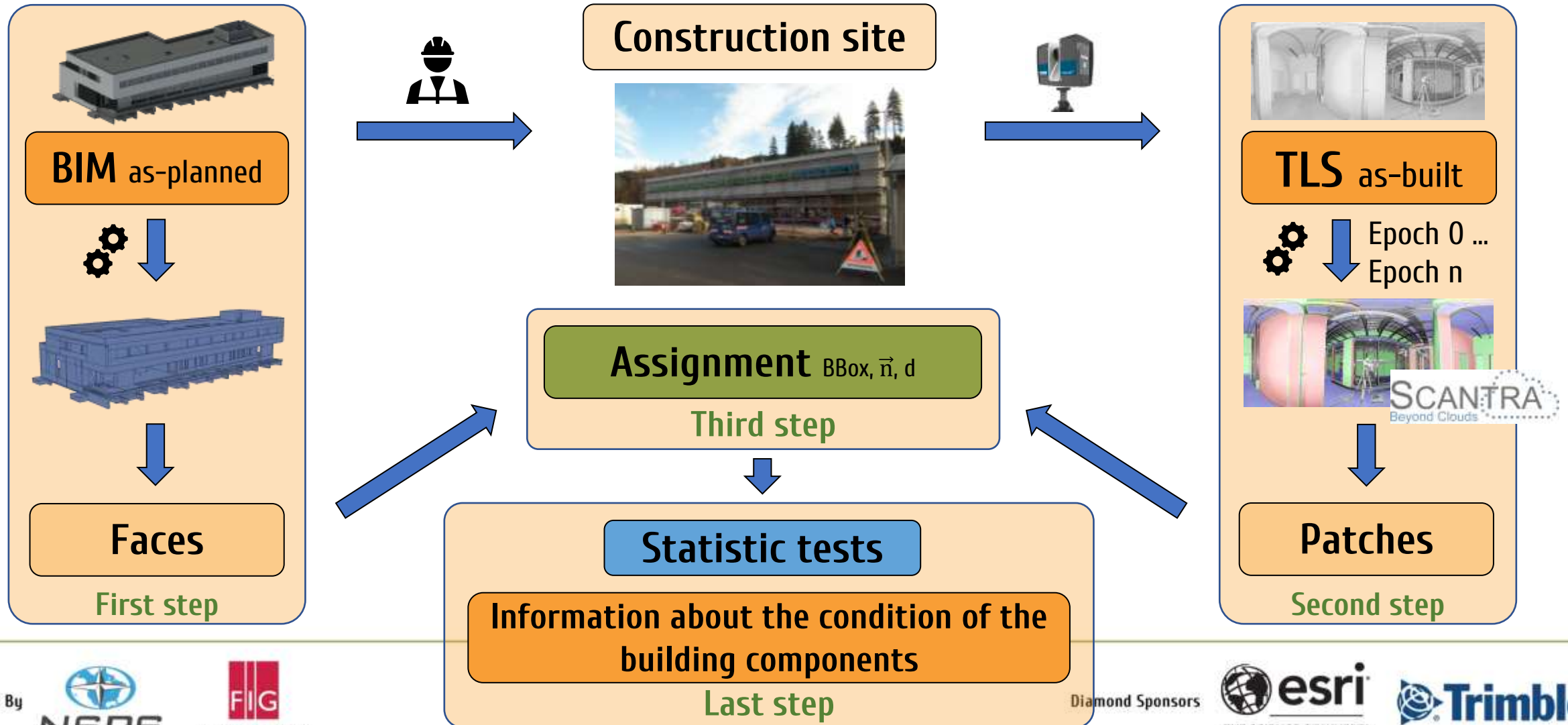


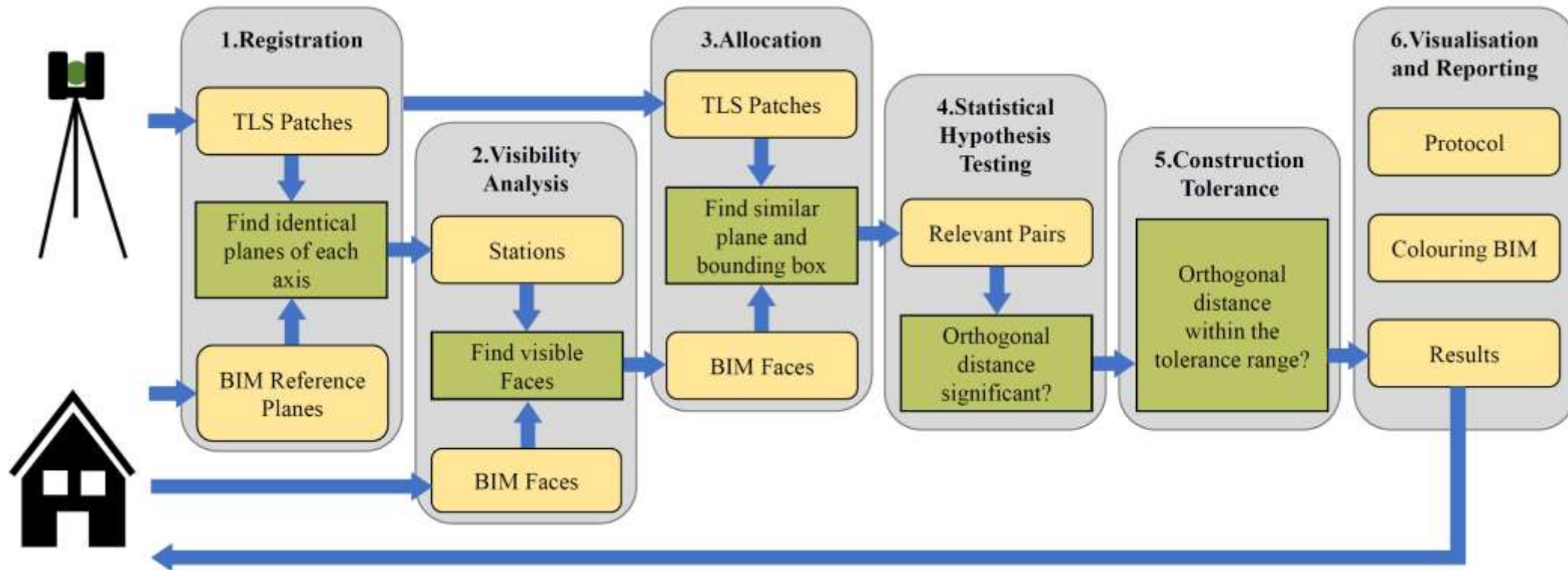
FIG WORKING WEEK 2023

28 May - 1 June 2023 Orlando Florida USA

Protecting Our World, Conquering New Frontiers

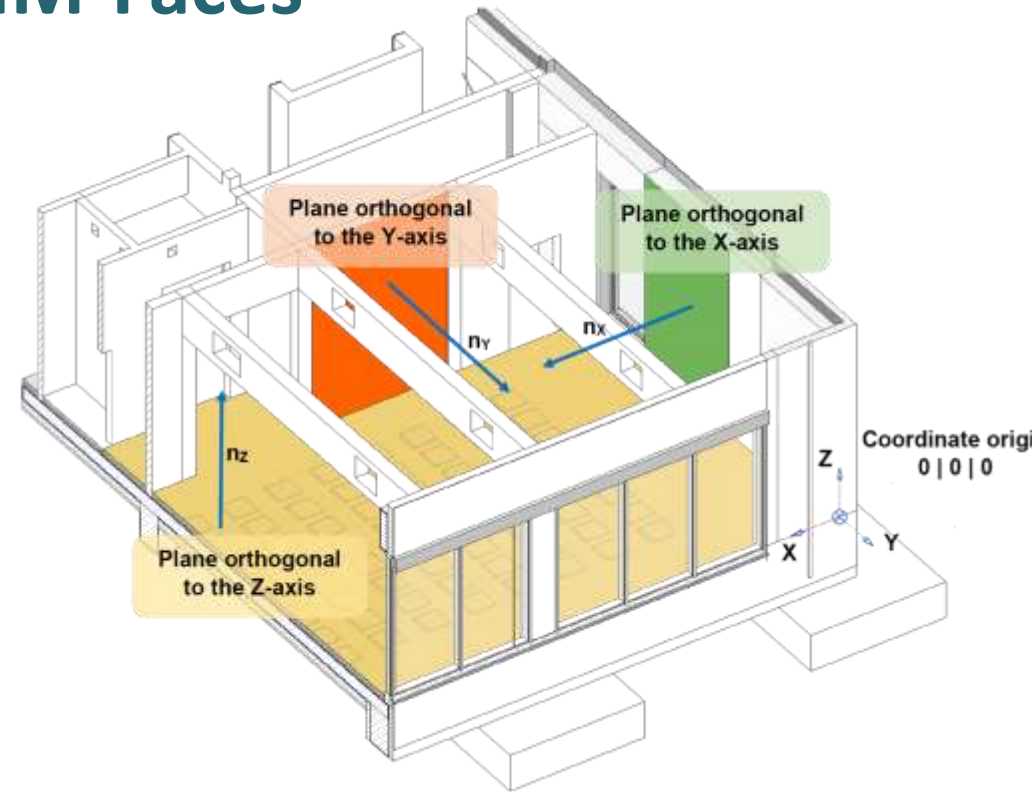


Our workflow



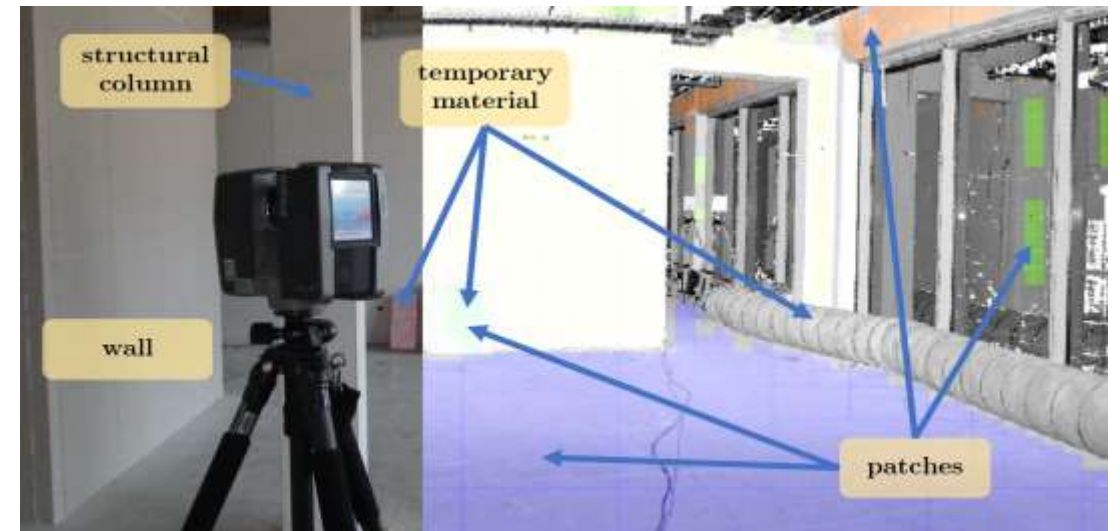
New approach - Co-Registration with BIM-Faces

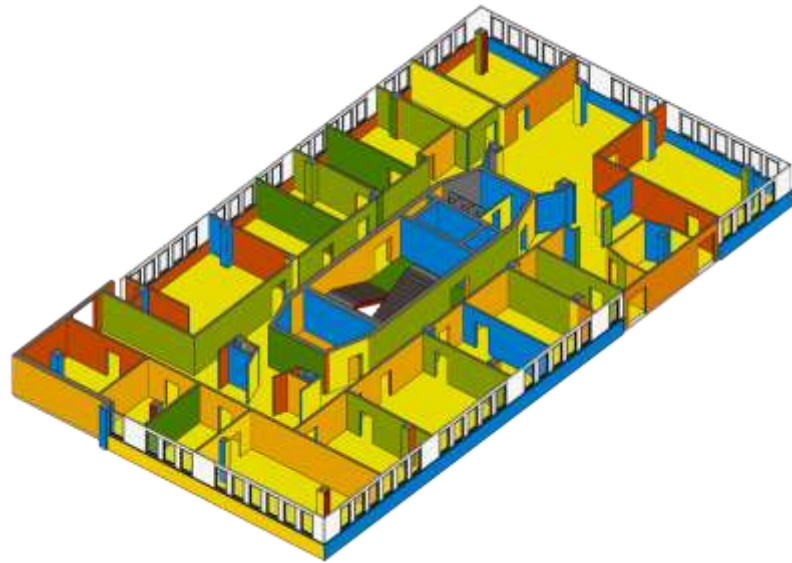
- BIM becomes an additional TLS station in Scantra
- TLS-Patches matched to BIM-Faces
- Choose as reference scan → transform the point cloud into the BIM coordinate system
- Georeferencing without control points



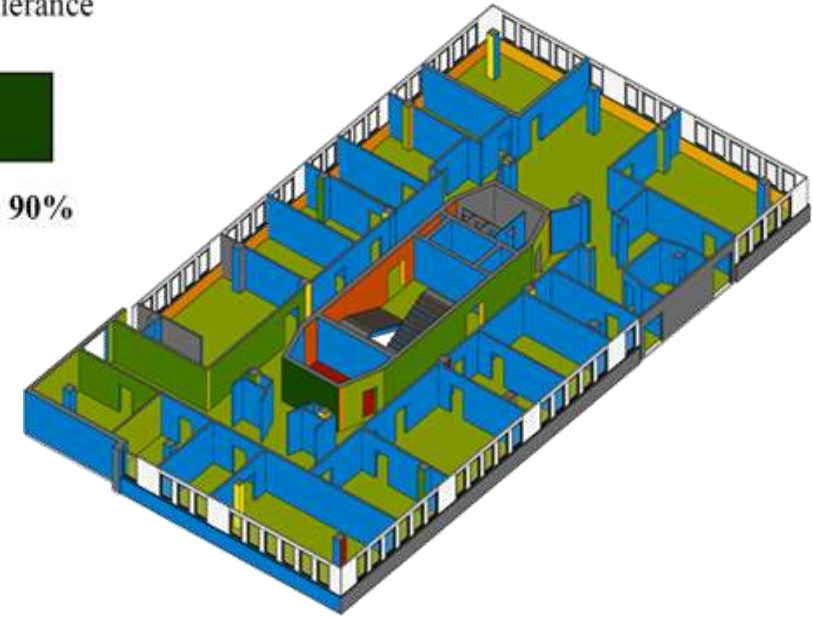
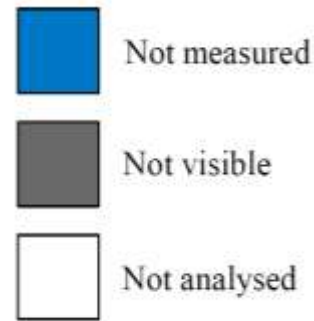
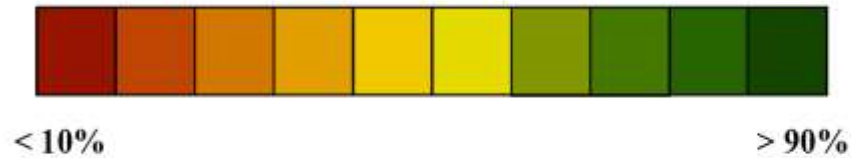
Experimental validation

- Two epochs were scanned
 - Before construction and after demolition
- Visibility analysis and assignment face-patch → temporary objects are excluded
- Shell construction is considered
- User does not see a point cloud





Percentual overlap of the face of clipped patches within tolerance

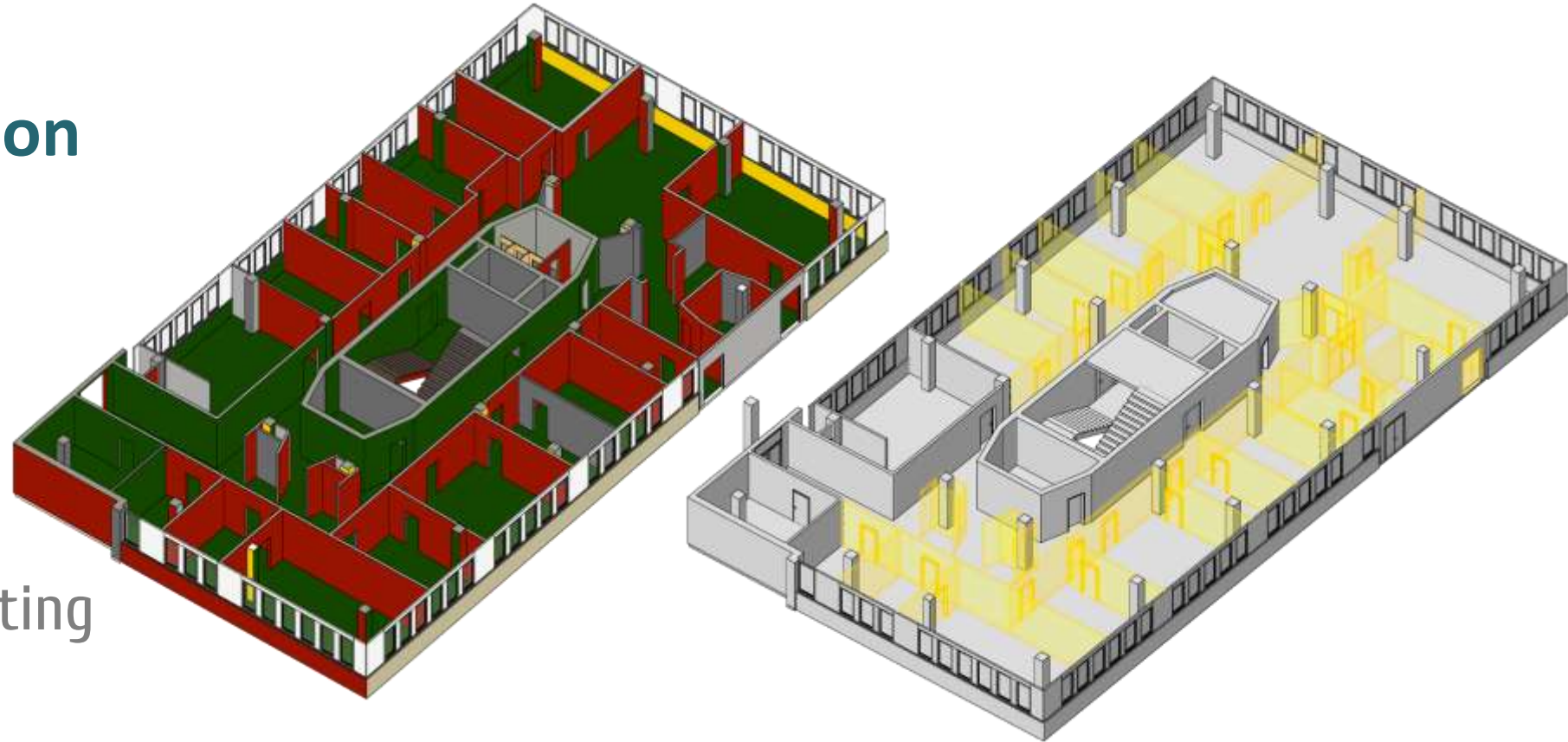


- Result epoch 0
- At the time of scanning not everything had been reduced to the shell

- Result epoch 1
- Many walls were removed

Epoch comparison

- Unchanged existing
- Demolished
- New built
- Unchanged not existing



- construction phase planning in BIM

Summary

- **Workflow is suitable** for monitoring the progress of construction, can be extended to include other results.
- Result depends on the match between **model** and **reality**.
- Analysis possible as **Revit-Plugin** or with **IFC**.
- In the **paper**, visibility analysis, the statistical test and calculations are discussed in more detail.

Thanks for your listening

Contact:

felix.gruner2@htw-dresden.de

enrico.romanschek@htw-dresden.de

daniel.wujanz@technet-gmbh.com

christian.clemen@htw-dresden.de