

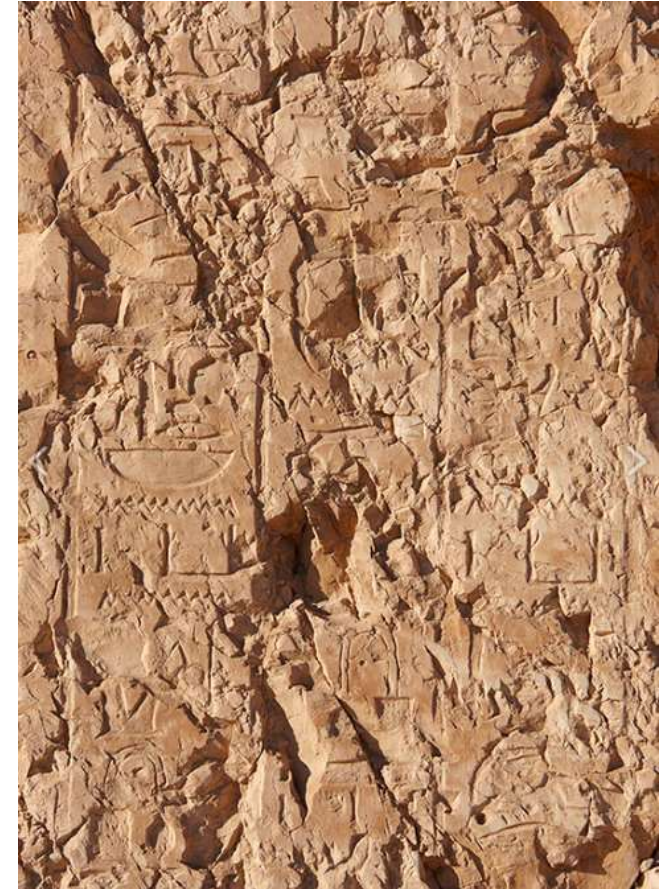
Presented at the FIG Congress 2018,
May 6-11, 2018 in Istanbul, Turkey



Fusion of laser scanning and Photogrammetric data for the documentation and VR visualization of an archaeological tomb complex

E. Friedli, J. Banz, Z. Gojcic and A. Wieser

Life Histories of Theban Tombs (LHTT)¹

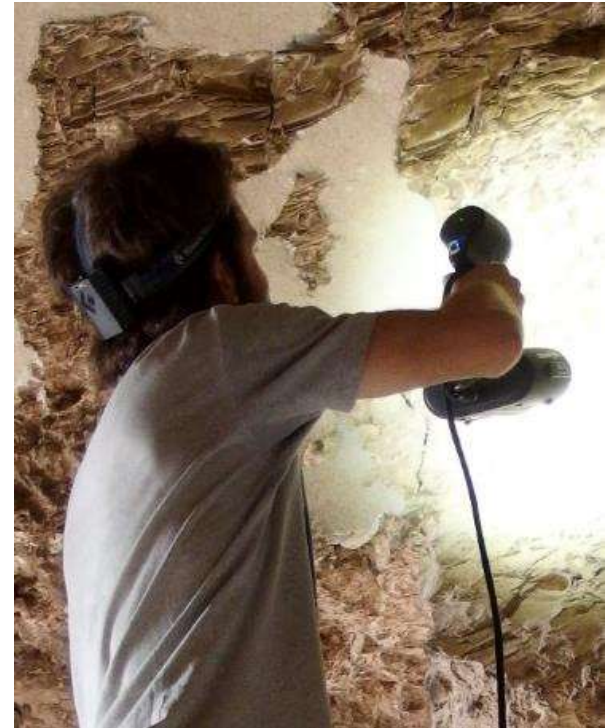


Goal: 3D Digital Reality with large coverage
and sub-mm resolution

¹ Cooperation with Department of Ancient Civilizations, University of Basel, SNSF grant 162967, <https://lhtt.philhist.unibas.ch/sheikh-abd-el-qurna>
Geosensors and Engineering Geodesy
Institute of Geodesy and Photogrammetry

Approach

- Fusion of TLS, Photogrammetry and close-up scans
- Selective coverage with highest resolution



Fotos: © University of Basel, LHTT Photos: M. Kačičnik

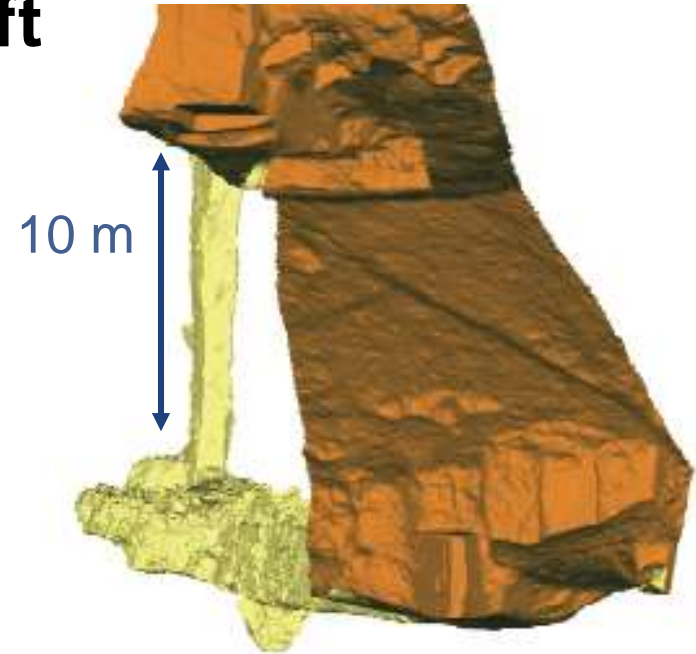
Example: Narrow vertical shaft

Challenge:

Upper part not accessible with the scanner

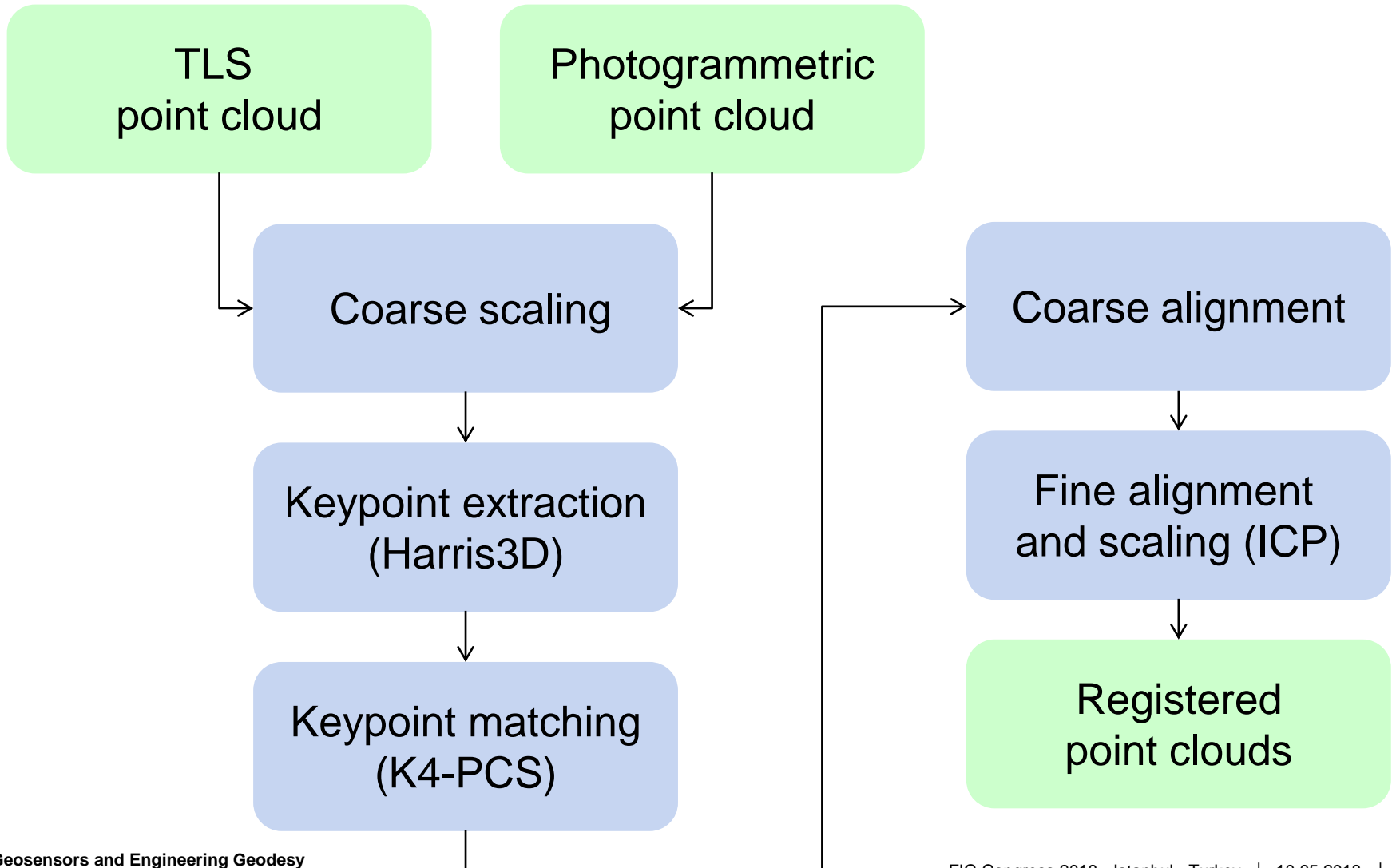
Solution:

- 8 scans of the shaft (ladder)
- 98 pictures with SLR camera mounted on a long pole for upper $\frac{1}{4}$
- Feature-based registration of photogrammetric and TLS point clouds (overlap only 15%)

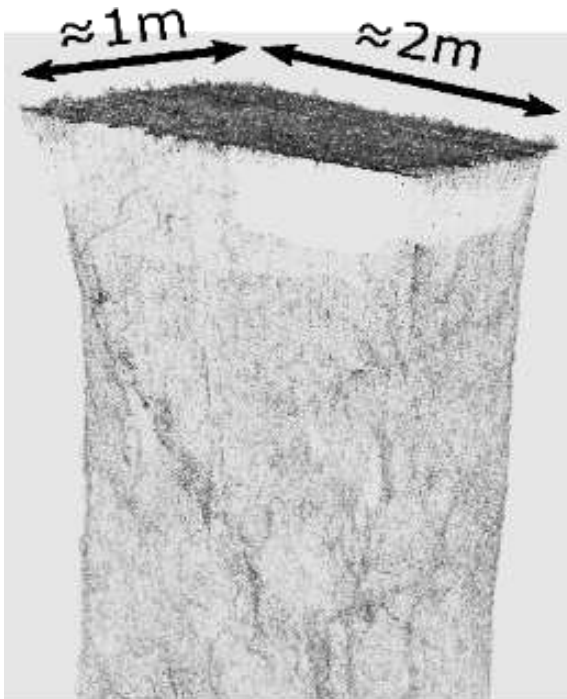


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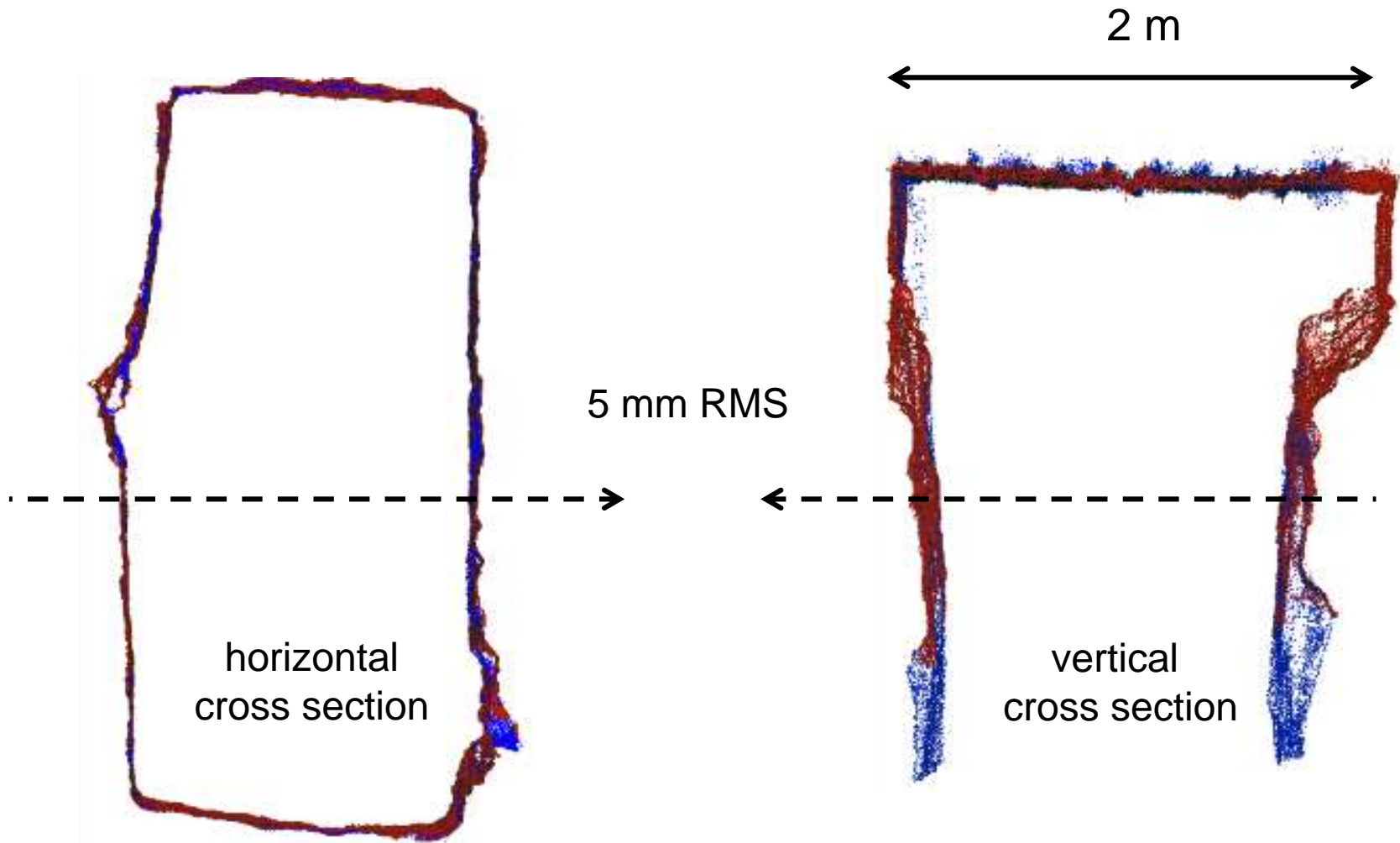
Workflow



Results



Results



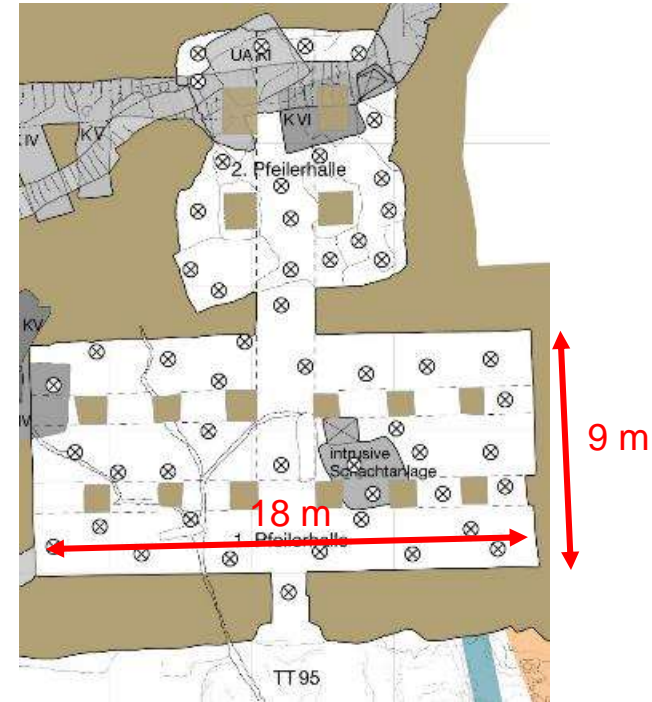
Example: Funerary Chapel

Challenge

Fully textured 3D model despite poor illumination, surface roughness, and parts with little texture

Solution

- TLS for geometry (80 scans)
- RGB pictures (7000) with SLR camera and flash for texture
- Fusion of TLS and photogrammetric point clouds after color adjustment and dense matching

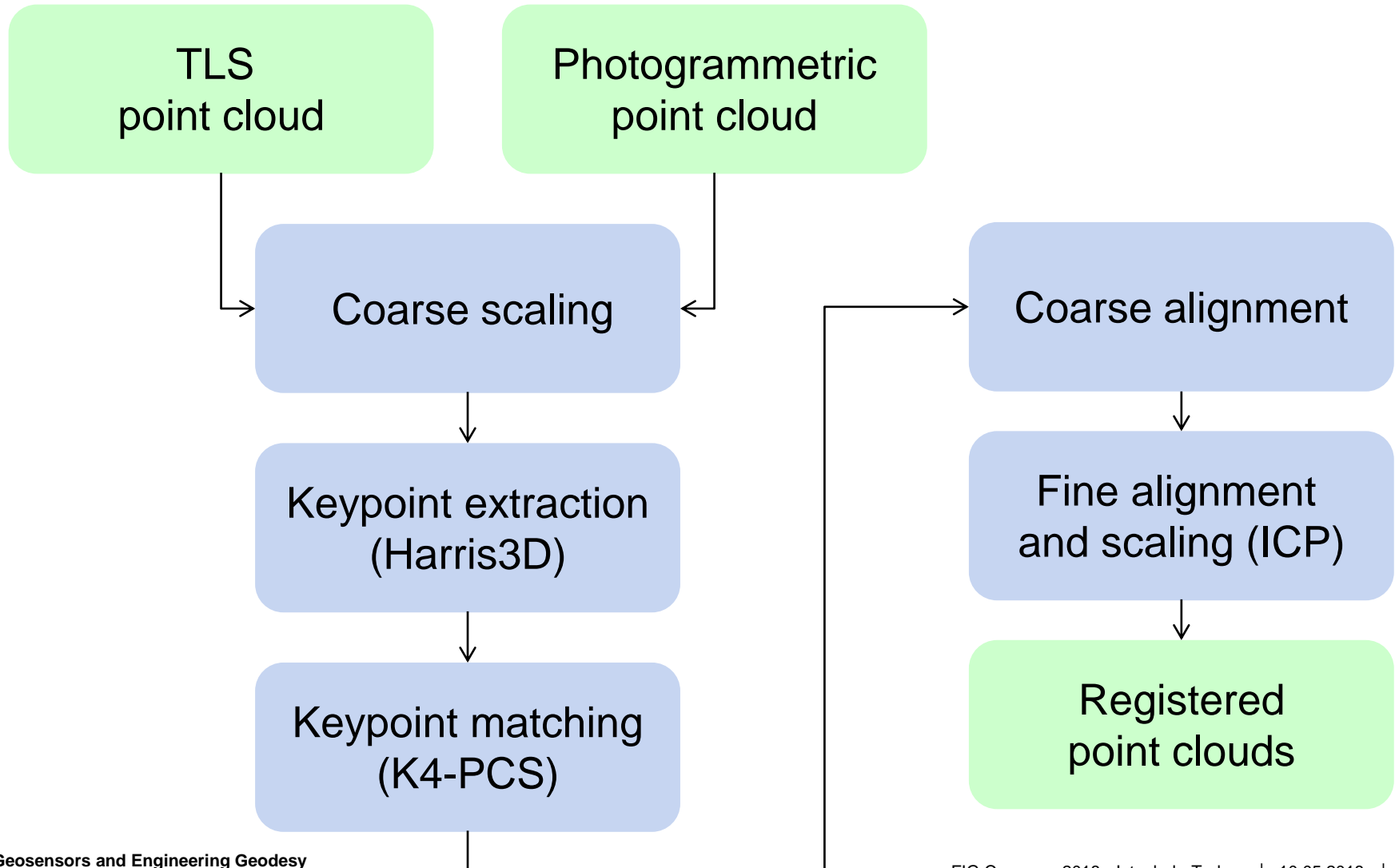


© University of Basel, LHTT Map: G. Heindl, S. Stucky



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Workflow 1 (Geometry)



Workflow 2 (Texture)



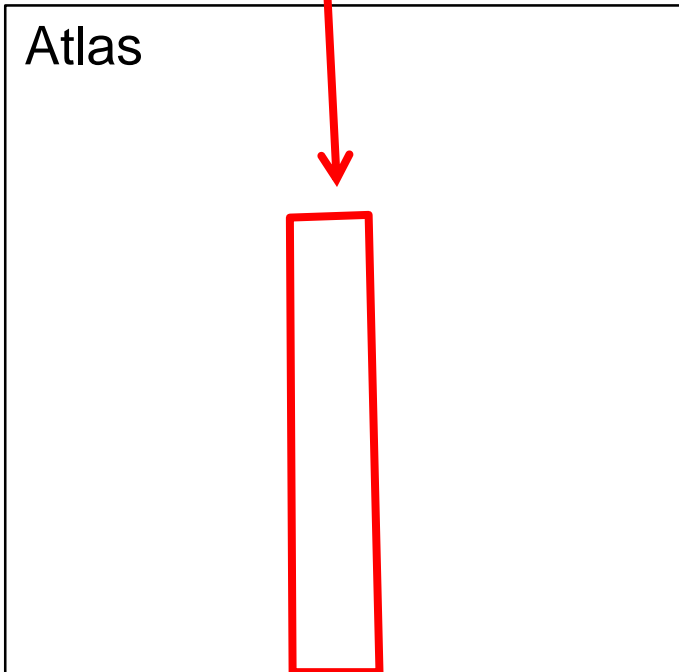
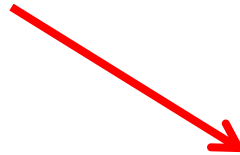
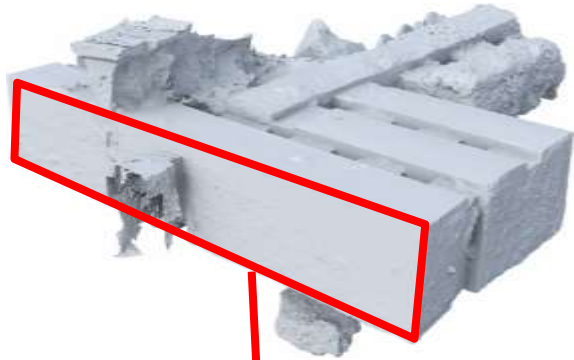
TLS
mesh

Oriented and
calibrated images

Creation of
texture atlas

Textured
TLS mesh

Texture Atlas



Workflow 3 (Reduction of resolution)

Challenge:

Resulting textured model too large
for RT visualization (25M faces)

Solution:

- Decimation of TLS mesh
- Calculation of bump maps
- New texture atlas:
Shading from bump map
plus original texture

Workflow 3 (Reduction of resolution)



decimated resolution (22k)
with bump map from the original resolution

Conclusion

- Multi-modal data acquisition for generation of 3d models with appropriate properties
- Variety of sensors for obtaining point clouds and colors
- Key are coregistration and blending
- Presented herein purely data driven approach for scaling and registration
- RT visualization using techniques from gaming industry and CG

