# Using BIM-Elements as Features for the Transformation of Local Point Clouds Created with Structure from Motion (SFM)

**Tim Kaiser, Enrico Romanschek and Christian Clemen (Germany)**

**Key words:** Deformation measurement; Engineering survey; Photogrammetry; BIM; Structure From Motion; Adjustment Calculation

**SUMMARY**

In order to use image-based point clouds that were automatically created with structure from motion (sfm) methods in a Building Information Model (BIM) the point cloud must be transformed into the building coordinate system. This can be achieved with a classical Helmert transformation. Usually control points i.e. points that have known coordinates and can be selected in both the point cloud and the building model are needed for the estimation the transformation parameters.

In this paper we present a novel approach to calculate these seven parameters. In the first step 3D line structures are extracted from the input image collection and matched to the planes coming from the BIM model. Besides of finding a suitable functional model for the observation equations a robust method (following a RANSAC-based algorithm) to determine a correct line plane match was developed. A BIM specific challenge is the extraction of appropriate plane parameters from the component-oriented 3D-model, since BIM knows a multitude of geometric representations, works with layered components and positions components in a cascade of spatial transformations.

The method is suitable, for example, for craftsmen who want to create point clouds of objects with in a limited area of a construction site or a building and want to visualize them for “defect description” or construction progress with a BIM model.