



## Case Study Indoor 3D Mapping of Lift Shafts without GPS

Digital planning data and exact 3D models of large building structures are already the norm today. Intelligent camera and laser scanning systems are often used for this purpose, which automatically create a so-called digital twin of an object or building structure. The particular challenge in the 3D measurement of lift shafts lies in the maximum height of up to 300m, the necessary measurement accuracy over the entire distance and the simultaneous localisation without GPS in order to be able to precisely record and localise even the smallest deviations from the plumb line, as well as the twisting of the cross-section over the entire height and other structural inaccuracies.

### Challenge & task

- The big challenge in indoor 3D mapping is localisation without GPS and the creation of 3D models based on huge point clouds.
- Lift shafts are measured floor by floor using a laser scanner installed on a tripod.
- The creation of an exact digital twin with a measurement accuracy of less than 1 mm takes several days to weeks.
- The task was to find a mobile 3D indoor measuring system for fast, simple and exact measurement of lift shafts including localisation without GPS data.

### Procedure

- Intensive patent and literature research in the field of 3D modelling, digital twin, indoor localisation, SLAM.
- Intensive exchange with selected experts in the field of 3D mapping and indoor localisation.
- Search for new technical approaches, start-ups and potential development partners via the international networks of the Deutscher Technologiedienst.
- Evaluation and summary of all results, creation of a technology matrix and development of a clear recommendation for action.

### Results

- Through the international research networks of the Deutscher Technologiedienst, 13 start-ups from 6 different countries were identified that are working intensively on mobile indoor 3D mapping without GPS and could already provide the latest prototypes for testing purposes.
- Through the international industry networks of the *dtd*, 15 companies were identified that are currently developing new systems for very similar tasks and are interested in cooperation.
- After joint evaluation with the customer, 4 systems / potential partners were selected and initial tests were carried out in lift shafts.

### Conclusion

Developing a highly accurate, mobile indoor 3D mapping system for creating a digital twin as easily and quickly as possible is a very big technical challenge in several respects. Through very intensive research and questioning of more than 20,000 experts in the fields of metrology, aerospace, defence, automotive and mining, 4 systems were identified that fitted the requirements almost exactly and in form offer an absolute competitive advantage in the field of lift construction.