



# MUM

## Mobile Urban Mapping

**Customizable system for the acquisition of 2D and 3D environmental data**

*The MUM system allows for the complete and efficient digitization of urban surroundings with one single system.*

Mobile mapping is increasingly important in the context of urban planning, as 3D city and infrastructure models have become valuable planning and engineering tools. Fraunhofer IPM's Mobile Urban Mapping System (MUM) is a turn-key solution for the acquisition of high-resolution 2D and 3D environmental data. It is designed as a modular system platform that allows for a flexible configuration of high-end sensors.

The Mobile Urban Mapping System (MUM) combines laser scanners and cameras with a positioning and orientation system to capture the environment. It is a robustly designed, flexible solution for continuous 24/7 deployment. We equip the system according to our customers' requirements, integrating, fully calibrating the individual components.

### **High-end laser scanner provides millimeter 3D resolution**

The MUM system comprises Fraunhofer IPM's Mobile Precise Scanner (MPS). This high-end profile scanner can take up to 3 million measurements per second and scans at frequencies ranging from 10 to 300 Hz, while providing a measurement precision of less than 1 mm. Integration and synchronization of multiple scanner heads is possible.

### **Georeferenced, textured point clouds**

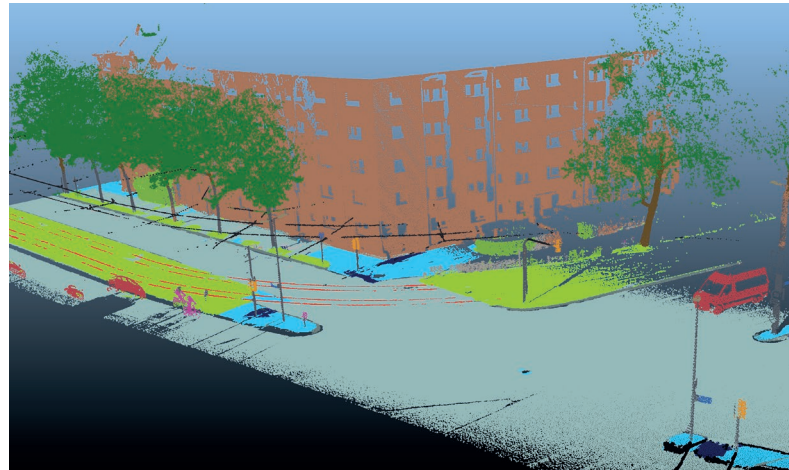
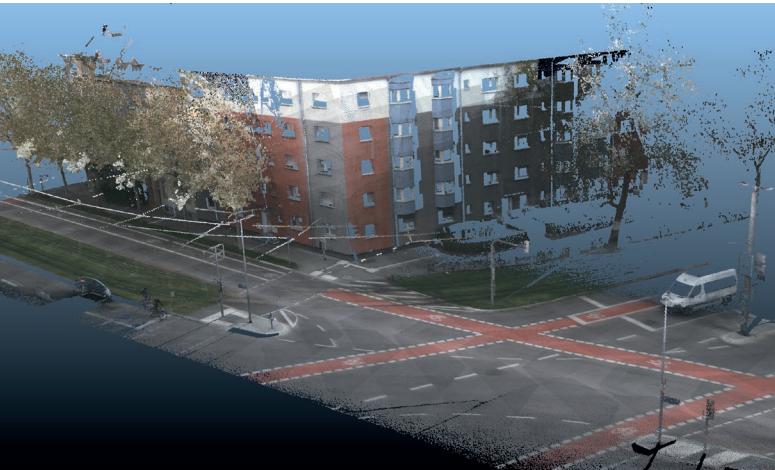
High-resolution cameras are used to capture the surroundings and texture the point cloud with RGB information. Several cameras with up to 65 MP can be integrated with individual positioning according to need. High-resolution panoramic cameras can also be included. State-of-the-art positioning technology, such as GNSS, IMUs and odometers, enables the precise computation of the vehicle's position and posture. This ensures highly accurate georeferencing of the point cloud and allows for the fusion with the camera data.

### **Additional sensors for moisture and road condition assessment**

Thanks to its flexible design, the MUM system can be customized to meet individual

#### **Our offer**

- Customization and individual sensor integration
- Control software
- Calibration
- Post-processing and data interpretation
- Maintenance and support



Left: Textured point cloud, reconstructed from data taken at 50 km/h with a CPS laser scanner and four cameras.

Right: Automatically segmented point cloud. Data interpretation was realized by using the automated 3D data interpretation software framework "3D-AI Urban" by Fraunhofer IPM.

requirements. The multispectral Clearance Profile Scanner (CPS-Plus) from Fraunhofer IPM can be integrated to detect moisture and vegetation.

Multiple sensors can be mounted to assess road conditions according to Federal Highway Research Institute (BASt) standards. These include line cameras with additional illumination to analyze the road surface. The cameras record high-resolution images of the road surface at speeds of up to 80 km/h and can detect cracks no larger than a millimeter. Fraunhofer IPM's Pavement Profile Scanner (PPS), which measures the transversal evenness of roads, can also be integrated. The PPS scans the road surface at driving speeds of up to 80 km/h. At

that speed, a measured 10 cm × 10 cm surface area contains up to one hundred 3D measurement points. An HRM bar (high-speed road monitoring) can be integrated to measure longitudinal evenness. Alternatively, Fraunhofer IPM can provide software to derive the longitudinal evenness in all lanes from PPS measurements.

### Automated 3D data interpretation

The MUM system comes with post-processing software that provides full control to the user. Additionally, Fraunhofer IPM offers AI-based software (3D-AI Urban) that automates the evaluation process and provides classified 3D objects. This eliminates the time-consuming process of manual data interpretation.



Typical sensor stack for a MUM system.

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