Mobile Urban Mapping System

Universal system for the acquisition of 2D and 3D environmental data

The Mobile Urban Mapping System MUM allows for the full and efficient digitization of urban surroundings with one single system.

3D mapping is becoming more and more important in the context of urban planning, where 3D city or infrastructure models make a valuable planning and engineering tool. The Mobile Urban Mapping System MUM by Fraunhofer IPM encompasses the entire workflow from the design of individual high-end measurement systems for high-speed acquisition of 2D and 3D data to data evaluation.

Precise, high-resolution digital 3D models of the environment combined with 2D imagery enable new digitized mapping processes. To enhance data acquisition speed, mobile mapping solutions are the method of choice. The Mobile Urban Mapping System MUM combines laser scanners, cameras, and a positioning and orientation system to capture the environment, automatically evaluating the data using artificial intelligence (AI). MUM is a modular system, which can be designed according to customers' requirements.

Millimeter 3D resolution

MUM comprises Fraunhofer IPM's high-end laser scanner CPS with up to 2 million measurements per second. Scanning frequencies are in the range of 10 to 200 Hz, while still providing a distance resolution of about 1 mm. Integration and synchronization of several scanner heads is possible. For pavement measurements, Fraunhofer IPM's Pavement Profile Scanner PPS or PPS-Plus can be integrated. The scanners scan the road surface at driving speeds of up to 80 km/h. A measured

surface area of 10 cm × 10 cm still contains up to one hundred 3D measurement points. In its PPS-Plus version, the scanner additionally produces a photorealistic image of the pavement with a resolution of 1.2 mm × 1.7 mm, which allows for the detection of even tiny surface defects.

Camera-based texturing

Several high-resolution cameras are used for texturing the point cloud with RGB-information. State of the art positioning technology like GNSS, IMUs and odometers enable precise computation of position and posture of the mobile platform, thus delivering a consistent, geo-referenced point cloud.

Fully integrated data flow

Fraunhofer IPM offers integrated measuring systems that cover the entire process of integration and fusion of all data streams. We design mobile mapping systems exactly
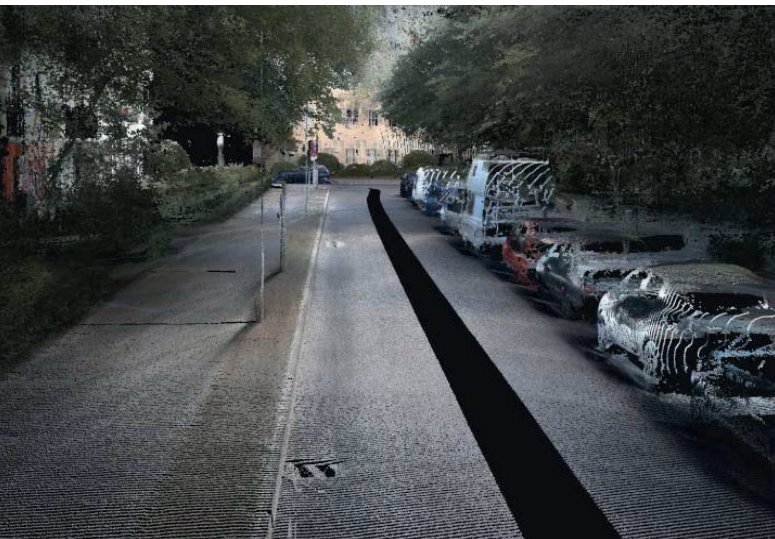
Left: Textured point cloud, reconstructed from data taken at 50 km/h with a CPS laser scanner and four cameras.
Right: Automatically segmented point cloud. Data interpretation was realized by using an automated 3D data interpretation soft-ware 3D-AI developed by Fraunhofer IPM.

tailored to the requirements of our customers by integrating and fully calibrating the appropriate components: from the desired number of cameras and laser scanners, to several optional 360° panorama cameras for documentation, low budget or high-end IMU/GNSS solutions with odometer, or appropriate laser scanners.

Automated 3D data interpretation

For efficient data interpretation, Fraunhofer IPM offers an AI based software, which automates the evaluation process, providing classified 3D objects. This eliminates the time-consuming process of manual data interpretation still common in most mobile mapping systems.
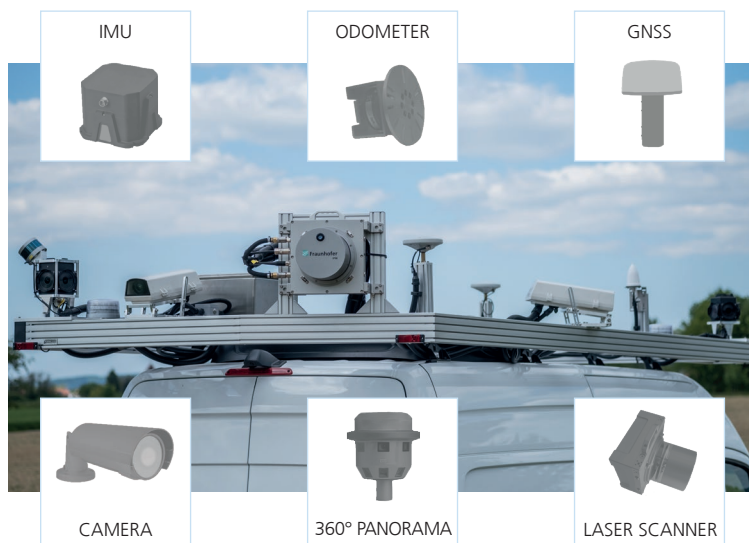
Typical sensor stack for a MUM system.

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