

PRESS RELEASE

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Strategy dialogue “Affordable housing and innovative building”

Quantitative measurement data as the basis for thermal building renovations

How do you establish a building’s energy efficiency? An optical mobile mapping system that is being developed at the Fraunhofer Institute for Physical Measurement Techniques IPM is expected to provide comprehensive data that will form the basis for planning energy-efficient refurbishments. Its core element is a multispectral LiDAR sensor that measures the geometry of the building and the thermal properties of windows and façades.

Generally, the renovation requirements of a building are determined by experts based on their examination of the façade, roof, windows, walls and materials. To estimate a building’s energy efficiency class, they almost exclusively rely on their expertise, making minimal use of measurement technology. This makes energy consulting lengthy and subjective, especially when it comes to the insulation properties of windows. As part of the recently launched project LaSanGe, which is funded by the state of Baden-Württemberg as part of the “Affordable housing and innovative building” strategy dialogue, Fraunhofer IPM is developing an optical sensor system. This system aims to provide quantitative data on the thermal properties of façades and windows, in addition to geometric building data. The new LiDAR sensor will be part of a mobile mapping system that captures buildings quickly and on a large scale from a vehicle. Municipalities or large building contractors can use the data to estimate where thermal retrofits are most needed and how much they will cost faster than ever before. “Building renovations need to pick up speed,” says Prof. Dr. Alexander Reiterer, Head of the Department Object and Shape Detection at Fraunhofer IPM. “Our mobile measuring system will be the first to provide a truly comprehensive data basis for thermal retrofits, which will significantly shorten the planning phase of building renovations.”

Multispectral laser scanner

The core element of the mobile mapping system is a novel multispectral LiDAR sensor that uses two lasers with different wavelengths to determine the insulation properties of windows. The optical properties of windows are highly dependent on wavelength. The rate of the backscattered signals should allow a precise quality assessment of the windows: type of coating, number of glass panes, etc. The LiDAR sensor is to be

Editorial notes

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supported by conventional thermal imaging cameras. The final result of the measurement is a 3D geometric point cloud enriched with thermal property parameters for the windows and the insulation. The multi-dimensional data is spatially and temporally referenced and can be incorporated in geographic information systems. This also makes it easy and cost-effective to document changes over time, such as through an annual survey.

The LaSanGe project

The LaSanGe (laser scanning for accelerated building renovation) project is funded by the state of Baden-Württemberg as part of the "Affordable Housing and Innovative Building strategy dialogue" (SDB) <https://www.sdb-bw.de/>

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Poorly insulated windows and uninsulated façades allow heat energy to escape:
In the future, mobile mapping vehicles equipped with LiDAR sensors and thermal imaging cameras will supply measurement data on the energy efficiency of buildings, providing a solid planning basis for thermal retrofits. Graphics: © Fraunhofer IPM

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