

3D multi-modal optical metrology for industrial and cultural heritage objects applications

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Recently most of the measurement tasks in industry and unconventional out-of-laboratory applications incl. cultural heritage objects refer to characterization and monitoring of 3D objects and structures and their performance under changing conditions. This may require full-field determination of many physical quantities including: their shape, displacements, strains, dynamic parameters (e.g. resonance frequencies), temperature distribution or internal structure. In the lecture I describe the hierarchical and multimodal measurement concept which enables to deliver results with requested sensitivity and accuracy and perform automatically measurements in difficult conditions. The reported measurement systems provide vital information to improve safety and efficiency of technological process, improve a product and/or monitor the influence of outside environment on the health of a structure. The example measurement systems, based on enhanced optical methods, fulfilling different tasks during production processes and monitoring of engineering and art structures are presented including:

- 3D digital image correlation method supported by thermovision, structured light and ToF method and their applications for structural integrity analysis in heat-and-power generating industry, building industry and testing of highly responsible composite structures (high pressure tanks and canvas paintings);
- interferometric methods incl. grating (moire) interferometry, digital holography, and white light interferometry and their applications used for local high sensitivity measurements of fracture mechanics and fatigue phenomena and parallel on-wafer quality control system for M(O)EMS;

Finally the perspectives of implementation of full-field optical measurement methods in wide range of industrial applications and the importance of their formal acceptance in the standard industrial procedures are discussed.