
Abstract:
Digital image processing was applied to develop a simple, robust and economical measuring system for detecting deformations in building structures. Selected points of the structure are captured by electronic cameras at regular intervals and their positions are measured in the digital image. The target points, in this case light-emitting diodes (LEDs), as well as the cameras used for measuring operate in the infrared range, which means that the quality of the images is not affected by the lighting conditions. Tests in the laboratory showed that using this technique it is possible to track targets over distances typical for building structures within a matter of millimeters. The practical applicability of the method was verified in a pilot project, for which the gym of the Staffelsee High School in Murnau in the district of Garmisch-Partenkirchen was chosen. The wide-span timber roof structure of the building was equipped with a system based on digital image processing gauging the movement of three points on each of the four main beams. Reference measurements can be taken with a built-in laser gauge. To be able to observe the correlation between weather conditions and deformation, the system is complemented by a weather station with snow-cushions on the roof of the building. Furthermore, the monitoring system is connected to multiple alarming devices.