Possibilities and challenges of measuring small fibre composite system structures using terrestrial laser scanning

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SUMMARY

Due to the rapidly increasing demand for living space, the way in which buildings are constructed must change. This topic is the focus of the Cluster of Excellence "Integrative Computational Design and Construction for Architecture" (IntCDC) at the University of Stuttgart. The development of new construction methods also poses new challenges for surveying and quality assurance. One of the construction systems developed involves coreless filament winding of fiber composite systems. The components are developed to be lightweight and with low material consumption, which is the reason that the design is based on the fibre-fibre interaction. The particular challenge here is that the position, diameter and shape of the fibres are of enormous importance for the structural properties. For this reason, the measurement of the fibres is of major importance. In this work, the possibility of measuring coreless fibre composite system components using terrestrial laser scanning will be investigated. Therefore, measurements of the laser scanners Leica HDS7000, Riegl VZ2000 and Trimble X7 are compared. The influence of a scanning spray is also considered. The analysis shows that for this application, time-of-flight scanners are better suited for measuring small structures than phase-shift scanners as these enable a more complete detection of the measurement object. It has also been shown that a more complete detection of the object is possible with larger angles of incidence, if the spot size is smaller. Furthermore, it becomes clear that the intensities, as well as the device-internal limit values for these, are decisive for the geometric representation of the object. as these enable a more complete detection of the measurement object. It has also been shown that a more complete detection of the object is possible with larger angles of incidence, if the spot size is smaller.
