

Advanced monitoring of the church of St. Benedict in Kančevci (Slovenia)

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Forum topics	<input type="checkbox"/> Energy in 21st Century	<input checked="" type="checkbox"/> Cultural Heritage in Digital World
	<input type="checkbox"/> Engineering Capacity Building	<input type="checkbox"/> Disaster Risk Management & Governance for Resilient Communities
	<input type="checkbox"/> Construction 4.0	<input type="checkbox"/> BIM Lifecycle, Facility & Asset Management

Abstract: (250 to 500 words: for each heading use the bullet points or narrative - the submission including graphics should not exceed one page)

Problems - Issues / Challenges-Needs	<p>A number of false steps have been made in the process of the recent church renovation works. During archaeological excavation in the main nave of the church at numerous positions foundations have been undermined that may cause severe cracking of side walls, separating of the nave from the bell tower and consequently damage on both artistic and structural elements on the ceiling of the church. However high trees in the vicinity of the church and SSF interaction may be also additional causes for structural degradation of the church.</p> <p>The challenges are:</p> <ul style="list-style-type: none"> - determine the current condition of the building with combination of different advanced geodetic and mainly non-destructive and minor destructive civil engineering testing techniques, - set-up of effective advanced monitoring protocol for the future assessment of both material and structural degradation, - identify main causes for structural degradation.
Solutions - Methods / Results - Findings	<p>Solutions – Methods:</p> <ul style="list-style-type: none"> - Crack-pattern investigation with set-up of monitoring positions measuring main deformations on church walls, main vaults of the nave and bell tower. - Monitoring of both exterior and interior of the church by means of 3D laser scanning and comparison with the results from crack-pattern monitoring. - Profiling of moisture conditions along the walls and bell towers together with taking material samples for further laboratory investigations. <p>Results - Findings:</p> <ul style="list-style-type: none"> - Church has severe structural cracks. At some positions remedial actions were already introduced. - Monitoring started in November 2017, thus we cannot effectively exclude the influence of different seasons on obtained results yet. - Geometric changes of the object were determined from levelling and terrestrial laser scanning data and they match well with the results of crack pattern investigation.
Novelty - Value / Relevance to ...	<p>Assessment of the interior and exterior of the church by means of advanced methodology approach considering interdisciplinary work. Results of monitoring will be used for easy determination of progress of structural and artistic deterioration as well as for the optimal planning for effective strengthening measures on the church.</p>
Forum statement	<p>Advanced monitoring of cultural heritage buildings demands interdisciplinary work and effective combination of geodetic and civil engineering measurement methods enables quick and efficient assessment of artistic and structural deterioration of cultural heritage assets.</p>

Keywords: (up to 5 keywords)

Advanced monitoring; church; laser scanning; levelling; degradation

Graphics: (please use the gray area below for representative graphics or graphical summary: select the gray area below and paste your graphics)

