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Simplified seismic assessment of monument applying the 3D time evolution presentation

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Forum topics		
	☐ Energy in 21st Century	☒ Cultural Heritage in Digital World
	☐ Engineering Capacity Building	☐ Disaster Risk Management & Governance for Resilient Communities
	☐ Construction 4.0	☐ 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	In order to perform numerical seismic analyses, which predict the behavior of structures during earthquake with adequate accuracy, many data needs to be considered to build a sufficient model. For monuments, this task is even more difficult, since there might be very limited information (if any) on the structural system, built in materials, details etc. available. Furthermore, monuments have often been constructed in more phases in different periods and subjected to structural changes through time. Due to its age and exposure to different environmental influences and events, monuments may already possess different types of damage. All this information is essential to determine the proper geometric and material characteristics of the monument for evaluation of the seismic resistance of the structure and of its assets (valuable non-structural elements) and furthermore to design (appropriate) intervention measures.
Solutions - Methods / Results - Findings	In the paper, application of seismic assessment approach using the case of stone masonry Asinou Church in Cyprus will be presented. The structure of the church has developed since 1105 in several steps until today and has valuable wall paintings. In the paper it will be demonstrated how the seismic resistance of church considering structural parts from different periods can be assessed by simplified performance-based approach introduced by EU FP7 project PERPETUATE (2010-2012, http://www.perpetuate.eu). For the input parameters, the recently introduced multimodal capturing of geometry and monument surface appearance with indoor and outdoor 3D laser scanner combined with high resolution digital and infrared camera provides improved accuracy and quality of data needed for monument assessment. Special attention will be paid to explanation of application of 3D information captured by integrated instrument.
Novelty - Value / Relevance to …	The presented case is one of the case studies carried out within the on-going project EU H2020 INCEPTION (http://www.inception-project.eu). Project realizes innovation in 3D modelling of cultural heritage through an inclusive approach for time-dynamic 3D reconstruction of artefacts, built and social environments. It enriches the European identity through understanding of how European cultural heritage continuously evolves over long periods of time.
Forum statement	"The nondestructive data collection can in combination with data obtained by digital tools be very useful for the definition of the input parameters for numerical models used for seismic assessment of cultural monuments."

Keywords: (up to 5 keywords)

Cultural monument, assessment, earthquake resistance, time evolution, 3D model.

Graphics: (please use the gray area bellow for *representative graphics* or *graphical summary*: select the gray area be llow and paste your graphics)