Session ID: CHH-3

Title
DIGITAL TWINNING OF CULTURAL HERITAGE STRUCTURES IN EARTHQUAKE ZONES

Convenors
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Description
The most advanced step in the path of knowledge of a structure consists of the definition of a virtual shadow or digital twin, as close as possible to the system under observation, not only from a geometric and material point of view, but above all from a mechanical point of view. The model corroboration process not only allows the consistency of the different experimental information to be checked, reducing the uncertainties of virtualization, but above all creates a predictive tool for preservation. This is especially important in the case of seismic protection of architectural heritage structures, where the principle of minimal intervention applies.
One of the main problems of the digital twinning is the conceptualization of virtual models that are able to reproduce quite accurately the behavior of the physical object (be it a mechanical or physical behavior) with a minimum computational effort.

To reach this milestone, a deep research for theories and models that explore behaviors that go beyond the classical continuum theory, e.g., Finite Element (FE) method, is needed for cultural heritage structures, contemplating synergistic approaches to modeling, for example by resorting to multi-theories (e.g., Discrete Element (DE) method interconnected to FE method) or directly by resorting to experimental data that partially or wholly replace parts of the digital twin, e.g., grey-box approaches. The automation of the interconnection of data, theories and modeling approaches is still an open issue in digital twinning, thus, the session intends to stimulate a multi-disciplinary debate about harmonizing heterogeneous information. Contributions will include but are not limited to digital twinning of structures, FE model updating, hybrid simulations, prediction of the seismic response, model driven SHM, multiphysics data integration, digital twinning of masonry structures, DE model corroboration and verification, Uncertainty Quantification, Surrogate Modelling, etc.

Invited Speakers
S. Gabriele [3], S. Cattari [4], G. Imposa [5], D. Abruzzese [6], G. Abbiati [7], I. Brilakis [8], C.G. Lai [9]

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