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# Vulnerability assessment of cultural heritage structures

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Cultural heritage (CH) assets are the legacy of a society that are inherited from the past generation and can be lessons for contemporary construction. Not only the CH assets but also the non-CH structures and infrastructure, and the interconnection between them are crucial to be considered in a vulnerability assessment tool for the sustainable reconstruction of historic areas. Since most of the CH assets were not designed based on robust design codes to resist natural hazards such as earthquakes, vulnerability assessment and preservation of them are pivotal tasks for the authorities [1]. For this aim, HYPERION, an H2020 project, was formed in order to take advantage of existing tools and services together with novel technologies to deliver an integrated vulnerability assessment platform for improving the resiliency of historic areas.

Geometric documentation is the first and most important step toward the generation of digital twins of CH assets that can be facilitated using 3D laser scanners or drones. Afterward, the finite element method is an accurate enough approach for developing the simulation-based digital twins of cultural heritage assets. For calibration of the models, the result of the operational modal analysis from the ambient vibration testing using accelerometers can be utilized. Structural analysis for the prediction of the structural behaviour or near real-time analysis can be carried out on the calibrated models. However, finite element analysis needs so much computational effort, and to tackle this limitation, equivalent frame methods can be utilized for the modelling of structures [2]. Herein, the structural vulnerability assessment module of HYPERION is highlighted by presenting the application of the module in some of the case studies of the ongoing project.

## REFERENCES

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