Recent trends in computational masonry mechanics: walls and vaults eventually reinforced by innovative composite materials.

Sviluppi recenti della meccanica computazionale delle murature: pareti e volte eventualmente rinforzati da materiali compositi innovativi.

Gabriele Milani
Associate Professor
Department of Architecture, Built environment and Construction engineering (ABC)
Technical University of Milan - Politecnico di Milano
Piazza Leonardo da Vinci 32
20133 Milan Italy

In the seminary, a review of popular recent and efficient numerical procedures for the analysis of masonry structures in the inelastic range will be provided. After a concise discussion of the key issues to tackle for a realistic prediction of masonry behavior in the inelastic range and the most diffused computational strategies suited for masonry (micro and macro modelling), particular emphasis will be given to homogenization, a fair compromise exhibiting most of the advantages shown by micro and macro-modelling. First, the basic principles of homogenization applied to the linear elastic case will be reviewed, then the problem will be extended in case of rigid-plastic constituents (homogenized masonry strength domain evaluation) and finally applied in presence of non-linear materials with softening. In particular, four simple approaches proposed by the speaker for the determination of the homogenized strength domains and for the study in the inelastic range of running bond masonry will be discussed, with particular attention to simple and double curvature structures (arches, vaults and domes). A generalization in presence of innovative strengthening materials will be also treated. Some of the models will be finally extended in the non-linear dynamic range and the results of realistic structural benchmarks presented.

Short Bio

Gabriele Milani has been Associate Professor at Politecnico di Milano since 2014, previously Assistant Professor (2009-2013), Post Doctoral Researcher at the Swiss Federal Institute of Technology in Zurich ETHZ (2008) and University of Ferrara (2005-2007). His research focuses on masonry modeling and safety assessment of historic masonry in seismic area. He works on FEM limit analysis, rubber vulcanization and seismic isolation. He has been awarded with a Telford Premium (2012) by ICE, a Bathe Award (2014) and a most cited author diploma for a paper in Computers and Structures (2006). He has co-authored 112 ISI papers, he is the 2nd author in Scopus under the keyword “masonry”. He is EIC of a Journal dedicated to masonry (International Journal of Masonry Research and Innovation) and co-editor of a Scopus journal generalist for civil engineering. He will co-chair the next International Masonry Conference IMC10 in 2018.