Kobe + DICEA + code_aster: Creating a framework for the validation of procedures with engineered masonry
Summary

00: about us

01: archetypal masonry elements

02: epistemic uncertainty reduction

03: dynamic identification

04: nonlinear dynamics
Kobe is an approved spin-off at the University of Florence Department of Civil and Environmental Engineering.

Members

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Scientific mentorship
Various levels of expertise are offered through the knowledge and experience of the members and the partners.
Existing constructions are exposed to heavy risks because:

1) they weren’t meant to resist to extraordinary events
2) their initial status is unknown
Masonry Archetypes

"Engineered" masonry vs chaotic masonry.

Main structural elements:
1) columns
2) walls
3) arches and vaults
Vault

Full-scale laboratory test on a vault subject to a corner settlement.

Phase 1: unreinforced

Phase 2: reinforced with FRP strips
1) quasi-static loading (corner settlement)
2) different constitutive laws (MAZARS and ENDO_ISOT_BETO N)
3) sensitivity analysis
4) experimental test data validation

 Vault

\( f_{mt} = 0.15 \text{ N/mm}^2 \)
\( f_{mt} = 0.25 \text{ N/mm}^2 \)
\( f_{mt} = 0.35 \text{ N/mm}^2 \)

\( s = 0.5 \text{ cm} \)
\( s = 2.0 \text{ cm} \)
\( s = 3.0 \text{ cm} \)
\( s = 5.0 \text{ cm} \)
Wall

Laboratory tests for static, cyclic and dynamic behaviour of masonry wall elements.
Wall

1) homogenization techniques (Lourenço et alii)
2) elastic modulus sensitivity analysis
3) cyclic behaviour (Naraine and Sinha)
Epistemic uncertainty

What can Reverend Thomas Bayes do with masonry related uncertainties?

We can update and reduce the uncertainty level using the Bayes theorem.
Dynamic identification

Identification of the free height and the elastic modulus of the Becci tower.

Assessment of the fragility curves based on the sensitivity of the compressive and tensile strength.

Nonlinear dynamics

Procedures have been set. We believe that 3D analysis will be the future in the assessment of historical and existing buildings, not only in the masonry field.

Thank you for the kind attention!

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