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On different discretisation strategies to solve the kinematical and equilibrium problem for masonry-like structures

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Most of the European residential and monumental heritage is represented by masonry structures. Nonetheless, their mechanical behaviour is currently subjected to an intense scientific investigation [1]. In recent years, interest in the computational prediction of the fracture mechanisms exhibited by masonry constructions when subjected to load and kinematic (i.e. settlement/distortion) data has been greatly increased. Specifically, it has been proved that common commercial software cannot accurately predict the no-tension response of the material. To this aim, accurate numerical strategies have been developed using completely different methods: non-associative approaches based on limit analysis, finite element methods and, recently, discrete element methods.

In this contribution, adopting a normal, rigid, no-tension material model, two methodologies are directly employed to solve the boundary value problem either using a displacement or an equilibrium approach [2]. Specifically, the two variational criteria are based on the minimum of the total potential and complementary energy in order to take directly into account the effect of foundation displacements. In both cases, the functional spaces are discretised using two opposite strategies, i.e. using continuous or singular functions and the corresponding boundary value problems are translated and then solved as constrained optimisation problems.

Based on the format type 1, the authors will raise a debate comparing different numerical strategies showing pros and cons both from a mechanical and numerical perspective.

REFERENCES

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