## Application of finite discrete element method in dynamic analysis of masonry structures

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## ABSTRACT

Building construction using stone or clay bricks which are held together by mortar is one of the oldest building techniques which is still in use today. In spite of the simplicity which is manifested during the construction of masonry structures, understanding and describing mechanical behaviour of those structures, especially in conditions of seismic loading, represents a true challenge. The reason is the nature of masonry structures which might or might not be filled in with mortar in joints among the blocks. Such structures show a complex and particular nonlinear behaviour.

Many masonry structures are located in seismically active zones in which earthquakes exposed their vulnerability. Among these, number of buildings and monuments are classified as cultural heritage. However some of them, which were originally built with mortar joints, have experienced a significant loss of mortar during the long period of time and the behaviour of these structures becomes similar to those made of dry stone masonry. With the aim of increasing their resistance, many of dry stone historical structures were further strengthened by steel clamps and bolts.

In order to preserve and maintain the cultural heritage and reduce the damage of structures, it is necessary to perform numerical simulations with appropriate numerical models.

In this work, the application of the numerical model for dynamic analysis of masonry structures based on a finite-discrete element method [1] is presented. The proposed model [2,3] considers the effects of the behaviour of masonry structures due to dynamic action, crack initiation and propagation, energy dissipation mechanisms due to nonlinear effects, inertial effects due to motion, contact impact and attaining state of the rest that is a consequence of energy dissipation mechanisms in the structure. The application of the model was performed on several examples related to behaviour of dry stone masonry structures strengthened with clamps and bolts as well as confined and unconfined masonry walls.

## REFERENCES

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