

Simplex algorithm for 3D limit analysis of roman groin vaults

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ABSTRACT

In Roman Baths the Romans employed groin vaults of great dimensions, with maximum span more than 20 m; simple tools of structural analysis of ancient wide span vaulted halls are still lacking, due to geometrical and material complexity. In this paper we study the collapse behavior, under horizontal static action, of a corner cross vault of the Baths of Diocletian in Rome (Hall I). In the present modeling, masonry is discretized as a system of interacting rigid bodies in no-tension and frictional contact. The computational code consists in a linear programming approach which make use of a series of optimization packages via lower and upper bound techniques of limit analysis. In the paper, a solution strategy based on a modified simplex algorithm has been introduced in order to manage the large number of contacts given by a 3D block assembly. One more task of the proposed problem consists in a suitable description of the overall 3D geometry, here afforded with a specific pre-processing approach.

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