

Using geometrical data for the structural analysis of historical domes: the case of the SS.Trinità Church in Torino

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ABSTRACT

Investigations on the geometrical configuration of historical masonry domes represent a fundamental element to take into account in the study of the structural behaviour of these architectural elements, above all if they have an historical and artistic relevance. Indeed, accurate geometrical data lead better structural evaluation and more reliable numerical models that can be used to evaluate the structural health state of the building and to planning strengthening and conservation interventions. To this aim, a multidisciplinary approach able to rate and to collect the highest number of valuable data for the numerical modelling is required, also considering historical and archival research [1][2][3][4].

The church "SS. Trinità" is a 16th century building of great historical, architectural and structural significance in the historic centre of Turin. It owing its fame primarily to the architect who built it, Ascanio Vitozzi, and to the large dome, built after the architect death [5]. The dome suffered over the years from structural problems that caused deformations on the intrados of the dome.

This study presents the design and the implementation of the numerical model of the masonry dome of SS.Trinità church. The starting point is the geometrical study of the dome from a point cloud obtained through a laser scanner survey. The real geometrical configuration, and some deformations observed in the intrados of the dome, were taken into account in the design of the numerical model. Structural analyses were conducted by using two different models of the dome-drum system, in order to evaluate if the deformations can be caused by construction errors or to the violent fire suffered by the dome in 1942.

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