

## Digital survey as a diagnostic tool

### A model for the tower of the Castle of Cerretaccio

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### Abstract

In the world of architecture, in particular closely linked to the architectural design of new constructions, 3D models have always been used as a method of deepening the design vision. In this case, the model constitutes the connection that exists between the 2D design and the real construction, representing the anticipated and editable reproduction of the finished object.

In restoration and in the study of existing heritage, the 3D model, intended as a product of processing data obtained from digital survey (point clouds and photographic mesh), can be a tool not only of accurate representation, but also the communicative link between what the building is today and what it hypothetically has been. What the model represents in the architectural design, that is the projection of the idea in the object created, in the restoration becomes the tool of projection in the past.

This type of approach associated with a stratigraphic study and a physical-chemical analysis of the materials, is particularly applicable in all cases where a building, subjected to different kind of stress, has suffered a collapse of the structures, and when the numerous ruins in the terrain are particularly fragmented and decomposed and are therefore not easily identifiable.

Given these considerations, it is interesting to present a case study where this method is of essential importance in the analysis of the collapse dynamics of the building.

The Castle of Cerretaccio lies, immersed in the woods of Chianti, in the Municipality of Castelnuovo Berardenga. The castle, dating back to the 11<sup>th</sup> century, represented a bastion of invaluable importance in the history of the city of Siena. Despite lots of Florentines assaults, the castle never seemed to capitulate to enemy attacks and was able, in all circumstances, to repel them to guarantee the defence of the Sienese territory to which it had always been faithful.

Although the building assumed a great fame in the period of the first Sienese-Florentine war, in a few centuries it turned into a mass of ruins which, subjected to degradation, have transmitted very few fragments of the building to our days. The cause of this demographic and architectural

interruption is to be found in the episode of the collapse or demolition of the central tower of the castle, a symbol of the power of the family that owned it, the Cerretani, and an essential point of sighting and defence in the case of enemy sieges.

The impact of the tower did not occur only against the ground but destroyed all the structures around it. This, according to historians, was the beginning of the ruin of the castle. The population abandoned it, probably pouring into some nearby centre and the site was never repopulated. Around this episode of such significant change in the events of the settlement and its material structures, two contrasting versions were defined.

According to a manuscript written by Don Virgilio Peruzzi the destruction of the castle is traced back to episodes extraneous to the military events that were affecting the city of Siena. In fact, according to this version, some exiles from the Sienese prisons took possession of the castle, carrying out raids and crimes of all kinds in the surrounding territory. The Sienese Republic then decided to intervene by engaging 100 “sappers” who had the task of demolishing, precisely, to “sap” the tower. Therefore, this procedure involved removing the walls at the base, replacing the empty walls with wooden beams that, once consumed by the fire, gave way, causing the building to capitulate.

The other version instead, supported by Giovanni Antonio Pecci believes that the destruction dates back to the last war events of Siena, around 1555. According to his writings, in fact, the castle was destroyed in the last war of Siena, clearly by the Habsburg Empire that ended a decommissioning enterprise begun years earlier.

However, between these two versions, by consulting the historical INGV (Istituto Nazionale Geofisica e Vulcanologia) databases, a third one could emerge, even more significant, not reported by historians, but worthy of analysis. In fact, it is credible that the large earthquake that struck the Chianti area in 1558 caused the tower to collapse and led to the destruction of the castle.

This is one of the most evident cases in which the digital survey and therefore the production of a 3D model could become not only a representative tool but rather an essential diagnostic tool. By implementing a backward procedure, starting from the various fragments of the tower lying on the ground and going to reassemble them, up to virtually reconstruct (or physically using a scale model) the original model of the tower, it will be possible to highlight any deficiencies consistent in the foundations, fractures that can be traced back to the seismic action or to the war activity or possibly aspects never taken into consideration.

This disassembly and reassembly method is an elementary process, of easy intuition, but it can lead to deductions that are anything but immediate, demonstrating how digital surveying can and must therefore represent, for the study of the existing heritage, not only a passive means of representation of the state of affairs but rather going to play the active role of diagnostic tool.



## Figures



*Fig. 1. Tower section. (© A. Maramai)*



*Fig. 2. Some fragments of the tower. (© A. Maramai)*





*Fig. 3. Digital survey campaign. (© A. Maramai)*

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