

# Integrating Material Formations in Digital Models of Architectural Ornaments

## A Process-Based Approach to Documenting Anatolian Stone Carvings

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Digital surveying and modelling technologies have significantly enhanced the accuracy and speed of architectural heritage documentation. Intricate ornamental forms, which are notoriously difficult to record using analogue techniques, were previously documented mostly in two-dimensional scaled or free-hand sketches and photographs. Therefore, specifically in the case of ornaments, digital modelling and surveying tools are utilised to record the final forms of heritage assets as-crafted by master craftsmen. Furthermore, digital models can be more than just instances of digital objects. They can convey information about traditional construction cultures. Today, architectural designs, encompassing data for time, cost, and building systems, can be represented within building information models. Digital models can also feature information about the materials and methods used in the construction. However, technical research is still insufficient in the field of architectural heritage to preserve information about materials and construction processes as part of digital geometric models (Ewart and Zuecco 2019; Scopigno et al. 2017). Materials and “making” (Ingold 2013) have been mostly overlooked in technology-driven digital heritage studies. Documentation relies heavily on the geometric understanding of final shapes as indicators of design styles. Design styles are holistic systems with construction factors that go beyond the final forms, especially when considering the traditional construction methods performed on-site by master craftsmen on a 1:1 scale. This paper argues for the need to integrate digital workflows and to document construction knowledge within digital models to bridge the gap between technology-driven and humanities-driven research.

The research focuses on the culture of geometric ornaments carved in stone in Anatolia and introduces a process-based computational approach to documenting it. This culture exemplifies the relationship between geometry and construction. Although there has been a rich exchange of traditional craft culture for centuries in Anatolia, many of the techniques are not practiced today and are facing extinction. In Anatolian heritage studies, literature on construction techniques is scarce and fragmented. Consequently, many heritage buildings are restored with imitative and standardized techniques regardless of their origins and locations (Tanyeli 2017). In an exceptional study on stone carvings, Asgari (Asgari 1988) conducted an in-depth analysis of the procedures involved in making a capital, where the drawings effectively convey the algorithmic nature of the subtractive process. The present study explores a digital modelling workflow for incorporating material formations of subtractive techniques. Experiments with a selection of decorative stone columns found on the facades of 13th-century monumental buildings in Anatolia serve as the basis of the study (Figure 1). It provides a framework for expanding the scope of digital modelling from being limited to final forms to a process-based heritage database that deepens our understanding of a particularly rich stoneworking tradition.

## References

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