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HISTORICAL TRACES' INTERPRETATION AND VIRTUAL RECONSTRUCTION - THE CASE OF ACROCORINTH CASTLE

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Abstract:

When archival information misses or is insufficient, the structure itself becomes the most valuable archive unfolding stories of monument's life. The current essay examines how the building traces can be used as tools of historical interpretation and how important is digital survey in this respect through the presentation 3d virtual documentation of the castle of Acrocorinth. The overall venture was initiated by the 25th Ephorate of Byzantine Antiquities under the supervision of the Ephorate dr archaeologist Demetrios Athanasoulis on the occasion of developing the web-platform ecastles.culture.gr for the Digital Enhancement of the Castles of Peloponnese (Athanasoulis *et al.* 2015).

Key words: virtual archaeology, virtual reconstruction, data acquisition, documentation of cultural heritage, 3d-modelling

1. Introduction

Despite the development of automated techniques of 3d documentation, every survey demands the tailoring of a unique suitable methodology, bonded with the specific aim of documentation. When working in situ the surveyor deals with complicated problems of function, historic phases and construction in order to produce not only accurate but also comprehensive measuring results. The survey of Acrocorinth castle was executed in summer 2015 by the writers architects-conservators. The questioning that arised through the documentation process was the cause for the conducting of this essay, that aims to display the interdependency of survey method and monument's interpretation.

Acrocorinth castle crowns the abrupt cliff that rises by Ancient Corinth in Peloponnese, a city of major importance in Ancient Greek and Medieval times. It consists of three successive fortification lines and runs a perimeter of 3000 m. The current formation is a long-time process, a byzantine core that was extensively tranformed in the mid-byzantine period following in a large scale the ancient wall understructure (Athanasoulis 2014) with later alterations of capturers (Ottoman, Venetians). The 3d-visualization period concerns the mid-byzantine castle (843-1210) due to the relatively big existing structural elements that permit the re-thinking of its peak-point period. The survey was restricted in the area of the castle that is located on the western and more accessible side of the rock between the first and second byzantine defence line (Figs. 1, 2).

Figure 1: Aerial view of the survey area between the two defense lines, photographer: K. Xenikakis.

2. Survey and 3d representation method

The digital survey was based on multiple techniques and required developing a methodology of seamless combination, filling gaps and avoiding overlapping (Remondino *et al.* 2009). The natural rock peculiarities and the necessity of creating analytic plans of the existing situation for further restoration projects of Acrocorinth's complex forced to develop a synthetic approach of documentation methodology with combination of different tools. Total station Leica TS06 was extensively used for the measuring of general plans after sketching of the preliminary recording plans. The blind areas were completed by hand measured details. Image rectification processing for both inner and outer walls followed. Laser scanning data for geometrically interesting selected areas and interior spaces (El-Hakim, et al., 2007) from previous and new surveys was

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exploited and linked to general plans by using common check points.

Because castles pose complications in their presentation in digital virtual reality formats (Finan 2012) there was a necessity of tailoring a personalized 3d methodology for Acrocorinth. The 3d model construction followed a synthetic process and not an automated scanner-based reproduction due to the fragmented overal icon of the castle and the natural obstacles. The careful analysis of the possessed material was fruitful for the building phases' identification and the creation of 2d graphic reconstruction plans. The representation was equally based on the existing indicators on the masonry of the castle and the assumptions created by comparisons with similar elements and archival information.

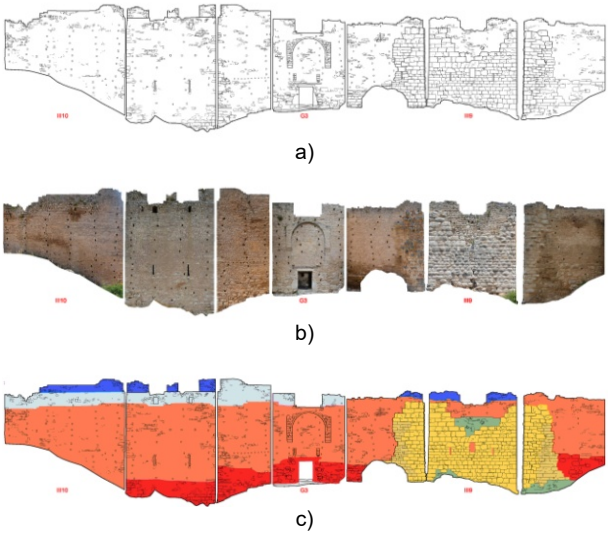

Figure 2: a) Elevations-existing condition; b) Image Rectification; c) analysis of building phases.

The 3d representation was made in 3d-studio max environment with small number of polygons, in order to be lighter for touring options, after inserting the 2d reconstruction plans. The final 3d-touring outcome was made in Unity WebGL in collaboration with a web developing company where hot-spots of archaeological information were introduced (Fig. 3).

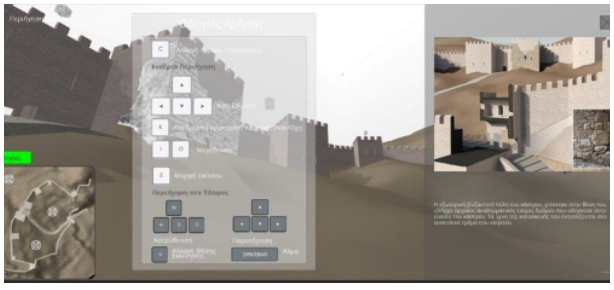

Figure 3: Final 3d tour in Unity with pop-up info windows.

3. Interpretation of special survey traces

3.1. Continuity and extension assumptions - Completion with analogies

Although relics standing scattered are incomprehensive, if we investigate them as a part of a whole they become valuable. The continuity of a construction can be confirmed and missing elements can be supplemented based on analogies. This was the case in the gate of the southeast corner where lateral wall relics' if prolonged reveal a previous elbow tower whose form could be completed in comparison with the standing towers.

3.2. Peculiar structural elements recognition

Another method is the recognition of peculiar indications on the construction that could possibly confirm a construction hypothesis. Survey revealed that a suspicious corner extruding from the parapets of the southern tower could solve the accessibility problem to the superstructure of the tower (Fig. 4). The metrical reconstruction was matching with the hypothesis of a straight line staircase attached to the towers platform.

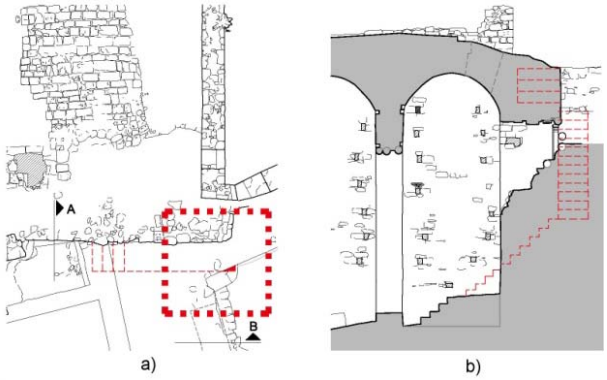

Figure 4: South Tower's survey Plans with special indication of staircase trace: a) ground plan; b) cross-section.

3.3. Corresponding joints or Parallels

The accuracy often defines if joints and parallels are corresponding and correlated with a building phase.The precise measuring of these features in comparison with other prototypes in the multilayered second Byzantine Gate led to a reasonable deduction.The gate was initially a rectangular-shape tower protected by a portcullis mechanism, whose core was later on alterated in order to facilitate the access to artillery platforms (Fig. 5).

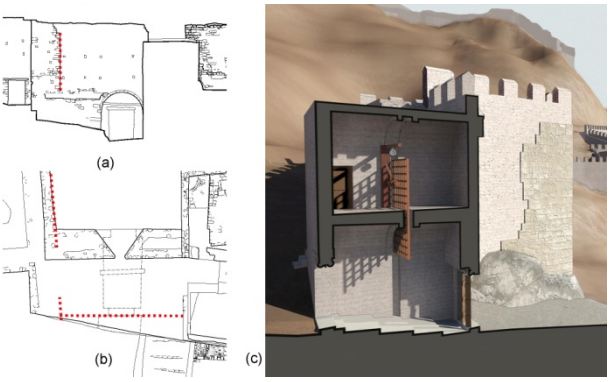

Figure 5: a) 2d graphic reconstruction plans-indication of joints and parallels; b) 3d representation of Byzantine Gate 2.

3.4. Rejecting and confirming scenarios

When other methods are inadequate, the conclusions could come by a "reductio ad absurdum" techniquesuch as in the re-thinking of the complicated first Byzantine Gate where multiple possible scenarios were made and

rejected for different reasons each. The most reasonable scenario prevailed and resulted to the representation of a two story passageway tower with a two-unit first floor (Fig. 6).

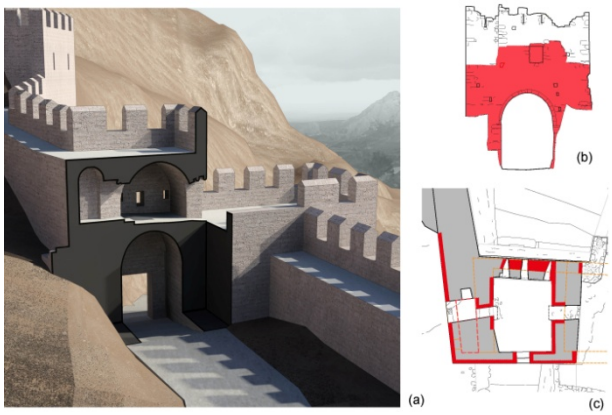

Figure 6: a) First Byzantine Gate 3d representation; b-c) Survey plans with indications of fragmented byzantine masonry.

4. Assessment of survey's contribution to interpretation and 3d-reconstruction

Appropriate selection of documentation methodology provides an indisputable accuracy in surveys, crucial in deducing conclusions about building's history. While elaborating data, the surveyor gathers multiple-sourced information that serve complementary to interpretation. Fragmented site elements like disrupted masonry can be reconnected due to the digital precision and can confirm the reconstruction hypothesis and cases like misleading eye-illusions can be rejected. In addition to this, the survey in unexcavated areas helps to surface investigation for any further archaeological excavation.

As Pletinckx (2009) noted "virtual archaeology complements perfectly documentation and conservation efforts and even can act as an integration activity to bring all information together in a structured way". In general all the acquired data from this survey can be stored and connected with older and new surveys for future use when necessary.

Unlike material reconstruction which has specific limitations, 3d-archaeological reconstruction must be as complete as possible in order to cover virtual-touring demands. In such a synthetic and subtractive approach, scholars have to give answers to the totality of the monument and fulfil huge gaps, although assumptions are inevitable. When there is no evidence, 3d modeling is based on hypothesis on different degrees of likelihood, (Georgopoulos 2014). 3d reconstruction is a non-destructive way with great potentials of reusing data for future different alternatives where the historic scenarios are weak.

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