

Creating Interactive 3D Visualizations of Archaeological Data: A Case Study of the Early Bronze Age Helike Corridor House

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Abstract

Recent review of Geoinformatic Technologies for landscape archaeology [1] has highlighted methodological issues concerning state-of-the-art digital techniques available to archaeologists. Virtual environments and data visualization help the archaeologist to explore, comprehend and explain data and information acquired from vastly diverse sources [2]. This paper advances research by addressing interactive visualization issues in archaeology [3, 4] through a methodological approach for fully geo-referenced, 3D interactive visualizations using open source tools. The method is focused on the generation of 3D models, and on placing archaeological datasets and artefact representations over large landscapes visualized on Google Earth (GE). A time-line for each object is defined so that relevant period data can be displayed. The Helike Corridor House (HCH) and related archaeological and borehole data are used here as a case study [5]. First, we discuss how items from a geoarchaeological database (e.g. borehole data) organized on a spreadsheet or on a MySQL database are augmented by a tag-based structure with attributes using the XML-Extensible Markup Language for conversion into KML file format for GE display. Second, we examine the methodology for creating geo-referenced 3D models using SketchUp by direct manipulation of the geographic area imported from GE into SketchUp. With regards to this issue, we explore the addition of textures and the exporting of the final 3D model to KML format. Finally, we submit our propositions on how overlays and animations in GE are created in the perspective of acquiring a powerful interactive experience and easy sharing of archaeological data. Overall the paper enhances the range of insights on the digital relationships with archaeological data that enable new inferences and knowledge by the implementation of universally shared low cost applications.

References

- [1] A. Sarris (2015). *Best Practices of Geoinformatic Technologies for Mapping of Archaeolandscapes*. Archaeopress.
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- [3] S. Jeffrey (2015). Challenging Heritage Visualisation: Beauty, Aura and Democratisation. *Open Archaeology* 1 (2015), 144-152.
- [4] P. Allen *et al.* (2004). Seeing Into the Past: Creating a 3D Modeling Pipeline for Archaeological Visualization. *Proceedings of the 2nd International Symposium on 3D Data Processing, Visualization and Transmission (3DPVT'04)*, 751-758. IEEE.
- [5] D. Katsonopoulou (2011). A proto-urban Early Helladic Settlement Found on the Helike Delta. *PROTOHELLADIKA-The Southern and Central Greek Mainland, Helike IV* (D. Katsonopoulou, ed.), 63-88. The Helike Society. Athens.

Some main steps in the methodology for geo-referenced 3D model building are illustrated in the figures below.

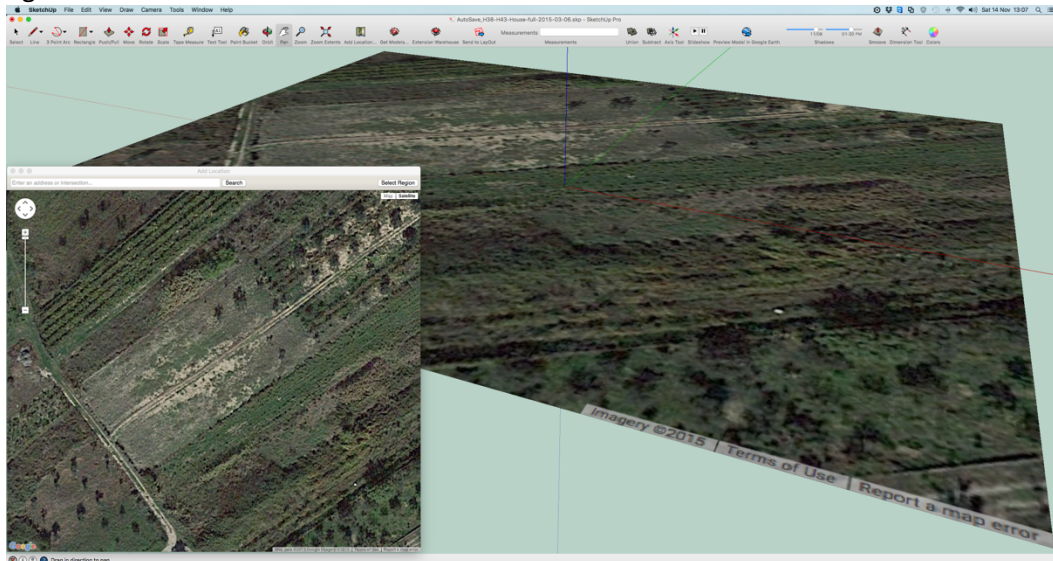


Figure 1: Geographic location import from Google Earth into SketchUp for fully geo-referenced 3D modelling.



Figure 2: Ground plan of excavated trenches overlaid on terrain providing guides for geo-referenced 3D modelling. The HCH spans over areas 1 and 2 circled in red in Trenches H43 and H38.

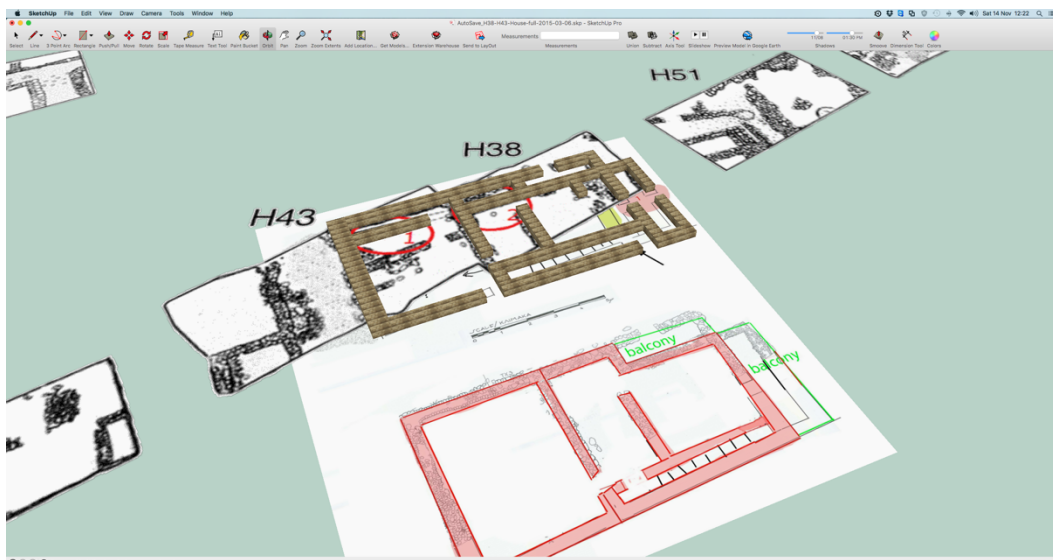


Figure 3: Terrain layer is hidden and scaled drawings are registered to the geo-referenced trench features. The complete house foundations (brown) are modelled in 3D. The drawings in pink illustrate the first floor plan.

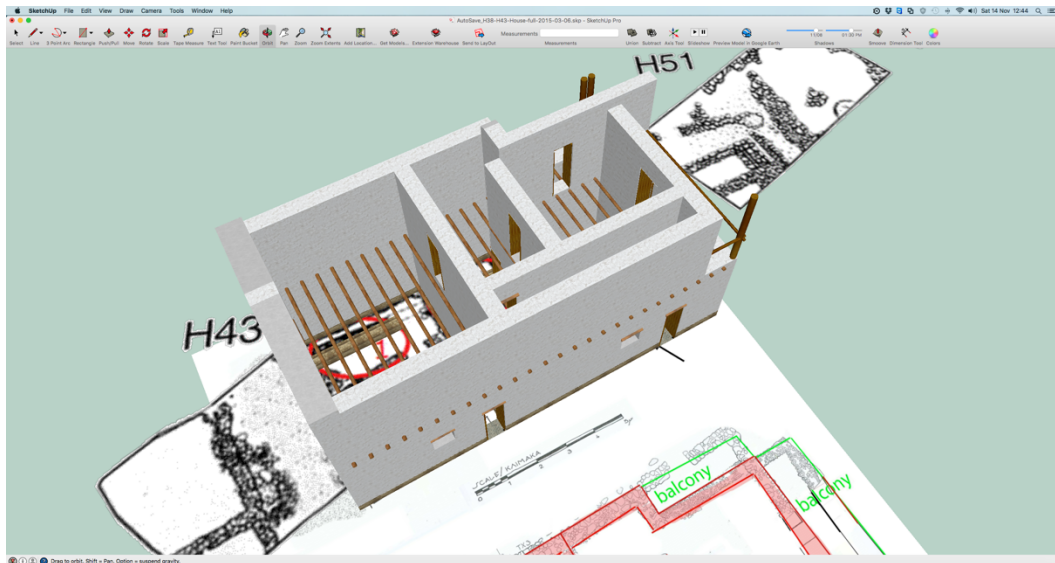


Figure 4: Walls, wooden features to support first floor, doors and balcony are created by extrusion.

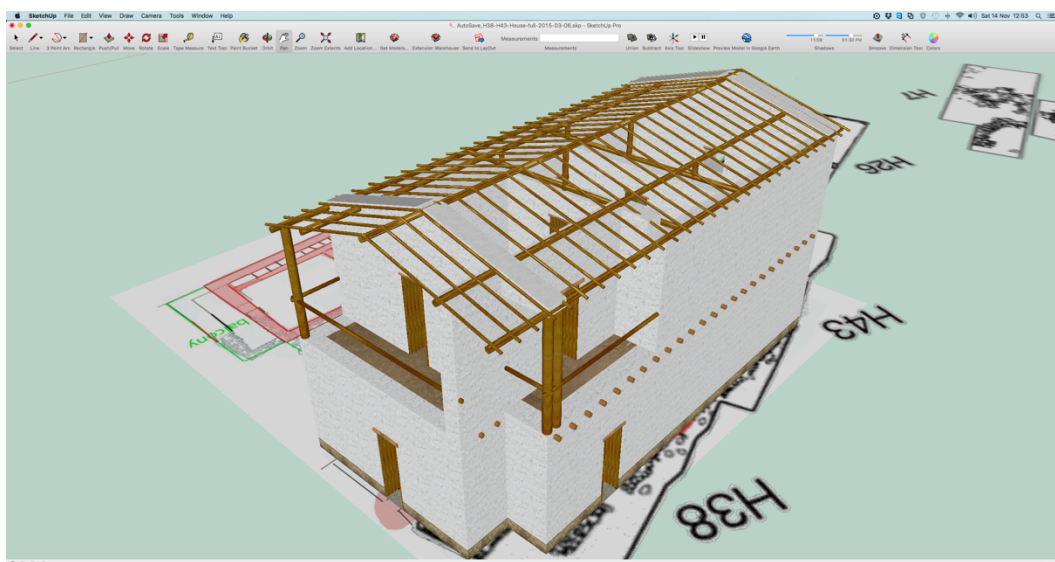


Figure 5: Roof structure and remaining floor features are added to the model.

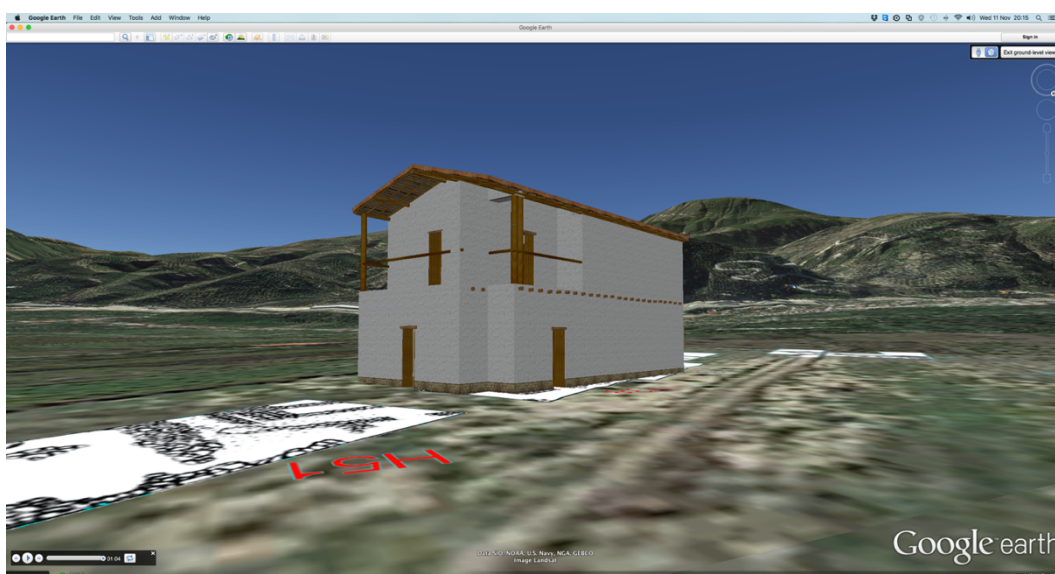


Figure 6: The exported 3D model to KML format is visualized with overlaid trenches on Google Earth.