3D Documentation in Archaeological Research

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Abstract: *Recently developed survey technique outline an archaeologist's new tools for documentation, analysis and visualization of archaeological data. This research paper aims to identify new techniques/methodologies for the 3D documentation and conservation of archaeological site. In today's modern age, the creation of 3D computer graphics for creating virtual reality environment applies to archaeological monuments/sites. The 3D documentation helped researcher in making hypothesis regarding the original architecture, its layout and also helps in visualizing and better understanding the ancient sites. In this paper, we know how to study of a archaeological site has been studied with main focus on the rectification of the original ground plan of the site drawn by hand.*

Keywords: 3D Modeling, Ancient Archaeology, Digital Archaeology, Settlement pattern.

Introduction

Latest developments in imaged-based 3D modeling have lead in a new era, one where primacy of laser scanning is the principle means of three-dimensional recording of archaeologically important features and landscapes. In archaeology, both measurement and documentation are very important, not only to record rare archaeological sites, but to record their excavation process as well. Annotation and precise documentation are very crucial as evidence is actually destroyed during archaeological work.[1]

On most sites, archaeologists spend a reasonable amount of time making notes, drawing plans and taking photographs. In archaeological work of the past, spatial information for excavations and structures was recorded in line graphs, video, photos and other forms of two-dimensional recording methods. However, three-dimensional documentation methods have been gradually applied to archaeological excavations. Archaeologists can now use the data recorded during excavations to create virtual 3D models suitable for presentation of project report, restoration planning & digital archiving. Although many issues still remain uncertain.[2]

This paper will present some 3D documentation and digitization of archeological information for creating virtual artifacts and virtual environments, for building visual interpretations of the excavations, buildings, pottery, and other elements of the ancient world which can help in improving knowledge about the antiquity. This paper presents a model for using a tool of 3D documentation in archaeological research.

Recording During Archaeological Excavation

3D documentation of an archaeological site recorded accurate information. The digital outcome is a set of overlapping scaled 3D model containing a large amount of information about geometry of the excavated features and their layers as well as calibrated color information. A laser scannercan should be used for making a 3D plan on complete excavation area containing detailed information on all deposit, wall sand structures. Archaeological research calls for an elaboration of a documentation that involves general and detailed site plans, drawings, pictures, topographical maps, etc.

Recent documentation strategies of current excavation most often takes the form of paper forms, narrative description, and spatial recording in a geographic information system, which are all 2D based methods that seek to record a 3D space. Attempts to develop a 3D documentation system for excavation have been carried out with varying degree of success.[3] Despite such attempts, a perfect system, one that is photorealistic and spatially precise and designed to store excavated data in a 3D environment that facilitates calculations of volume, an examination of spatial relationships, and is easily updatable, does not exist. Regardless of these limitations, the spatial integrity of image-based 3D models would provide an ideal basis for a 3D excavation recording system, since most of the software packages permit area and volume calculation functions.

Site area measurements: For the photogrammetric work and the integrated 3D restoration of the site, the following site surveying was done.

- Establishment of a 25 points network, dependent on the National Reference System.
- Calculation of control points coordinates for the aerial and terrestrial photos.
- Calculation of 3D coordinates of detailed points at the parts of the Acropolis that are not in the photos. The combination of aerial and terrestrial photos has significantly decreased the area of those parts and accordingly the laborious and time consuming procedure of the field work for the completion of the plans. Mainly the ruins of the construction foundations of the Hellenistic era, where the masonry consisted of relatively small stones, and which have a respite of approximately a few cm from the ground surface were measured.[4]

Direct measurement of the height difference between the construction distinctive points and the ground, for those that were not photogram metrically produced or by other field measurements. The combination of the above methods resulted in the collection of all necessary data for generation of a complete, unique, accurate and reliable digital 3D documentation of the Acropolis.

Analysis of Archaeological Object/Artifact

In the past, object analysis depended on either direct physical access to objects or the usually inferior experience of pouring over 2D representations or written descriptions. High-fidelity 3D digital artifacts can help in bridging the gap in quality of data available to researchers by improving the experience of indirect object interaction. Even the physicality of distant object interaction can be partly dealt with by integrating 3D printing technology.[5] Now we used new modern 3d technology and will save the all data in digital form. .

The relative closeness with which digital artifacts can be distributed across physical boundaries and distances will prove favorable to scholarly collaboration, while conservation deliberations of safe transport, physical storage space and object deterioration is not an issue. In few hours, an object discovered in the field can be sent as a 3D model anywhere in the world, increasing the pool of expertise beyond those present at the excavation site to provide a more informed preliminary analysis.[6]

Conclusions

As modern archaeologists, we are expected to be thorough and efficient custodians of the information we have been entrusted upon with. 3D modeling image is fresh, exciting, and scientifically valuable, but should be approached sincerely with clear analytical goals in mind. Practically, 3D models may offer enormously superior visual and spatial representations of objects and areas than conventional 2D methods, but they also represent an analytical resource, provided that diligent consideration of how and why a 3D dataset is created takes place before the first picture is snapped.

Thus, we will use 3D documentation of any archaeological site or monument. Archaeology is a destructive act because all human works are temporary and attempts to faithfully record and duplicate object areas in a digital environment are the closest that an archaeologist can come to recreate the moment of discovery. After the 3D documentation of this site , we have preserved its important data in digital forms. This data will help us in the study of this area in future.

The ability to authentically record, digitally duplicate, and rapidly disseminate photorealistic 3D representations of subjects of archaeological interest is only possible when approached with foresight and only valuable if researchers in the field and in institutions find ways to create effective collaborative spaces. In the absence of collaborative innovation, the archaeological field runs the risk of simply imitating the results of conventional tools and methods without realizing the full potential of a digital recording system.

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