VISUALIZATION IN NAUTICAL ARCHAEOLOGY

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Digital Humanities\(^1\) is a new academic field for the creation, implementation, and interpretation of computer technologies. The University of California Los Angeles (UCLA), established the Center of Digital Humanities and the Experiential Technologies Center, launching multiple projects in social sciences, design, architecture and archaeology\(^2\). Their objective is to construct digital models of historical and archaeological artifacts to explore them in the digital space. With the project of Underwater Cultural Heritage, digital modeling methods on land are implemented in underwater environment, contributing to the visualization of nautical archaeology.

With the prologue of information technologies into archaeology, 3D documentation techniques, laser scanning, photogrammetry, and computer aided design/drafting (CAD) tools have been extensively used. Even if 3D visualization and presentation models are becoming widespread, the methodology of conventional 2D orthographic drawing maintained its importance in the academy. The initial examples of 3D models were giving limited clues about the texture and material of the artifact -abstract models-, but development of algorithms led to more realistic visualizations. Structure from motion (SfM)\(^3\) algorithms made possible the generation of digital models out of the methodically taken photographs. We conducted fieldwork for the Project of Underwater Cultural Heritage in November 2013 to apply these SfM tools in an underwater setting.

UNDERWATER CULTURAL HERITAGE PROJECT

With the permission of the Ministry of Culture and Tourism, we conducted archaeological surveys along the Lycian coast of Turkey. Our aim was to document archaeological and historical finds to provide data for the information systems.

\(^1\) BURDICK vd. 2012  
\(^2\) PRESNER – JOHANSON 2009  
\(^3\) VERHOEVEN 2011, 67-73.

Fig. 1 A panoramic view of underwater

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The main objective was to retrieve the data from the artifact without decontextualization, as the in-situ preservation is the first option listed in the “Convention on the Protection of the Underwater Cultural Heritage 2001” by UNESCO. Following this preservation methodology, a systematic archaeological survey was conducted by divers. Discovered artifacts were locally georeferenced and data was entered into a database system.

In addition to general mapping documentation, studies included taking sets of photographs for photomosaic and recording video (Fig. 1). However, these techniques provided only 2D representation of 3D cargo sites and finds.

In 2013 campaign, we used Structure from Motion (SfM) software to process sets of photographs for generating 3D models. Even though sites and artifacts differ in size and in depth, the main technique was to take sets of sequential photographs covering all sides and angles. This technique may be briefly summarized as 3D scanning of the object by taking photographs. In case of standing objects such as amphorae, pithoi, ceramic pieces, architectural objects and anchors, photographs were taken following a spiral pattern.

Since the lighting conditions vary according to topography and depth, a variety of light sources and lenses are used. Later, the photographic sets are processed by the modeling software without photo editing.

In the 2013 campaign, models of 100 finds and four archaeological cargo sites were generated from site photographs. Even with this low-budget technology, we achieved accurate 3D models easily. The efficiency of this technique brought the idea of shifting the design of the online virtual museum from conventional 2D display of the artifacts to 3D photorealistic models.
**CONCLUSION**

At the early stages of the project we developed a data collection methodology following an in-situ preservation guideline. Without decontextualization of the artifacts, we retrieved the data to create an online inventory. Photorealistic models of the artifacts brought the challenge of an immersive virtual museum project with an emphasis of 3D virtual environments to fruition. We are currently at the stage of exploring methods of display and dissemination of the models online.

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