

## ASINOU

### MULTIPLE-USES OF 3D MODELS OF A HISTORIC MONUMENT

#### ABSTRACT

A novel approach was used across several Research projects, to document the UNESCO World Heritage site of Asinou Church in Cyprus<sup>1</sup> using various modern techniques, such as UAV, photogrammetry and 3D printing. Digital 3D Models created from UAV photographs, were used for a variety of purposes related to tourism, education and HBIM. The approach provides architects, archaeologists, civil engineers and cultural heritage experts an accurate, simple and cost-effective method of documenting cultural heritage sites. Furthermore, the applications subsequently derived signpost the way to multiple uses of 3D models and the importance of a holistic approach to documentation in supporting this.

The approach taken at Asinou provides architects, archaeologists, civil engineers and cultural heritage experts an accurate, simple and cost-effective method of documenting cultural heritage sites. Furthermore, the applications subsequently derived signpost the way to multiple uses of 3D models in HBIM, cultural heritage, education, tourism by specialists of many kinds and the general public together with the importance of a holistic approach to documentation in supporting this.

**KEYWORDS:** cultural heritage, architecture, documentation, 3D models, HBIM, gamification, augmented reality

#### INTRODUCTION

The famous Byzantine painted church of Panagia Phorbiotissa of Asinou lies about five kilometres to the south of the village of Nikitari in the Troodos range of mountains. The church is dedicated to the Virgin Mary and is considered to be one of the most important Byzantine churches in Cyprus. The main church is the only surviving part of the Phorves monastery. The church is dates from the early 12th century AD and the murals inside range from the 12th century through the 17th century. The church is recognised as a World Heritage Monument by UNESCO, as it is home to perhaps the finest examples of Byzantine Mural paintings

Starting in the 1960s, the Asinou church site became the object of an ambitious restoration project, with an associated effort to study and catalogue the murals and architecture of the church. To highlight this effort and present the findings a research institution focused on Byzantine studies in the USA published an attractive volume<sup>2</sup> that presents a number of

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<sup>1</sup> <http://www.byzantinecyprus.com/>

<sup>2</sup> Annemarie Weyl Carr and Andreas Nicolaides eds. *Asinou across Time: Studies in the architecture and Murals of the Panagia Phorbiotissa, Cyprus* Washington, D.C.: Dumbarton Oaks Research Library and Collection, 2012.

perspectives on the history of the church of Asinou, its murals and architecture, its place in Cypriot history and culture, and the painstaking methods used to study and preserve the site and its murals.

The chapters of *Asinou across Time* cover the development of the murals and paintings within the church in chronological order, starting with the original work that was created when the church was founded. The introductory chapter provides the historical, social, and cultural context of the church, the original monastery, and its place in Cypriot history and the broader Mediterranean region. At the time of the church's construction, "Cyprus was a prosperous, strategically important bulkhead of Byzantine naval power," and this advantageous situation generated the resources needed to build and maintain such a meticulously decorated church, using costly pigments and other materials that were considered rare, and therefore expensive, at the time.

The monastery remained intact and functioning under a varying range of rulers, expanded and new murals were added. The Venetians were especially careful not to disrupt the established religious life in Cyprus, not wanting to unduly incite Cypriots against Venetian rule. In the end, the monastery fell into disuse by the early part of the nineteenth century, slowly decaying because of a "slow transformation of the rural economy following a long demographic decline" in the central region of Cyprus that surrounds the church. However, the associated church—as opposed to the building itself—continued to operate to serve the local population. Limited resources available meant that the unique murals and paintings in the church were nearly impossible to maintain. Attempts were made under British leadership to catalogue and restore the artwork, but these produced mixed results at best.

## **APPROACH**

A novel approach has since been used across more than one EU Research projects, to document the using various modern techniques, such as UAV, photogrammetry and 3D printing.



Hundreds of images from the monument were taken using a UAV with an attached highresolution camera. The images were processed to generate an accurate digital 3D model and reproduced using a 3D printer. Such a methodology provides architects, archaeologists, civil engineers and cultural heritage experts an accurate, simple and cost-effective method of documenting cultural heritage sites and generating digital 3D models

using novel techniques and innovative methods. This approach can also be used in urban or rural environments to document large scale sites which traditionally are time-consuming and labour-intensive.



A high-quality 3D model has been made from these photos. The following image derives from a recent one, made using Agisoft Photoscan, where the frescoes were digitised in order to produce a 3D model of the interior.



Infrared Cameras were used as imaging technology and intangible information gained for perceptual and real-time rendering. The images obtained are of very high quality and can be edited as needed in order to be used in any application.



Some of the assets have been used, for example, during the development of an **interactive book** including a puzzle in 2D and 3D form. When the user completes the puzzle, the story of the fresco appears and later directs them to a video.

An **educational game** was also created where the user needs to find the ‘hotspots’ in the picture. If they succeed, the specific area scales up and a short description of the fresco is displayed.

A **Hologram of the Priest** narrates the story of Asinou.



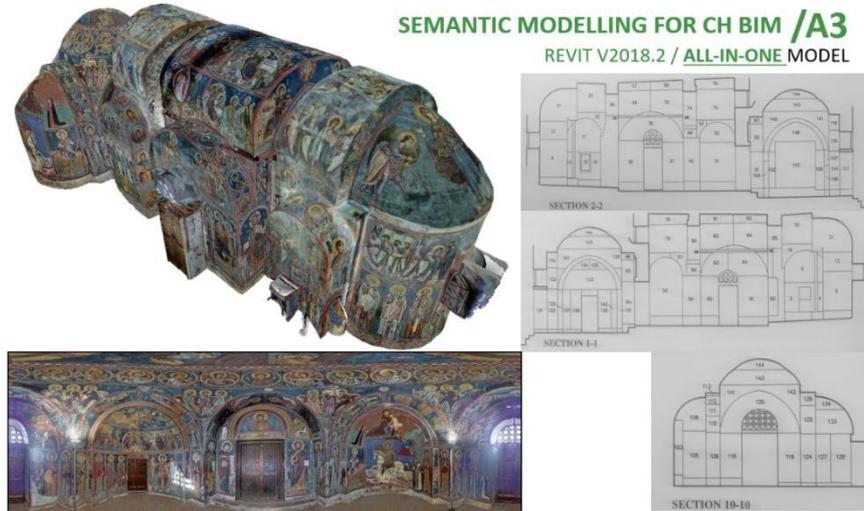
Mobile phone and tablet **Augmented Reality** applications to be used as a digital tour guide since the church doesn't provide a tour guide 24/7. The priest, in digital 3D form, will explain the history and provide the information needed. The church will also act as a live museum where significant parts of it will become live during the tour.

Applications in progress include: **Heritage Building Information Modelling (HBIM)** through an accurate 3D model which holds all the available information about the monument including material architectural, historical, structural information, etc.



This is characterized by an “all in one” philosophy which will lead to a VR application where the users are virtually present in the church and explore its aspects according to their preferences (e.g. as engineer, tourist, explorer etc.)

### CUT / DEMO CASE / ASINOU (AHC01)



The Asinou – UNESCO World Heritage List monument.

Amongst the dissemination activities, at the Mediterranean Science Festival, a creative workshop on the Asinou Church was held where parents and children together sketchpainted and assembled beautiful outcomes.



### REFERENCES

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