Chapter 68
Automatic Classification of Decorative Patterns in the Minoan Pottery of Kamares Style

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ABSTRACT

An important feature of the Minoan culture is the pottery of Kamares style, that documents the Cretan cultural production between the first half of the 2nd millennium BC. This high level painted production, characterized by the combination of several diverse motifs, presents an enormous decorative repertoire. The extraordinary variety of combinations between elementary motifs according to a complex visual syntax makes interesting the automatic identification of the motifs, particularly upon potsherds. A complete pipeline to accomplish this task is still a challenge to Computer Vision and Pattern Recognition. Starting from a digital image ROI identification, motif extraction, robust contour detection should be performed to obtain a bag of digital shapes. In a second phase each of the extracted shapes has to be classified according to prototypes in a database produced by an expert. The co-occurrence of the different shapes in a specimen will, in turn, be used to help the archaeologists in the cultural and even chronological setting.

INTRODUCTION

In the past decades, the application of the computer science in the archaeological research, and especially in the field of prehistory, turned out from a simple auxiliary technology into a cognitive strategy influencing the approach to the ancient artifacts. Although the introduction of the database enhanced the possibility of dealing with large amount of text data, the problem of taking into account huge groups of visual data still remains unsolved. One common case that makes hard the initial steps of an archaeological study is for example the analysis of decorative repertoires of some prehistoric pottery classes that are characterized by the exuberant use of a multiplicity of motifs. The most complicated artistic production of the Mediterranean prehistory is certainly the Kamares style pottery (Figure 1), flourished in Crete in the first half of the 2nd millennium, which main feature is to present a complex system of polychrome painted decoration with a rich decorative alphabet aimed to produce an endless variation of visual results. The highest number of vessels and potsherds available of this class all over Cretan territory and the fact that a complete framework for the Kamares decorative grammar and the associations 'motif/vessel/site/ chronological layer' is far from being understood, determined a stop in the cognitive progress of the Minoan civilization.

In this perspective Computer Vision and Pattern Recognition could provide a great support in automatically assisting the archaeologists in classification of Kamares pottery fragments (Figure 2), especially considering that in many cases, the visual informations available are of several kinds, like watercolors, black and white and color photographs of unequal resolution and quality, pencil sketches and high quality digital photographs. Within the research program Archeomatica Project (IPLab, 2010) of the Catania University, devoted to the application of Computer Graphics and Image Processing techniques in the field of prehistoric archaeology (Stanco, Battiato, Gallo, 2011), a specific study for the developing of an automatic classification system of the Kamares simple decoration elements (Farinella, Stanco, Tanasi, 2008), (Guarnera, Stanco, Tanasi, Gallo, 2010) (Gallo, Stanco, Tanasi, in press) started under the inspiration of the Center of Cretan Archaeology (2010) of the Catania University, dealing with the Kamares pottery from Phaistos (Levi, Carinci, 1988), (Carinci, 1997).

The application of this research strategy on the available visual *corpus* of image data is the

Figure 1. Examples of Kamares style vessels (this image has been obtained as a collage from several public sources)

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