

Preface

Archaeology constitutes a vast discipline involving several subdisciplines, theoretical positions, and research methods. Within this great variety, their professionals produce and manage large amounts of data about evidences of our past and present, from which they create new knowledge, constituting the knowledge about heritage of a particular community. This knowledge defines the community at present, and is transmitted to the present and future generations. In addition, any new piece of information or archaeological knowledge created serves as a basis to build new hypothesis of work or new research lines for an archaeological site, area, community, or heritage problem achieved. Thus, any archaeological data set captured, created, interpreted, and managed acquires special relevance, as basis of the archaeological knowledge that we produced, but, increasingly often, these data sets are large and complex information structures underestimated or used only in specific contexts like an archaeological site or project.

Current trends incorporate software engineering strategies from the beginning of the archaeological research conception in order to assist knowledge generation processes from large archaeological data sets. As a science of the information, software engineering provides a repository of techniques, methods, and tools to manage, process, use, and exploit information. Using them, it is possible to assist domain professionals in performing processes ranging from the analysis of raw gathered data to the generation of new knowledge based on them. Successful examples are software genomics research or business decision-making processes. This assistance is also possible in archaeology and heritage information.

However, and despite their relevance and the regular application of software engineering solutions to the archaeological domain, the knowledge generation process in archaeology poses a challenge for software engineering, mainly due to the lack of formal studies about it. This implies that we do not know which particular processes in archaeology we must assist and what should be the appropriate assistance in each case. Furthermore, the archaeological information, in general, the humanities, possesses some particular characteristics that are especially difficult to deal with by software, such as the presence of high subjectivity, the fact that much

information is uncertain or vague, and the importance of the temporal aspect of the information.

All these aspects, among others, represent current challenges in archaeological software assistance. This book aims at presenting state-of-the-art research and future trends on software strategies to manage and build software systems focused on generating new knowledge from large archaeological data sets. As a result of years of research, the book also presents specific new techniques to integrate data conceptual and visual assistance in our archaeological software systems: how to model from archaeological textual sources, how to create dynamic and conceptually rich data models, how to capture cognitive processes performed in analyzing archaeological data sets, and how to define visual and interaction strategies to improve visualization areas in archaeological data analysis. All these parts are explained in detail and integrate in a conceptual framework that allows the reader to follow step by step the application to their own archaeological information.

The proposed conceptual framework has been validated through an archaeological case study, also implemented as a functional iOS system prototype. The prototype has been validated empirically by archaeologists, comparing the performance of knowledge generation processes using the proposed framework to the conventional ways without software assistance. The empirical validation reveals how the framework provides a robust solution for the construction of software systems to assist in the knowledge generation process in archaeology.

In light of these results, this book is an excellent source for students (as a reference for existing works and innovative literature in the topics addressed), for archaeologists and data managers in working on digital humanities domains (as a reference guide to apply software strategies in their daily analysis of archaeological data) and finally for researchers interested in how the archaeological knowledge is represented and generated, as well as how it is possible to assist these processes by software.

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