

DIGITECH III: Study of 3-dimensional digitization technologies

Cultural and Educational Technology Institute Integrated Research for the Information Society

INFORMATION SOCIETY 2000-2006, 3rd Framework Programme AXIS 1: EDUCATION – CULTURE INSTRUMENT 1.3 «DOCUMENTATION, EXPLOITATION AND DISSEMINATION OF GREEK CULTURE»

The cultural heritage of a nation is an inseparable part of its unique identity. Cultural heritage is a prestigious deposit with significant protection and management needs; needs that are a debt to all of us, today. "Science and Art" is one of the best knowledge interaction domains that is developing since the beginning of the XX century, mainly in Europe, because of the importance of its ancient artistic and scientific roots, because of the number of precious artefacts conserved in museums and in archaeological sites and because of the development of the public consciousness to safeguard their Past for Future.

In the last decade, the Information Technologies amplify the digital activity to protect, manage and disseminate knowledge of cultural treasures through the Internet. Digitisation and Computer access are increasing strongly. Several research efforts still strive for new technological means to make easy access to a durable cultural heritage a reality.

This study is an inseparable part of this attempt. Through the many pages of this study an attempt is being made to unfold the idea of three-dimensional (3D) digitization of cultural heritage objects and monuments. The main purpose of this study is to become a handbook both for researchers and scientists that are interested in learning about the usage and possibilities of new technologies for 3D digitization, as well as cultural heritage owners that are interested in protecting their collections through the usage of digital technologies. The study describes methodologies for 3D digitization of objects and monuments accompanied with methods for digital data storage, archiving, management, display, dissemination, reproduction and replication of the digital copies.

The requirement for the imprinting of objects and shapes through the use of optical means dates back to the beginning of the 19th century. We can trace the roots of the photographic arts nearly at the same time. Since then, the optical imprinting technologies have made great advancements; and this is a reality we all experience in our every-day lives.

The process of acquiring 3D information from real-life objects is complicated, since it involves resolving the problem of acquiring accurate complex geometry measurements. This is why 3D digitization is a very demanding process in terms of processing power and consumed time. Nowadays, after a rapid advancement in computer and digital technologies,



3D digitization is becoming a more appealing practice both in terms of time and money. New systems have been developed and many hardware choices are available in the market. Still, one of the main problems is that there is not an all-in-one solution, that is, there is not a system to be used in any case of digitization. The characteristics of the digitization subject (size, geometry and texture complexity, surface properties and characteristics), as well as the application to be used, play a very important role in the selection of the system.

All these notions and facts are extensively analyzed and presented in this study. Since size of the digitization subject is one of the most important factors (at least the first factor to consider) for the selection of the appropriate system and method, the study was divided into two parts, one referring to small objects (we call them movable) and one referring to monuments (we call them non-movable). In detail, the study (written in Greek) comprises of:

- *"Study of 3D digitization technologies for cultural objects"* This part focuses on the digitization of cultural objects of relatively small sizes.
- *"Study of 3D digitization technologies for monuments"* This part focuses on the digitization of very large objects, monuments and buildings

• *"Educational multimedia CDROM title"* This multimedia title presents the knowledge of the two main parts of the study in a more appealing way, by using multimedia. It also includes a "wizard" that makes use of the database of all available 3D digitization systems documented in the study to greatly aid in the selection of the appropriate system for a specific digitization task.

Both the main parts of the study include:

- Introduction to 3D digitization and some minimum technical terminology that is required
- Description of most of the contemporary methodologies for 3D digitization that can be either commercial or still under research and development
- A complete selection of the commercially available 3D digitization systems with detailed descriptions of their characteristics
- Best practices and suggestions accompanied with detailed tables that can aid nontechnicians in their task to select the appropriate system and method according to their needs
- Description of the digital product of the digitization (file formats) as well as the available digital data storage options, providing detailed tables of all file formats and data storage technologies
- Description of the options for digital data management, archiving, and retrieval focusing on existing and emerging international standards
- Description of 3D display and projection possibilities in terms of 3D data visualization, providing complete tables of available technologies and characteristics
- Description of 3D digital data copying (reproduction) and 3D printing (replication) with tables of the available options and their characteristics