



Training for Innovation: Data and Multimedia Visualization

**Matteo Dellepiane
and Roberto Scopigno
CNR-ISTI**

Two interrelated objectives of the ARIADNE project, are the design of new services (or the integration of existing ones) and the implementation of a programme of training & hands-on access. Especially in the case of visual media (which are evolving at an impressive pace) new services should be accompanied by user consultation and training, to consolidate knowledge on the potential of the new media and the impact these could have in the selected discipline. The latter is the main objective of the programme of Transnational Access and training, and user consultation events that have been organized in the first 18 months of the ARIADNE project. This short contribution presents the results of this activity and our plans for the design of new services.

Introduction

Training is an important component of an infrastructure project, especially when the infrastructure has to manage and support new technologies. Visual media are a clear example of the need for training due to: the many media available and used in Archaeological activities; the complexity of mastering both data creation and presentation; and the complexity of making the right choice, understanding which media fits better the specific documentation or visual analysis needs.

One major goal in ARIADNE is to help our community in building a clear view of the affordances of particular genres of representations, their documentation potential and the possible limitations with reference to storing, discovery, accessing, connecting with other data, and rendering. We see this as an important service to our community.

Visual data are nowadays a basic component of the massive amounts of data gathered in archaeology. By visual data we mean any visual representation that could be associated with an artwork, architecture or site, to describe its shape in terms of visual and geometric elements. The term visual data stands for different representations: 2D images (standard images, panoramic images, Reflection Transformation Images - RTI), 2D graphical representations such as maps or drawings (usually represented by standard digital image files), 3D models (either sampled or reconstructed with modelling systems) and videos (either captured from reality or produced with computer animations).

The ARIADNE TNA Programme

The Transnational Access (TNA) is an important activity in ARIADNE. A programme of training activities aims to provide opportunities to consolidate “next generation skills” and access to the research data services supported by the partners of the research infrastructure. Researchers will have access to innovative data centres, tools and methods for working on specific research questions and data related issues. Since we are aware that training is key to fast acceptance of new methodologies and technologies, the role of the TNA will also be to offer guidance in the use of new services.

ARIADNE has planned TNA opportunities (granting fellowships to eligible participating researchers) on the following topics:

- Legacy Data and Dataset Design
- Scientific Datasets
- 3D Documentation of Fieldwork and Artefacts

We report below on the results of the first TNA summer school on 3D documentation.

In preparation for the TNA summer school, we hosted a workshop on Ariadne infrastructure for Multimedia data: Matching technologies and user needs”, which took place in Pisa on October 7th-8th, 2013. The goal of this workshop was to bring together ARIADNE’s data providers and technical partners and find a consensus on what we mean by Multimedia or Visual Data and the support we should plan to provide in the framework of ARIADNE. The capabilities of current technology (both commercial tools and resources produced in EU projects) were presented to users with the aim of understanding their needs and the potential services for production, sharing and visualization of visual media.

Summer School on 2D/3D Documentation for Archaeology

From 23rd to 27th June, 2014, CNR-ISTI hosted the ARIADNE TNA summer school on “2D/3D Documentation for Archaeology” in Pisa. The main goal of this school was to enable scholars and professionals to implement modern approaches for the visual multimedia documentation of artworks and archaeological sites (i.e. fieldworks and artefacts), including innovative approaches to digitize and document our heritage using 3D and enhanced 2D media.

The scope of the TNA school was to pair a classic programme based on lessons with practical activity: hands-on experience of the technologies being presented (both hardware and software) was a main component of the TNA experience. We invited participants to submit problems and test cases they are working with; the quality and interest of the test beds were an important criterion in the selection of the participants (as was their CV). Consequently, the programme for the school was designed to dedicate sufficient time to advising participants on both the practical hands-on experience and in developing their proposed case study with the technologies presented in the course.

The eleven participants (9 received an ARIADNE fellowship) were from several countries (Argentina, Belgium, Estonia, Germany, Greece, Italy, Netherlands and the UK) and had a mixed background (the majority had a background in the humanities, only a few held an engineering degree). The instructors were researchers of the Visual Computing Lab (<http://vcg.isti.cnr.it/>) at CNR-ISTI: Matteo Dellepiane, Marco Callieri, Gianpaolo Palma, Marco Potenziani and Roberto Scopigno.

The summer school started with a presentation by the students of themselves and their projects/case studies. After this introductory step the first lesson aimed to build up a common language and background in basic ICT and visual technology concepts. Then the work was organized with a day dedicated to each specific sub-topic (active 3D scanning and data processing; image-based approaches for 3D digitization; colour acquisition and mapping on 3D models; RTI images acquisition and visualization). Other topics, like the issues and technologies enabling the publication and visualization of 3D/2D models on the web, the advanced manipulation of 3D models, and the use of 3D in Cultural Heritage projects were touched on at different times throughout the five days. All the topics were firstly presented theoretically and then practically with some hands-on experience with real datasets.

The schedule was arranged to give time at the end of each day for the participants to experiment on their own data (or on test dataset we provided) on the topics presented, and for individual question-answer sessions with the instructors. On the last day, besides finishing open topics, was dedicated to the completion of the student's test cases, the presentation and evaluation of the results obtained and a final discussion and wrap up.

The course witnessed a fruitful cooperation between instructors and participants, providing benefits to all: the participants had the opportunity to be instructed on CNR tools by the authors, in a structured context that included practical hands-on experiences and the use of high-end technological devices; the instructors had the chance to witness a number of interesting test cases, which were extremely helpful to understanding the needs of the CH community and assessing the usability of the more recent tools and technologies.

The feedback received from the participants (who compiled formal evaluation forms after the end of the TNA) allows us to say that this first edition was a success. The main practical hints that came out during final discussions were related to the selection of an audience with a comparable technical background, so that the lecturing style could be more easily adapted to the participants, and to the preliminary analysis of the datasets they provided. (For more info, see at: <http://www.ariadne-infrastructure.eu/News/2D-3D-Documentation-for-Archaeology-Summer-School>)

TNA summer schools on archaeological datasets

Two further TNA summer schools were organized in 2014.

“Mapping existing datasets to CIDOC-CRM”, hosted by PIN in Prato, on 26-30 May 2014. The main goal of this school was to enable scholars and professionals to implement conceptual mappings and data conversions of their existing datasets to the CIDOC CRM ontology. Two of the five days were dedicated to practical exercises, focused on the implementation of the mappings for case studies proposed by participants and carried out under the supervision of the specialists. (see: <http://vast-lab.org/ariadne-2014-summer-school/>).

“Design of archaeological datasets”, held at CNR-ISTI Pisa, July 14-18, 2014. The main goal of this school was to enable scholars and professional to design archeological datasets endowed with rich semantics (by providing explicit representation of concepts and their relationships) and allow semantic interoperability (by drawing from existing standards). Semantic web knowledge representation languages were examined in detail along with the CIDOC CRM ontology. The participants were given the possibility of presenting their research problems, analyzing their data requirements, and applying the principles of knowledge representation to address their requirements. (see: <http://www.ariadne-infrastructure.eu/News/Summer-school>).

Towards innovation in Visual Media Management

Going beyond training and TNA, ARIADNE aims to provide tools and technologies for improving the management of visual data (images, 3D models, geo-specific data) stored in the archives of ARIADNE partners.

These functionalities will be implemented as resources/services available on the ARIADNE portal. The main goal is to move from the old approach still used in many archives of visual media being transferred to a remote user as a plain file, who then has to store it on a local PC and select/install an application to open the file). ARIADNE aims to move to a more modern, web-based approach, the presentation of the result set of a query to the archive enriched by adding an URL that will allow the user to inspect visual media in a standard web page. We are working on the implementation of services for three different types of data, described below.

Conversion and publishing of 3D models

The service is accessible as a web application that produces a multi-resolution version of a set of 3D models, together with a basic HTML visualization page of the given models.

One (or more) 3D models in one of the standard formats (ply,obj, stl, dae...) are manually uploaded by the user (either one at a time or zip-ed in a single file, in order to reduce uploading time). The service will perform some simple cleaning operations (e.g. removal of geometric artifacts), convert the models into a multi-resolution format (.nxs), and then creates and publishes a simple webpage that allows the user to visualize the models interactively in a WebGL frame (no add-ons needed, working on all the main browsers, except smartphones and tablets for now). The processing will be based on 3DHOP components (<http://vcg.isti.cnr.it/3dhop/>). All the operations will be performed by local scripted executables (meshlabserver.exe for model preparation, nxsbuilder.exe for nxs creation, a final script to prepare the webpage).

The output is the URL of a webpage on the ARIADNE portal or a zip file containing the multi-resolution nxs model and the html/js files of the basic webpage, or both. The zip file is available for download to the reference archive manager.

Conversion and publishing of RTI Images

The service converts relightable images into webRTI, and produces a basic html visualization page for the image, i.e. a version of the image that can be transmitted on the web and visualized efficiently on a standard web page.

One (or more) RTI images in the standard formats (ptm or hsh) will be uploaded to the service available on the ARIADNE portal or automatically collected in a batch (it will also be possible to automatically zip them, in order to reduce uploading time). The service will transform each image in a web compliant format (similar to Google maps, the image will be divided into chunks of different resolution) and create a simple webpage where it will be possible to navigate the model in a WebGL. The processing will be based on the components of WebRTI viewer (<http://vcg.isti.cnr.it/~palma/dokuwiki/doku.php?id=research>). All the operations will be performed by local scripted executables (WebRTIBuilder.exe for the processing of the image, a final script to prepare the webpage).

The output will be a webpage published on the ARIADNE server (the URL will be returned to the reference archive manager) and/or a zip file to download, containing the processed image and the html/js files of the basic webpage.

Conversion and publishing of high-resolution images

This service converts high-resolution images (uploaded using standard image formats) into multi-chunk versions, enabling progressive transmission, and produces a basic html visualization page of the converted images.

One (or more) high-res image(s) in the standard formats (such as jpg, png, tiff...) will be uploaded to the service available on the ARIADNE portal, or automatically collected in a batch (it will also be possible to automatically zip them, in order to reduce uploading time). The service will transform the image in a web compliant format (similar to Google maps, the image will be divided in chunks of different resolution) and create a simple webpage where it will be possible to navigate the image in a WebGL frame. All the operations will be performed by local scripted codes (an executable for the processing of the image, a final script to prepare the webpage).

The output will be a webpage published on the ARIADNE server and/or a zip file to download, containing the processed image and the html/js files of the basic webpage.

Conclusions

This note presents ARIADNE initiatives and activities organized so far to offer training and service opportunities to our partners and community. The new innovative services described above are now in an advanced implementation phase and will be available to partners very soon for testing and assessment.

