Resource or Extravagance? - How can 3D Heritage Data be (made) sustainable

Session

Archaeology, like our lives in general, has become increasingly data intensive. Digital photography allowed, laser scanning, structure-from-motion and a general trend to archaeological "big data" are to be mentioned here. The convenience of the tools and the impressive and vivid 3D models and other data products often make users forget that this abundance of data comes at a price: the ever-increasing resource consumption of our heritage data and applications. These data needs to be created, curated, stored and processed, which leads to a large resource consumption for hardware, energy, and manpower. Resources in our world are scarce and becoming more so. Leading to pressing questions: Do we have criteria for determining whether it is worthwhile to devote so many resources to the creation, processing and storage of 3D models and related data? This central question raises a number of follow-on questions: How do we decide on the scale and resolution of our data collection? Are we aware of the subsequent costs at the time of design and capture? What are the opportunity costs? - Perhaps an archaeologist guiding groups of people around a site has a greater impact on heritage awareness than the same archaeologist sitting in his office tinkering with a 3D model to be viewed on the web? Do we have robust data to answer the question of whether an online presentation of heritage in 3D achieves the often-claimed goal of a wider audience?

These questions are deliberately provocative, and are also intended to stimulate contributions that demonstrate how 3D heritage data can be used purposefully and become a resource for the societal changes that lie ahead. The question is, in light of the problems outlined above: What are the demonstrable or conceivable benefits of 3D data in archaeology and heritage in a world of increasing resource scarcity and the resulting environmental and societal challenges?

Motivation

Archaeology, like our lives in general, has become increasingly data intensive. New technologies have made it possible to record and process all kinds of data more quickly. Digital photography allowed more intensive photographic recording, laser scanners enabled high-resolution point cloud recording, and structure-from-motion technology permitted the creation of high-resolution 3D data from even more digital images. Software, processing hardware and services have become cheaper and cheaper as these technologies have become more mainstream. The convenience of the tools and the impressive and vivid 3D models often make users forget that this abundance of data comes at a price: the ever-increasing resource consumption of our heritage data and applications.

Archaeology generates large amounts of data and wants to store it forever. Even before the digital revolution, the vast majority of archaeological data remained unprocessed. High-resolution 3D data is becoming a standard part of any archaeological documentation. They take up a lot of storage space compared to, for example, CAD or GIS drawings. If the 3D data is generated by Structure-from-Motion techniques, the original image data adds to the storage requirements. Since the SfM reconstruction process is non-deterministic, the resulting models must be considered secondary

data and the original images must be stored with them. If such data is to be further processed, such as semantically segmented, analysed with pattern recognition and in the context of big data analytics, the energy-intensive training of AI models also comes into play. While hardware and software have become increasingly energy-efficient, this development has physical limits and cannot keep pace with the rapid growth of data. At present, the energy requirements of data processing are treated as a trivial problem because energy remains unrealistically cheap at the expense of the climate and the environment. This will inevitably have to change as humanity moves towards a carbon-neutral economy. Energy will never be as cheap as it was in the fossil fuel age, and decisions abou on what to spend energy will become more pressing and most likely be expressed in budget discussions. The resource consumption of 3D and other digital heritage data is not limited to energy. Another issue is the scarcity of human resources. They have always been scarce in the heritage sector. The increased use of digital technologies requires a workforce of ITC specialists and (research) data management experts to deal with the curation, storage, retrieval, management and rights management of heritage data and to keep the necessary hardware and software infrastructure running. These experts in turn have requirements for the technical quality, legal status and documentation of the data. This task has to be passed on to the heritage professionals in the field and in the institutions, taking up time for training and additional tasks in the already tight schedules of this group.

It is not the intention of this session to stimulate a general critique of the creative use of 3D and other digital data in heritage and archaeology. Instead, we would like to invite papers that discuss the issue in terms of quality vs. quantity and scale vs. resolution. The core question is: Do we have criteria for determining whether it is worthwhile to devote so many resources to the creation, processing and storage of 3D models and related data? This central question raises a number of follow-on questions: How do we decide on the scale and resolution of our data collection? Are we aware of the subsequent costs at the time of design and capture? What are the opportunity costs? - Perhaps an archaeologist guiding groups of people around a site has a greater impact on heritage awareness than the same archaeologist sitting in his office tinkering with a 3D model to be viewed on the web? Do we have robust data to answer the question of whether an online presentation of heritage in 3D achieves the often-claimed goal of a wider audience?

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Target Audience

All heritage professionals, with a special focus on archaeologists creating data in the context of research, cultural resource management, education and also those tasked to store and manage that data and provide the necessary infrastructures and funding.

Keywords

3D #Heritage Data #Sustainability #Research Data Management #Societal Impact