CAA 2009
Williamsburg

37th Annual International Conference on

Computer Applications and Quantitative Methods in Archeology (CAA)

"Making History Interactive"

Williamsburg, Virginia, USA
March 22 – 26, 2009

The 37th annual CAA conference will be held from March 22 to 26, 2009 in Williamsburg, Virginia, bringing together students and scholars to explore current theory and applications of quantitative methods and information technologies in the field of archaeology. The CAA conference has established a strong tradition of international, open communication and exchange that crosses boundaries between archaeologists and colleagues working in quantitative fields such as mathematics and computer science. CAA members come from a diverse range of disciplines, including archaeology, anthropology, art and architectural history, computer science, geography, geomatics, historic preservation, museum studies, and urban history. The theme of the conference is "Making History Interactive," which will be reflected in both the conference activities and the unique venue. Participants are especially encouraged to submit papers and posters relating to the conference theme of how computer applications can be used to engage diverse audiences in the study of the past. The conference will also offer optional short, introductory courses in the use of equipment (such as 3D scanners), hardware, and software typically used by digital archaeologists today.

The Call for Papers invites the submission of abstracts for papers and posters to be presented at the conference. Typical CAA topics include: agent-based models, bioarchaeology, CIDOC and other digital standards, databases, 3D data capture and modeling, data management systems and other field applications, GIS, predictive modeling, open source software in archaeology, photogrammetry and imaging, prospection and remote sensing, quantitative methods, high precision surveying, virtual museums, and virtual reality. The Scientific Committee has accepted a wide range of proposals for thematic sessions, which are described below. Authors may choose to submit an abstract to participate in one of the selected topical sessions or may apply to the General Paper session on Computer Applications and Quantitative Methods in Archaeology if their paper topic does not relate to one the accepted sessions. However, there will be a limited number of

slots in the General Session so authors are strongly encouraged to apply to a thematic session where relevant. Proposals for posters may be submitted on all conference-related topics and posters selected will be available for the duration of the conference in a special area set aside for this purpose.

For papers and posters, authors should submit an abstract of between 300 and 500 words in length; should clearly indicate the reason why your work is original and significant; should contain a short bibliography (if there is important earlier work to cite); and for papers should indicate the session in which it could appropriately be presented. Paper presenters will also need to indicate whether they wish to present a Short Paper (15 minutes) or Long Paper (25 minutes). Short papers are appropriate for case studies or ongoing projects while long papers are for presenting innovative approaches or completed projects. The Scientific Committee reserves the right to switch a paper from long to short and to assign it to the session that appears most appropriate, which may sometimes not correspond to the session to which the author(s) applied.

Submissions of abstracts for papers and posters are due by <u>December 19, 2008</u>. Presenters will be notified by January 15 of the Scientific Committee's decision. For international travelers who need a visa to visit the United States, it is recommended that you apply at least 90 days before arriving, or by approximately the fourth week of December. The Scientific Committee will try to expedite decisions on abstract submissions of attendees needing a visa so that they will know whether their abstract has been accepted prior to beginning the visa process. *If you need a visa and submit your abstract by December 4, 2008*, the Scientific Committee will make every effort to notify you of its decision by December 15, 2008. To be considered for inclusion in CAA 2009, all proposals must be submitted electronically through the online ConfTool system available on the conference website (http://www.caa2009.org/SubmitProposal.cfm).

CAA 2009 is being organized by the Colonial Williamsburg Foundation and the University of Virginia. For further information on the conference and how to register, please visit:

www.caa2009.org

CAA 2009 Scientific Committee

Prof. Bernard Frischer (chair), University of Virginia; Prof. Peter Bol, Harvard University; Dr. Wolfgang Börner, City of Vienna; Lisa Fischer, The Colonial Williamsburg Foundation; Prof. Arne Flaten, Coastal Carolina University; Prof. Maurizio Forte, University of California, Merced; Prof. Bernard Frischer, University of Virginia; Prof. Alyson Gill, Arkansas State University; Prof. Luc van Gool, Federal Technical Institute, Zurich; Prof. Gabriele Guidi, Politecnico di Milano; Prof. Elisabeth Jerem, Archaeological Institute of the Hungarian Academy of Sciences; Prof. Ian Johnson, University of Sydney; Han Kamermans, University of Leiden; Prof. Kevin Kee, Brock University; Prof. Guus Lange, National Service for Archaeological Heritage, Netherlands; Gary Lock, Oxford University; Prof. Scott Madry, University of North Carolina, Chapel Hill; Mark Mudge, Cultural Heritage Imaging; Prof. Fraser D. Neiman, Monticello Organization; Dr. Daniël Pletinckx, Visual Dimension; Dr. Axel Posluschny, German Archaeological Institute; Julian Richards, University of York; Prof. Nicholas Ryan, University of Kent; Stephen Stead, Paveprime; John Tolva, IBM

CAA 2009: Accepted Paper Sessions Looking for Contributors

Archaeological Prospection Using High-Resolution Digital Satellite Imagery: Recent Advances and Future Prospects (Session ID: 120)

Chair: Karsten Lambers, University of Konstanz, Germany

This session will focus on the analysis of high-resolution digital satellite imagery for archaeological prospecting. Since a few years, a new generation of satellite sensors such as the well known Ikonos 2 and QuickBird 2, the new WorldView 1 and GeoEye 1, and a variety of others provide an unprecedented variety of remotely sensed imagery with a spatial resolution of 1 m and better, and the launch of several similar sensors with a resolution of up to 25 cm has been announced for the near future. The resulting space-borne imagery allows for the first time even small archaeological sites and features to be detected. Although this type of space-borne imagery is still quite expensive and does not yet achieve the very high spatial resolution of aerial imagery, it offers a variety of advantages over aerial imagery: it is available nearly worldwide without major legal or practical limitations, it is rather easy to georeference and to use in GIS, and some sensors feature a near-infrared channel in addition to the usual RGB and panchromatic channels, which potentially allows crop marks to be identified more easily. Furthermore, stereo coverage enables a photogrammetric analysis of the images.

Archaeologists have been quick in realizing the high potential of this new data source for the detection and documentation of archaeological sites and features, and a growing number of case studies with interesting results have evolved from ongoing archaeological field projects in recent years. While some of these projects have been limited to a visual inspection of the imagery to aid fieldwork, others now go beyond this level by applying advanced methods of digital image analysis in order to extract archaeological information. These methods include, among others, image classification, multispectral analysis, pattern recognition, photogrammetry, and related approaches. However, a systematic evaluation of the potential of these methods, which were usually developed for different kinds of applications, and the potential of the new data source itself remains a desideratum.

In this session, papers will be presented that explore the chances and limitations of high-resolution digital satellite imagery, and of current methods of digital image analysis with regard to the requirements of archaeological prospection. Papers with a methodological focus, addressing specific problems of identifying uncooperative archaeological features through digital image analysis and showing recent advances and promising research strategies are especially welcome. Overview papers and new case studies will complement this session that is hoped to bring together specialists from the fields of archaeology, remote sensing, geomatics, photogrammetry, digital image analysis, pattern recognition, and related disciplines.

Topics: photogrammetry and imaging, prospection and remote sensing
Keywords: satellite imagery, high resolution, digital image analysis, remote sensing, archaeological prospection

Cell-based analysis and landscape archaeology: new approaches and new applications (Session ID: 129)

Chairs: Gary Lock and John Pouncett, Oxford University, United Kingdom

Since the early adoption of GIS in archaeology in the late 1980s the place of cell-based, or raster, analysis has been of central interest. It has become almost routine to apply techniques such as line-of-sight, viewshed, least-cost path and cost surface analysis in attempts to understand human interaction with past landscapes. Indeed, it could be argued that these techniques are so commonplace and easy to perform that their methodological and theoretical underpinnings are often ignored or, at best, mentioned in passing. Derivatives of elevation such as slope and aspect, the essential building blocks of many analytical techniques and models, are scale dependent. Yet, despite widespread recognition of the significance of scale within landscape archaeology, analysis based on these derivatives is uncritical and typically fails to take this scale dependency into account.

This session is intended to explore beyond the push-button application of cell-based analysis through focusing on new approaches and new applications. We welcome papers that address issues of methodology, new approaches to visibility and movement, topographic modeling and visualization. While visibility and movement will probably remain popular, other areas such as erosion modeling, landscape change and time series analysis would be very welcome. Contributions relating to remote sensing techniques which employ raster data structures and allied image processing techniques are also welcome. It is hoped that this session will provide a platform from which to promote the development of new theoretical and methodological approaches to cell-based analysis within landscape archaeology.

Topics: GIS
Keywords: cell-based analysis, GIS

Close-Range 3D Laser Scanning: Recent Developments and Applications (Session ID: 109)

Chair: Christopher Goodmaster, Geo-Marine Inc., Plano TX, and the Center for Advanced Spatial Technologies, University of Arkansas

Recent advances in three-dimensional (3D) laser scanning hardware coupled with the development of improved scanning methodologies on the part of a growing community of practitioners, advances in micro-computing capabilities allowing the ability to process and manage large data files, and the capability of integrating these data across a variety of platforms have made this technology an effective and practical option for the documentation, analysis, archiving, curation, and dissemination of archaeological information. For these reasons, 3D laser scanning has become an accepted and widespread practice in the European archaeological community with increasing popularity in North America as well.

This session specifically explores close-range 3D laser scanning, i.e., techniques that rely on an active near-infrared sensor to generate sub-millimeter three-dimensional surface data for artifacts, features, monuments, architectural elements, etc. Session participants should highlight:

- improved methods for data collection and processing,
- new and innovative applications of the technique and resultant data,
- issues in digital archiving, data curation, and data dissemination,
- metadata standards, and

- the implications of this technology with regard to archaeological practices.

Participants are encouraged to draw upon a wide variety of case studies to underscore the utility and potentials of close-range 3D laser scanning, as well as share their tribulations and successes. This session is also intended to foster a sense of community among the practitioners of this technique and serve as the potential basis of an international working group dedicated to the application of this technology to archaeology.

Topics: 3D data capture and modeling, North American archaeology and digital technology
Keywords: close-range 3D laser scanning, field methods, 3D data processing, data curation, metadata

Computational Intelligence in Archaeology (Session ID: 114)

Chair: Juan Antonio Barcelo, Universitat Autonoma de Barcelona, Spain

Computational (or "Artificial") intelligence is not just about robots. It is about understanding the nature of intelligent thought and action using computers as experimental devices. The purpose of this session is to present investigations about the nature of inferential mechanisms for archaeological explanation, and how computer programs allow us to discover how we produce inferences.

The discussion should be between what is considered an artificial way of reasoning (computer programs) and our supposed natural way of reasoning (verbal narrative). Critics of the Constructive and Formalized view of archaeological discipline are ignorant of the true renaissance of the cybernetic paradigm experienced in the late 1980s, and its integration with new paradigms of cognitive science, philosophy and the "New" artificial intelligent paradigm. One reason for its resurgence is the discovery of more powerful machine learning algorithms: new generation adaptive algorithms (neural networks, support vector machines, genetic algorithms, Bayesian models) appear to be formally true universal mechanism devices.

If we want to reproduce human intelligence in a machine, we should make emphasis on three central aspects: development, interaction, and integration. Development forms the framework by which machines should imitate the way humans successfully acquire increasingly more complex skills and competencies. Interaction should allow an "automated archaeologist" to use the world itself as a tool for organizing and manipulating knowledge, it allows them to exploit humans for assistance, teaching, and knowledge. Integration should permit the automated archaeologist to maximize the efficacy and accuracy of complementary mechanisms for perceiving and acting. These subjects are inspiring a new generation of cyberneticists in the fields of situated robotics or "New Artificial Intelligence", and they offer an interesting domain for debating what it means to "produce" knowledge.

To imitate a human scholar, an "automated" archaeologist should not be fully programmed since the beginning, but developmentally. The gradual acquisition of interpretive skills and the consequent gradual expansion of the automated archaeologist capacities to explain archaeological observables (creating more and more self-training data as it does so) will define then the cognitive behavior of an "intelligent" machine. This strategy facilitates learning both by providing a structured decomposition of skills and by gradually increasing the complexity of the task to match the competency of the system. Behaviors and learned skills that have already been mastered prepare and enable the acquisition of more advanced explanations by providing sub-

skills and knowledge that can be re-used, by placing simplifying constraints on the acquisition, and by minimizing new information that must be acquired.

This special session pretends to explore the implications in archaeology, both theoretically and methodologically of Machine learning. Suggested contributions can be about the application of standard "Artificial Intelligence" tools and methods (Neural networks, Agent-based simulations, Genetic Algorithms, Expert Systems, Bayesian networks, Automated Induction, Rule generation, etc.) but specifically on any contribution at the interface between theory and method, that is to say, investigations using computers to discover the way we think.

References:

BARCELÓ, J.A., 2008, Computational Intelligence in Archaeology. Henshey (VA), Information Science Reference (IGI Group).

Topics: Other
Keywords: Artificial Intelligence, machine learning, Neural networks

Computer Applications in Maritime Sites (Session ID: 132)

Chairs: Eric Dennis Ray and Peter Bryson Campbell, Program in Maritime Studies, East Carolina University, United States of America

Maritime sites present a unique set of challenges to archaeologists. The sites are sometimes submerged, limiting time and equipment on-site. They are frequently inaccessible to the public, making effective outreach difficult. Added to these issues, ships are incredibly complex structures, consisting of a variety of quickly-decomposing organic materials arranged in non-uniform, complicated ways.

Increasingly, high-tech methods are being used to overcome these challenges. Maritime archaeologists are using new surveying and rapid photogrammetric methods to rapidly survey sites at low-cost. Historical and archaeological data can now be visualized in new ways, allowing a better picture of what historic ships looked like, and how they were operated. The Internet is being harnessed for outreach, allowing the interested public to visit these inaccessible sites and connect with their maritime heritage.

These computerized methods are allowing much greater accuracy and higher speeds of recording, at a low cost. They are allowing fragmentary or sparse data from the archaeological and historical record to be reconstructed into models of complete ships, providing new information about usage, construction, rigging, and performance about these vessels - in some cases, vessels that are heavily deteriorated or even only existent in the historical record. Finally, all this data can be presented via virtual museums and the Internet, allowing public outreach with minimal site disturbance - a photograph requires no destruction of the site.

This session explores the particulars of some of these new methods. Papers in this session will detail new applications of computerized technology in a maritime context, including research, data collection and surveying, photogrammetry, reconstruction and modeling, and outreach and presentation methods.

Topics: 3D data capture and modeling, photogrammetry and imaging, high precision surveying, virtual museums
Keywords: maritime, reconstruction, visualization, surveying, photogrammetry

CyArk Digital Preservation (Session ID: 136)

Chair: Elizabeth A. Lee, CyArk, United States of America

3D data capture is widely used for documentation and proves invaluable to cultural heritage. As 3D documentation becomes the standard for heritage sites, new problems arise around the complete process of capturing, producing, presenting, and archiving this digital media. Using CyArk's Digital Preservation Process as the session theme, several presentations will be given on the widespread implementation of this process. Presentations will be given by CyArk partners who have leveraged newly developed web-based applications to manage digital media and make it accessible to the general public. Presentations will also demonstrate how to add value to data by producing rich digital media and placing it within a spatial and cultural context. Presentations will also examine the CyArk web-based archive (http://archive.cyark.org) and its emphasis on user interactivity.

Papers presented will be selected from a wide range of disciplines, including professional survey firms, universities, the media and foundations.

The goal of the session is to foster awareness of the CyArk methodology and to encourage discussion about its adaptation for more widespread implementation.

Topics: 3D data capture and modeling, data management systems and other field applications, high precision surveying
Keywords: 3D, web-based, digital, interactivity

Digital Humanities and Pedagogy (Session ID: 127)

Chairs: Arne R. Flaten[1], Alyson Gill[2] and Paul Olsen[1]
[1]Coastal Carolina University, U.S.A.; [2]Arkansas State University, U.S.A.

Digital Humanities projects address a wide range of locations, periods, physical materials and technical innovations, and their methodologies are as diverse as the topics they cover. While many programs focus on in-the-field tools or secondary research applications, others emphasize the end user and the dissemination of their materials. End users can be primary or secondary students, undergraduates, the general public, or museum audiences, but all of the designers of web pages, portable lecture/display units or kiosks are concerned with the platform appearance, accessibility, what materials are offered, and how intuitively the platform or interface functions. Digital Humanities projects also offer exceptional opportunities for collaborative research between faculty and students. The introduction of various hands-on technologies in the "classroom" can energize and heighten the learning experience.

The organizers of this session are interested in the diverse perspectives offered by data providers, producers, and end users of various Digital Humanities projects. These might include 3D models and virtual environments, GIS database construction and population, games, laser scanning, Podcasting, data retrieval matrices, software innovations, hardware installations for a variety of venues, or any combination thereof. Papers might address in-class methods and experiential learning, end user problems and solutions in various contexts, demographics, interdisciplinary opportunities and challenges, or any number of issues concerning the design, construction, implementation or use of Digital Humanities projects.

Topics: databases, 3D data capture and modeling, GIS, North American archaeology and digital technology, open source software in archaeology, photogrammetry and imaging, virtual

museums, virtual reality
Keywords: digital models, digital humanities, virtual environments

Envisioning the Past: Virtual Reconstructions of Archaeological Sites (Session ID: 121)

Chairs: Alyson Gill[1] and Arne Flaten[2]

[1]Arkansas State University, United States of America; [2]Coastal Carolina University, United States of America

Over the past decade various digital technologies ranging from three-dimensional reconstructions or models, laser scanning, GIS databases and digital mapping have been used to contribute to our understanding of various aspects of ancient sites. In some cases these tools have led to the creation of three-dimensional virtual models of buildings or of entire sites, while in others they have been used in a variety of contexts to address specific archaeological problems.

While acknowledging that there are some problems native to the creation and use of digital models, digital technologies can be an exceptionally powerful tool when used in reconstructions and there is information that can be gained from them that is not available through traditional archaeological means. Virtual reconstructions allow scholars to consider a vast array of theoretical issues for the built environment, including sight lines, the ways in which space would have functioned in antiquity, and how buildings would have interacted with each other. Three-dimensional digital models also allow us to engage a diverse set of experimental architectural problems, including lighting and engineering issues.

The organizers of this session are interested in the diverse perspectives offered by data providers, producers, and end users of three-dimensional models with respect to problems and possibilities presented by digital technologies as research tools in archaeology. This session is intended to foster discussion between these groups. Papers should focus on the ways in which digital technologies might be used as research tools, or the presentation of a specific project that models a specific digital research tool or set of tools in the study of a specific archaeological problem or site.

Topics: data management systems and other field applications, GIS, Google Earth and archaeology, North American archaeology and digital technology, virtual museums, virtual reality
Keywords: archaeology, 3D models, reconstructions, archaeometric, digital

Excavation to publication: developing and applying integrated digital technologies
(Session ID: 115)

Chair: Michael John Rains, York Archaeological Trust, United Kingdom

The UK JISC funded VERA (Virtual Environments for Research in Archaeology) project is a collaboration between the University of Reading (Department of Archaeology and School of Systems Engineering), University College London and York Archaeological Trust. Over the last two years, the project has looked at various aspects of the acquisition, management and dissemination of the digital record of the large research excavation at Silchester Roman Town, Hampshire, England. The project is centered on the IADB (Integrated Archaeological Database), which has been used as the excavation recording system at Silchester since the start of the archaeological project 12 years ago. A key aim of the VERA project has been to improve the accessibility of the digital records to co-workers, particularly those, such as artefact specialists who are not generally physically present on the excavation. In practical terms this has involved a number of themes:

- Trials of digital recording devices including hand held Internet tablets, digital pens and digital clipboards to speed up the availability of the digital records.
- Extensive user needs analysis, linked to these trials, to ensure that the solutions created fit problems exposed.
- New visualization techniques, both 2D through enhancements to the traditional stratigraphic matrix diagram, and 3D mechanisms.
- Improvements to IADB functionality and the user interface.
- Standardization of the IADB within a portal framework to improve security, accessibility and sustainability.
- Direct web report and database publication within the IADB framework.

During the course of the VERA project a number of important issues have arisen, including:

- The fragility of on-site infrastructure,
- The robustness and usability of digital recording devices,
- The central role of the Context Recording Sheet in excavation recording,
- Managing the introduction of new technologies and techniques into long running fieldwork projects with well established management and recording systems,
- The importance of training,
- The need for well established management and data validation procedures,
- The importance of extensive and detailed user needs analysis,
- The role of appropriate and useful visualization techniques, and whether legacy data can have a role in 3D visualizations.
- The appropriate open source model for applications such as the IADB and the data they contain.

In two ninety minute sessions, these issues will be covered in a number of papers to be submitted by members of the VERA team. Proposed topics include:

- Managing Change: introducing innovation into well established systems.
- User Needs Analysis: what do users really need and want?
- Innovation in Visualization: using data in innovative ways, which fulfils researcher needs.
- Evaluating Innovation: does it work? Is it worth it?

Papers are also invited from other CAA members who would like to address any of these issues, particularly from their own practical experience. The VERA project session will be chaired by Steve Stead.

It is proposed that the formal paper session should be followed by a round table discussion which would focus on the implications of the VERA project for the wider archaeological community. The round table will be chaired and moderated by Steve Stead and the panel will include both VERA and non-VERA participants.

Topics: databases, 3D data capture and modeling, data management systems and other field applications, open source software in archaeology
Keywords: VERA, IADB, User Needs, 3D

Integration and Sharing of Cultural Information Resources (Session ID: 113)

Chair: Klaus E. Werner, Capitoline Museums, Italy

Cultural heritage organizations – public or private museums; national and federal heritage agencies, cultural institutions, public archives – rely on many different kinds of information resources for their day-to-day work. Most of these are held in autonomous containers like word documents, databases, spreadsheets, image files, &c. which were not originally meant to interact with other resources.

This scenario is gradually beginning to change. We think it was actually the introduction of XML as lingua franca of most underlying file formats (or, where not as file format, so at least as meta data format) to make people aware of the potentialities of seeing data and documents as differently structured, but mere containers of information, which can and should to be accessible via a common API.

The in-house use of standardized APIs and the subsequent opening up and linking of information resources inside the cultural organizations themselves inevitably led to the idea of federated networks which would connect these same information resources between different cultural heritage organizations, too. Technically simple mechanisms like RDF/RSS feeds would allow ad-hoc aggregation of resources from different "knowledge domains" (Englebart).

Much of this is still in an early phase but one thing is clear: the possibility of search, retrieval, re-purpose, and aggregation of structurally different information resources originating from different knowledge domains will finally lead to greater contextualization of cultural objects – something, which seemed to have been lost long ago, even before every institution began storing its information in closed data silos – and, as a side-effect, lead to more collaboration between different cultural heritage organizations.

The session will therefore concentrate on three points: (1) the **content** of the information resources we think worth exposing, (2) the laborious re-construction of the **context** between cultural objects and information resources, (3) the **collaboration** (technical and organizational) between different cultural heritage institutions.

Topics: databases, data management systems and other field applications, Other
Keywords: information resources, cultural heritage, API, mashup, knowledge domain

The New ICOMOS Ename Charter (2008) on the Interpretation and Presentation of Cultural Heritage Sites: What Impact Can Digital Technologies *Really* Have on Public Heritage? (Session ID: 141)

Chair: Neil Silberman, University of Massachusetts Amherst, United States of America

Heritage professionals in the humanities and social sciences have turned their attention in recent years to questions of contemporary social significance and context as well as to documentation and research. This has become increasingly important to the conduct of economically-sustainable, community-based heritage activities. Such international documents as the 2003 UNESCO Intangible Heritage Convention, the 2005 Council of Europe Faro Framework Convention for the Role of Heritage in Society, and the 2008 ICOMOS Ename Charter on the Interpretation and Presentation of Cultural Heritage Sites (www.enamecharter.org) have provided guidelines for action.

The purpose of this session will be to present new approaches and methodologies that go far beyond the traditional aims of academic research and tourist promotion—toward a new, more socially conscious heritage of the 21st century. This session will bring together technologists, humanities scholars, and social scientists to examine the potential role of Cultural Heritage ICT in the following areas of emerging interest:

• **Intangible Heritage and Collective Memory** – The domain of heritage has today moved from a primary involvement with the physical preservation of built structures and historical sites to a wider focus on evolving urban landscapes, cross-cultural routes, vernacular architecture, intangible heritage, minority and indigenous heritage, and collective memory. In a word, public reflection on the **significance** of the past for contemporary society has become as important as the conservation of its physical remains. What will Cultural Heritage ICT play in the coming years?

• **Community Participation** – Through community-based initiatives and innovative public pro-grams, growing numbers of people from all walks of life have been become involved—not only as passive consumers and visitors, but as active partners—in the development and support of historic sites and heritage-related activities. In what practical ways can CH ICT facilitate this emerging trend?

• **Heritage Conflict and Consensus** – Everyone knows about the role of ICT in the virtual reconstruction of the Buddhas of Bamyan. Yet what role can CH ICT play to contain or even prevent future explosions of inter-ethnic violence—and destruction of heritage resources—in other regions of the world?

The session will be divided into three 90-minute sections to deal with each of these themes, with three 20 minute papers and 30 minutes for discussion in each. The emphasis will be on interdisciplinary collaboration and specific tools to implement ICT applications and to measure their success in contemporary social contexts.

Topics: Other
Keywords: Social Context, Public Heritage, Community, Collective Memory

Reality-based modeling and visualization of large and complex archaeological sites: theoretical achievements, current bottlenecks and technology perspectives (Session ID: 135)

Chairs: Gabriele Guidi[1], Fabio Remondino[2] and Carlo Bianchini[3]

[1]Politecnico di Milano, Italy; [2]ETH - Zurich, Switzerland; [3]Università degli studi di Roma la Sapienza, Italy

Several optical technologies are currently available for capturing the 3D digital shape of an archaeological site, based on satellite, aerial photogrammetry, GPS, laser scanning and close range photogrammetry with manual or automatic image matching. The attainable results are very much dependent on the intrinsic capability of each technology in terms of geometric resolution, accuracy, portability and flexibility. The possibility to integrate several 3D technologies in order to match different needs, allows the user to modulate the amount of geometrical points for properly describing a specific site or object. In addition, the use of digital photography for adding detailed textures involves another level of choice about how high the resolution of images should be for maximizing the archaeologically useful information. The final outcomes of each project directly refers to the construction of 2D representations or 3D models, where the former is comparable with the "traditional" archaeological iconography while the latter aims at exploiting the inner features of digital 3D representation.

In any case, the lack of a sound and shared methodology as well as bottlenecks at different stages constitute a strong limit in the whole pipeline. The impossibility to use active sensors in any condition or location might limit the acquisitions time during a field campaign forcing a consequent reduction in the collected data. The difficulties in creating and cleaning meshes (but sometimes even in producing conventional drawings from the acquired data), discourages some users from completing the process, leaving for example a survey in form of point clouds (maybe spectacular but not very useful in practical terms). The absence of commercial and powerful image processing tools able to derive automatically detailed and precise surface model from any data set orients users more towards active sensors than image-based approaches.

A relevant step certainly is then the visualization of the 3D model which can be done by means of videos (i.e. with sophisticate but time consuming off-line renderings) with fixed walk-thru paths, or real-time rendering - often in virtual reality environments -, that allows to freely navigate into the model, possibly linking the model with complementary information. The limitations in actual visualization packages may force users to simplify the geometric model with respect to the acquired high-resolution model for the impossibility of the platform to manage and visualize too many polygons. The difficulties in most 3D visualization systems of linking external information to the 3D models may keep off powerful and useful addictions to the representation of the site. Last but not least, the possibility to remotely manage the whole model through a web site is a project's feature often claimed by not always consistently fulfilled.

Session papers will focus on (i) discussing experiences in data acquisition and processing for archaeological sites documentation by means of integrated approaches, possibly with polygonal modeling and texture mapping and (ii) reporting the specific steps for local and remote visualization with the possible ways of connection to geographic information systems or archaeological databases.

Topics: 3D data capture and modeling, photogrammetry and imaging, high precision surveying, virtual reality
Keywords: 3D Recording, Data Acquisition, Laser Scanning, Photogrammetry, Texture Mapping, 3D Model Visualization, 2D and 3D representation from real data

The Semantic Web: 2nd Generation Applications (Session ID: 134)

Chairs: Leif Isaksen[1] and Tom Elliott[2]

[1]University of Southampton, United Kingdom; [2]Institute for the Study of the Ancient World, New York University, USA

Semantic Web technologies are increasingly touted as a potential solution to the data integration and silo problems which are ever more prevalent in digital archaeology. On other hand, there is still much work to be done establishing best practices and useful tools. Now that a number of projects have been undertaken by interdisciplinary partnerships with Computer Science departments, it is time to start drawing together the lessons learned from them in order to begin creating second generation applications. These are likely to move away from (or at least complement) the monolithic and large-scale 'semanticization' projects more appropriate to the museums community. In their place we will need light-weight and adaptable methodologies more suited to the time and cash-poor realities of contemporary archaeology.

This session will be a forum in which to present current work, appraise previous projects, identify best practices and look for collaborative opportunities. Papers are invited which explore the use of any Semantic technologies in archaeology – especially those recommended by the W3C: RDF(S), OWL and SKOS. Subject matter may be either abstract or with reference to a particular project but in either case should seek to engage with the unique technical challenges in this area. The target audience will have at least some previous experience in this field so a reasonably high level of technical discussion is expected. Specific areas of interest include (but are not restricted to):

• The role of the CIDOC-CRM as a domain ontology in archaeology

• Integrating live legacy databases

• Ontology mapping and alignment

• Spatial and temporal semantics

• Barriers to uptake amongst non-IT professionals

• Top-down (e.g. ontology-based) vs. bottom up (e.g. RDF/a-based) approaches

• CoolURIs and stable web dissemination

• Coreferencing

• Triple- and quad-stores

• Trust, authentication and reification

• Semi-antics: integration with RSS/Atom and Web 2.0 technologies

• Visualization and interfaces

Technical demonstrations are also welcomed. The session will conclude with time for general discussion and debate.

Topics: CIDOC and other digital standards, databases, data management systems and other field applications, Other
Keywords: Semantic Web, RDF, OWL, CIDOC CRM, data

Short paper session for presentation of student's research projects (Session ID: 126)

Chairs: Stephen Stead[1] and Nick Ryan[2]

[1]CAA Steering Committee, Paveprime LTD, United Kingdom; [2]CAA Steering Committee, University of Kent at Canterbury, United Kingdom

This session allows for students and new scholars to describe their current or new research project. It is intended that this will provide a platform for students to give a brief (5 minutes maximum) presentation on their research. It is particularly aimed at first year Phd or Masters candidates who have only recently started their research. But all are welcome, young or old we do not care we are just interested in what you are up to!

It is hoped that this will give an opportunity for newcomers to gain some experience in giving papers at an international conference without the pressure of a full paper and the expectation of publication (although contributions can be submitted for publication if you want). Some old CAA hands will be around to make suggestions as who might be a good person to "network" with (consumption of fluids is of course optional during such "networking"). It is organized as a series of short papers and additional time is available for late additions to the program. So you can submit a paper ahead of the conference or just turn up and give a brief outline of what you are embarking on. Pre-submitted papers may be considered by your department as a reason to help support you attending the conference.

So if you fancy getting your feet wet by presenting at CAA but don't fancy a full paper just yet or want a few pointers as to who might a good person to chat with, come along and tell us what you are up to!

As a final incentive the best contribution (as voted by the all attending the session) will receive a small prize (contributed by the CAA International Committee).

The session is organized by the CAA International Steering Committee as a part of the conference program. This is the third time such a session has been run.

Topics: Other
Keywords: Student presentations

Short paper session on research projects looking for collaborators (Session ID: 124)

Chairs: Stephen Stead[1] and Nick Ryan[2]

[1]CAA Steering Committee, Paveprime LTD, United Kingdom; [2]CAA Steering Committee, University of Kent at Canterbury, United Kingdom

This session allows for projects, units, institutions, individuals and groups to ask for collaborators and data providers to help further their research. It is a bit like a clearing house or brokerage session where you can find people that have data for you to test your new software on or have software to process some data that you have. Students or their supervisors may be able to find research opportunities or projects for them to complete as part of a degree or masters program. It is organized as a series of short papers and additional time is available for late additions to the program. So you can submit a paper ahead of the conference or just turn up and ask if anyone can help use up your free time or solve your problem!

So if you are looking for data or collaborators, need a project for a research student to work on or just have some free time, this is the place to come and announce it or volunteer!

The session is organized by the CAA International Steering Committee as a part of the conference program. This is the third time such a session has been run.

Topics: Other
Keywords: Collaboration

Spatial Analysis 'Remains Downtown': analytical approaches to past built environments and urban movement economies (Session ID: 128)

Chairs: Hans Kamermans and Hanna Stoeger, The University of Leiden, Netherlands

This session seeks to encourage dialogue and comparison between different methods of urban analysis: space syntax, network analysis, visual analysis, cost analysis and agent modeling. The common link between the various approaches and diverse research traditions are pronounced spatial thinking and spatial perspectives. A central concern to all these methods is the re-creation of the past urban experience within a reproducible framework. While all these approaches explore and examine the dynamics of past built space to reveal the underlying social processes, a growing number of analytical urban studies show a vested interest in identifying those areas within the past environment which privilege interaction and movement. Fundamental to the goal of making such urban movement models as realistic as possible, are empirical studies of contemporary urban circulation patterns conducted at large-scale experimental levels.

The session aims to continue the lively discussion started at the CAA07 in Berlin, when the urban context of spatial analysis started to receive specific attention, an interest which was successfully continued at the CAA08 in Budapest. The session intends not only to encourage dialogue between different approaches but also seeks to address questions crucial to all spatial approaches: how applicable are the methods and how to translate social phenomena into quantifiable data.

Topics: agent-based models, Other
Keywords: spatial analysis, urban analysis, space syntax, network analysis, visual analysis

Three-Dimensional Surface Recording, Analysis, and Interpretation in Archaeology and Anthropology (Session ID: 131)

Chairs: Michael Phillip Scafuri, Maria Jacobsen and Benjamin Rennison, Clemson Conservation Center, Clemson University, United States of America

This session will focus on presenting and discussing the most recent technologies and methodologies for three-dimensional surface recording, analysis, and interpretation currently utilized in the fields of archaeology and anthropology; the specific emphasis will be on the use of structured light (optical tomography) and laser-based scanning techniques.

The latest generation of structured light and laser scanners offers unique capabilities in terms of their flexibility of range, speed of operation, and accuracy. In addition, they allow for the ability to perform non-destructive/ non-contact data collection, and, in some cases, the capacity to capture high-resolution photographic surface information that is automatically linked and integrated with surface topography captured during the scanning process. Going beyond highly accurate and fast three-dimensional surface mapping, these new techniques and features greatly enhance our ability to analyze and interpret data captured in both field and laboratory environments. They also lay the foundation for novel ways to manipulate, publish, and display

the results of archaeological and anthropological investigations. However, there are unique challenges and inherent problems with applying these technologies to archaeological and anthropological data recording and interpretation that should be addressed as well.

Session papers will focus on discussing experiences with data acquisition, interpretation, analysis, and visualization/ dissemination utilizing structured light (optical tomography) and laser-based three-dimensional scanning techniques and methodologies.

Looking to the future, this session is also designed to provide a forum for a discussion on how to improve our current methodologies, as well as explore new avenues for implementing structured light and laser scan techniques for archaeological data processing, manipulation, and dissemination. Therefore, we welcome contributions from researchers that are dealing with data collection under adverse or extreme conditions, or teams that otherwise are testing the range and pushing the capabilities of the currently available scan systems.

Topics: 3D data capture and modeling, photogrammetry and imaging
Keywords: 3D Recording; Data Acquisition; Laser Scanning; Structured-Light metrology

Visual archaeologies for the digital age. Rethinking representation in archaeology.
(Session ID: 143)

Chairs: Graeme Peter Earl and Gareth Beale, University of Southampton, United Kingdom

Visualization has been central to the archaeological process from the inception of archaeology as a discipline. Visual representations have been created to aid every stage of the archaeological process from the capturing of field data to the representation of complex theories, interpretations and concepts. In turn representations have shaped and directed many aspects of archaeological thought. Computer graphics introduce a new range of new visual media to archaeology. Many of these new representative forms are grounded in established archaeological practice. However, others provide new challenges to a critical archaeology.

In this session we wish to discuss the interface between computer graphics and the archaeological process. In particular we are interested in the extent to which computer graphics produced in an archaeological context are themselves a form of archaeological practice. We encourage papers demonstrating computer graphics not only as alternatives to traditional illustrations but also as new tools for engagement and knowledge formulation.

Some of the ideas we wish to explore include:

1. Graphical recording techniques. How have computer graphics altered the way that we record archaeological data and how have these changes altered the way that we think about archaeological practice?

2. Graphics as collaborative environments. Computer graphics allow us to construct a vast range of interactive and non-interactive archaeological spaces, places and environments. What impact have these played on archaeological interpretation?

3. Performative Graphics. CGI encourages new modes of representation that can communicate to a diverse audience in ways impossible through traditional archaeological modes of expression. How do these changes alter our perception of archaeological subjects and how can this be of use to us?

Topics: 3D data capture and modeling, virtual museums, virtual reality
Keywords: Computer Graphics, Representation, Performance

Why did it take so long? spatio-temporal modeling and GIS (Session ID: 139)

Chairs: Ian Johnson[1], Ruth Mostern[2] and Cathy Campbell[1]

[1]University of Sydney, Australia; [2]University of California Merced

One might expect archaeologists and historians to be early adopters – or indeed demanders – of spatio-temporal GIS, dealing as we do with objects and events situated in space and time. Yet GIS and 3D reconstruction has remained largely atemporal – where time is addressed at all, it is generally in the form of layers or alternative views at different periods (snapshots), more rarely in the form of objects with time stamps allowing filtering of extant material for different dates. Little serious attempt has been made to address issues such as the representation of temporal uncertainty.

The reasons, we believe, are to do with the often imprecise nature of historical and archaeological dating - we deal with periods, with *terminus post* and *ante quem* dates, with indirect observations, with observations made during an extended period rather than dating the beginning or end, with statistical dating errors, with dating by association and so forth. The resolution of our observations often varies within a single corpus depending on the circumstances of discovery or the nature of the phenomenon recorded (site, shard, settlement, battle etc.).

For these reasons, most research in the area of spatio-temporal systems deals with contemporary phenomena where the data is more easily defined and collected. Archaeologists and historians therefore have particular needs which are less likely to be addressed by mainstream spatio-temporal research.

However, over the last couple of years, papers on temporal modeling and temporal GIS have started to appear in the CAA program. It therefore seems timely to bring these papers together into a special session to review the current status of spatio-temporal work and its application in our domain, to share ideas, to define how our needs differ from work on contemporary material, and perhaps to stimulate new collaboration.

We invite papers which review attempts to integrate spatial and temporal information, papers which provide theoretical or methodological insight into the issues of spatio-temporal modeling and analysis in the history and archaeology, and papers which provide practical examples of spatio-temporal GIS or visualization in action. Papers proposing original approaches and new directions are also invited.

To provide a concrete outcome for the session, we plan to produce a short annotated bibliography of spatio-temporal applications in archaeology and history, which will be published on the web using Heurist (HeuristScholar.org), allowing ongoing addition and discussion around the topic. We will ask participants to provide key bibliographic references and/or web sites prior to the session for inclusion in the bibliography and to kick off discussion - we plan to conclude the session with a roundtable discussion, with the aim of developing a 'manifesto' identifying the current status and particular needs of this domain.

Topics: agent-based models, GIS, Other
Keywords: spatio-temporal systems, spatio-temporal modeling, simulation, historical events, timelines