

Contextual Information Visualization and Interaction

Stavros Christodoulakis
MUSIC/TUC

School of Electronic and Computer Engineering
Technical University of Crete

Contextual Information Visualization and Interaction

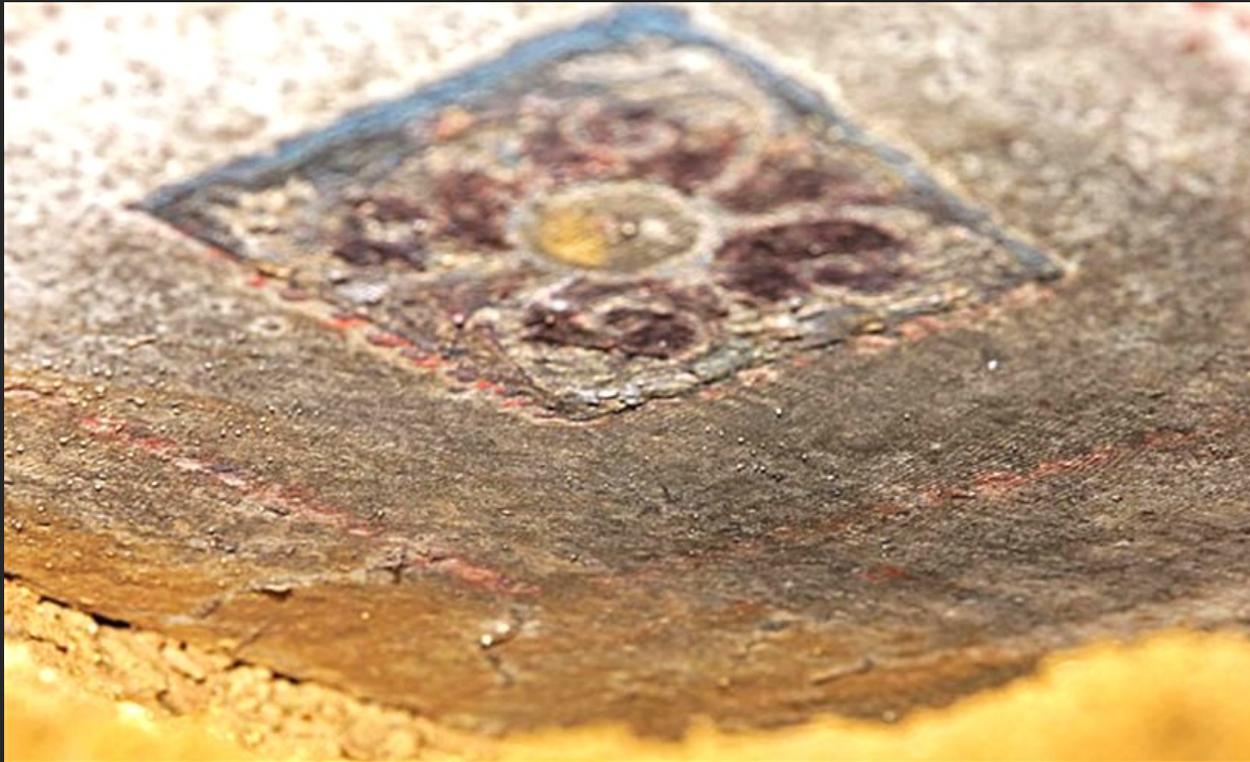
- Purpose: Outline some applications and challenges in contextual information visualization
- For interaction with information “context is the king”
- Some foresee that it will pass in importance the search engines
- Context as means for effective and efficient user interaction and knowledge acquisition

Context in Visualization



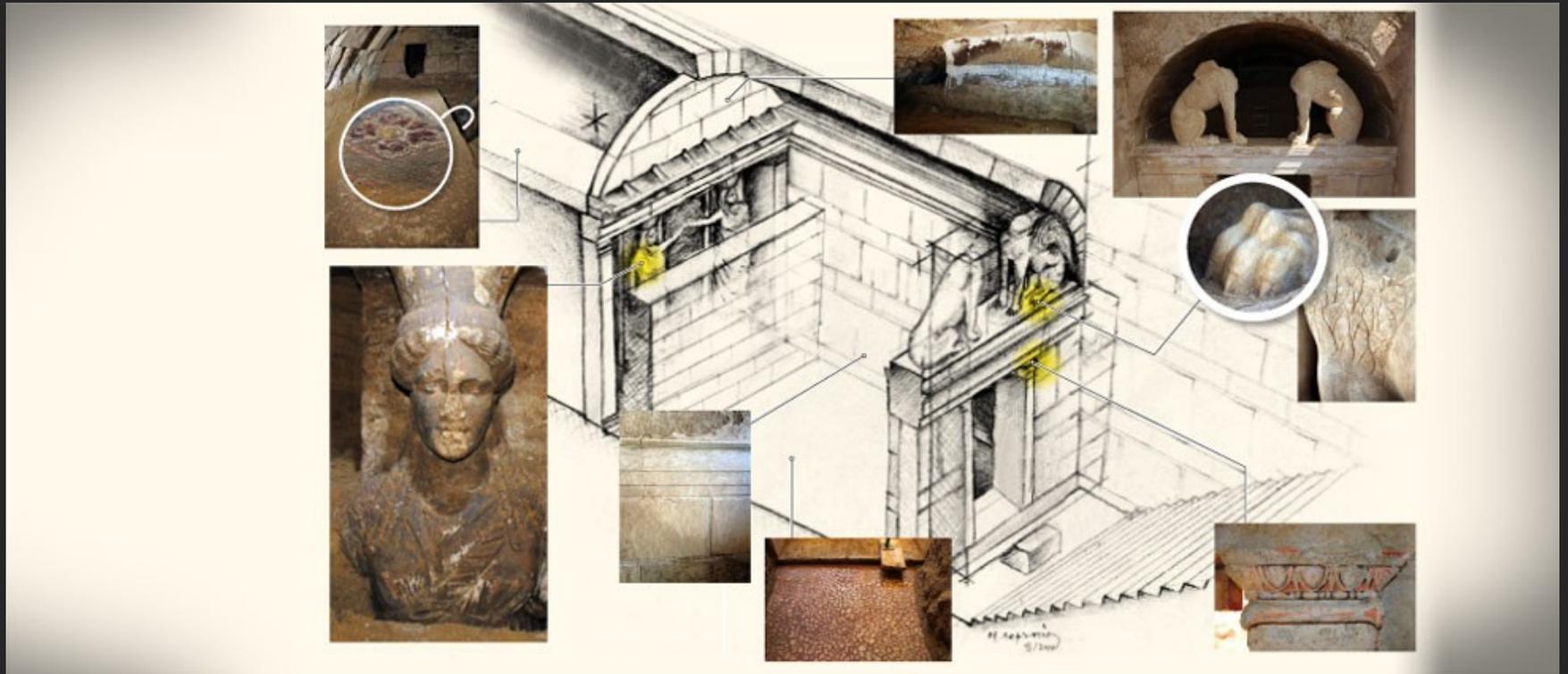
Amfipolis: Ontological Description and pictures

Context in Visualization



Amfipolis: Ontological Description and pictures

Context in Visualization



Contextual Viewing and Understanding

Context Modeling

- Logic reasoning based approaches, McCarthy Formalizing Context, 1993.
- Ontological reasoning approaches, Giunchiglia Contextual Reasoning, 1993.
- Graphical models (UML, ER)
- Markup models
- Key value models, ..

Context in Multimedia

Content and context of multimedia often involves objects, events, participants, activities, states



Multimedia Context Modeling

- [Hunter 2002] Semantic Multimedia Model in RDF (and some DAML+OIL extensions) to capture the context:
 - Entities, situations, properties, events, actions taken by agents
 - “Attachment Points” to existing modeling concepts in MPEG7/21
- Extensions of the semantic model of MPEG7/21 to incorporate the semantics of context within the mpeg-7 itself [Tsinaraki and Christodoulakis 2007]

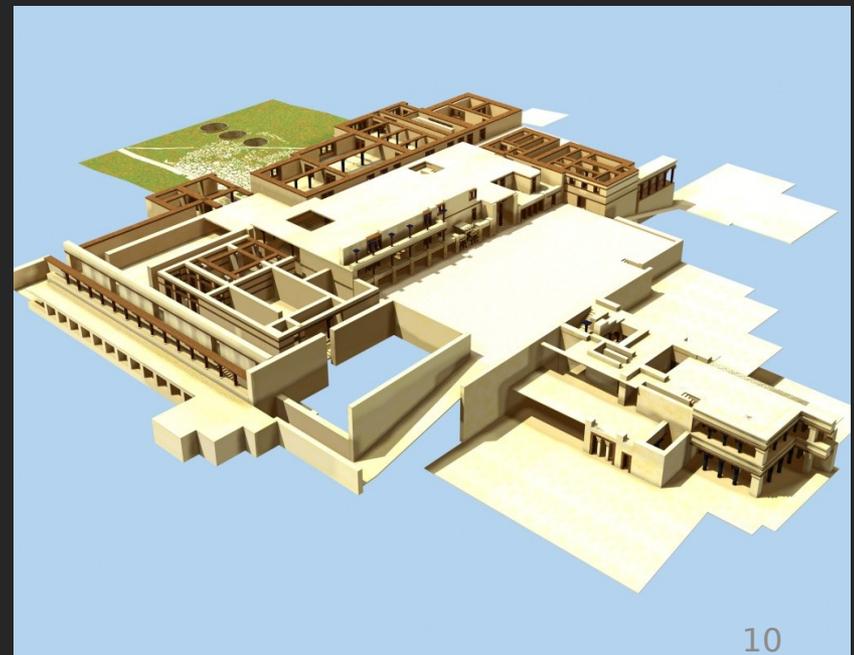
Mobile, Personal and Social Use

Context of capture VS context of use

- Location, direction, azimuth, sensor data, ...
- Interests, knowledge, preferences, device used, activity...
- Social contexts for different activities, notifications, cooperative viewing,...

Location Based Visualization

- Reconstructions of ancient sites
- Augmented reality
- 4D visualizations (3D slices in time)
- Capturing becomes easier with new software



Visualization and Interaction in Internal Spaces

- Great emphasis to simplify capture and interaction in internal spaces
- Not just for archeology..
- GPS and WiFi not appropriate.
Open research topic.
- Hybrid approaches
(Apple, HP,..)



Contextual Geovisualization

- The mobile device as my window to the world (Ricoh)
- Can I say what is an object that I see far using context ?....
- Difficult,

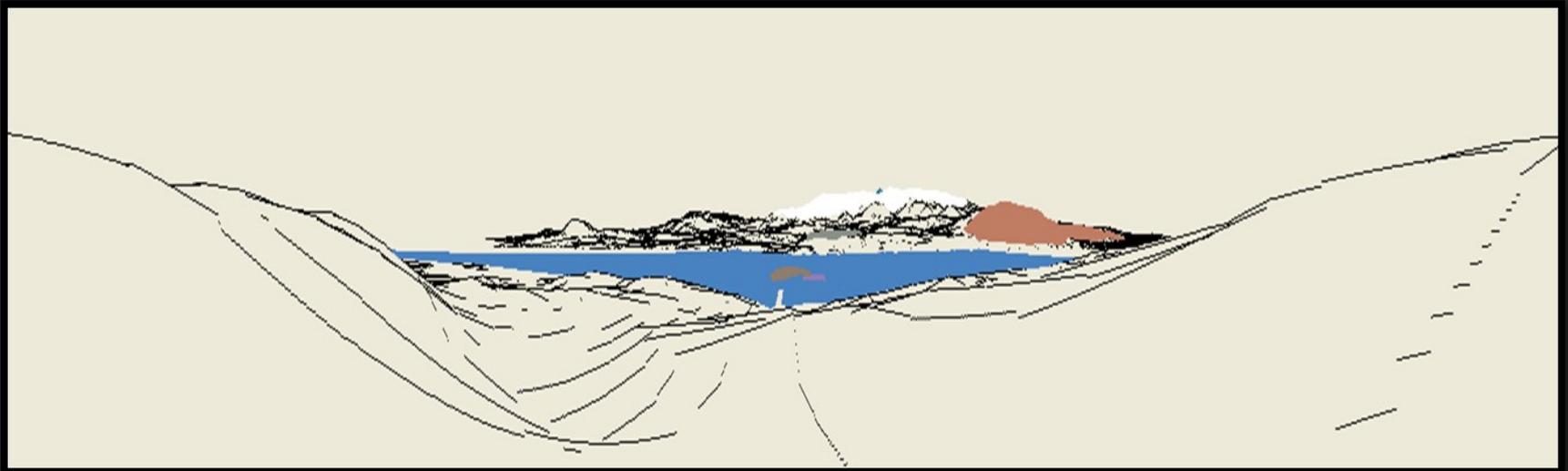


Contextual Geovisualization

- Image registration using local techniques:
Match the picture with the 3D model of the earth in the direction of the picture
- Match with the horizon line
- Use additional context : time of day gives shadows, sun reflection on the sea, etc.

Contextual Geovisualization

- Use the panoramic model when no compass available [Christodoulakis, et al 14]



Event Geovisualization

- Event visualization on top of 3D maps (Google Earth)
- Objects change shape in space and time
- Visible from the point of view of the (mobile) user, or other. Learning, culture, tourism, disaster training



Personalization

- Mobile phones are personal devices
- Great emphasis by companies to learn the user context, profile, activities, patterns, knowledge, social habits, etc.
- User interface design is based on personas: the more accurate the model of the user the better the interface
- Contextualized and personalized storytelling, dynamically adapted to external input (museum visits, etc.)
- Proactive recommendations based on knowledge of external context and user profile (smart cities)

Crowdsourcing Applications

- Crowdsourcing important for biodiversity, smart cities, culture, tourism, etc.
- Users are Prosumers, social, collaborative context
- Infrastructure and application in biodiversity [Skevakis et al 2014]
- Contextual web and mobile interfaces (spatiotemporal, social, personal context)

Crowdsourcing Applications

The screenshot displays the AnnoTool web application interface. At the top, the logo "AnnoTOOL" is on the left, and "Logged in as trioann" is on the right. A horizontal banner of various animal images spans the width. Below this, a breadcrumb trail shows "Observation Annotation / Your Observations".

On the left side, a navigation menu is organized into three sections: "ONTOLOGY ANNOTATION" (with links for "View Ontology" and "Edit Ontology"), "OBSERVATION ANNOTATION" (with "Your Observations" highlighted in blue, and "Browse Public Observations" below it), and "PATHS" (with "Your Paths" and "Browse Public Paths" below it).

The main content area, titled "Your Observations", features a blue header. It contains two observation entries, each with a photo and a text description. The first entry, by Aristidis Apostoloy, shows a plant with a red box around the photo and an orange box around the text. The second entry, by Maria Grammenou, shows a similar plant with a green box around the photo and a green box around the text. Below the photos is a green "Upload Media" button with a red arrow pointing to it and the text "User Observations" in red.

At the bottom, a "Browse Ontology" section is highlighted with a green box. It lists a taxonomic hierarchy: PLANTAE, TRACHEOPHYTA, LILIOPSIDA, ALISMATALES, ARACEAE, and ARUM. Under "ARUM", "Arum creticum" is listed with a small image of the plant. To the right of this list is a text input field labeled "Write your comment..." with a green arrow pointing to it and the text "Taxonomic Keys" in green. Below the input field, "Taxonomic keys:" are listed: "1. yellow-white spathes" and "2. dark green leaves".

Knowledge Distillation

- System allows to annotate and discuss observations with the purpose of identifying the species and the events
- Fastest knowledge passing with combination of diagrams and text (voice)

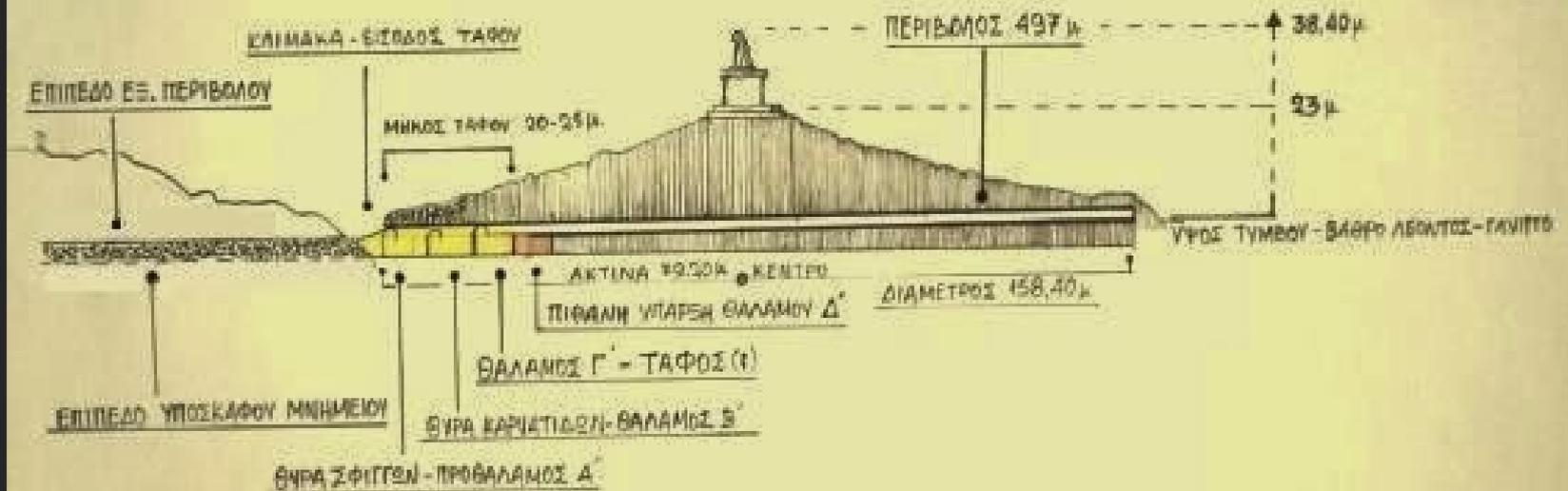
Multimedia Annotations

- Typed multimedia annotations compatible with W3C multimedia annotation model
- Annotations in parts of the images identified by selectors (allows drawing)
- Generic structure that can interrelate annotations, comments, multimedia, etc.
- User is assisted by an ontology that allows classification using taxonomic keys (multimedia)
- Contextual multimedia explanations

Meaningful Contexts

ΤΥΜΒΟΣ ΑΜΦΙΠΟΛΗΣ

Σχολικό γράμμα 3: Περιφέρεια Γ. Γεωργιάδης - 2004 - 4-13
Κλίμακα: 4/5000 - ΤΟΜΗ



ΕΠΙΧΩΜΑΤΩΣΗ: Το πρόβλημα του μνημείου (Είσοδος - κλίμακα), όπως και οι θαλάμοι του τάφου Α'-Β'-Γ', βρέθηκαν κλειστά χωρίς να έχουν ανοίξει.

Contextual Questions

- What are meaningful context fragments?
- What are key aspects of a context, context summarization
- What are similar contexts?
- What are dissimilar contexts?
- What are interesting contexts?

Summary

- Contextual visualization and interaction enhances user understanding of the information and accelerates interaction
- Context today involves context of capture and context of use
- Mobile sensors will keep increasing the context capturing quality
- Information system applications using it will enable new applications and offer greater user satisfaction