Contextual Information Visualization and Interaction

Stavros Christodoulakis

MUSIC/TUC

School of Electronic and Computer Engineering

Technical University of Crete

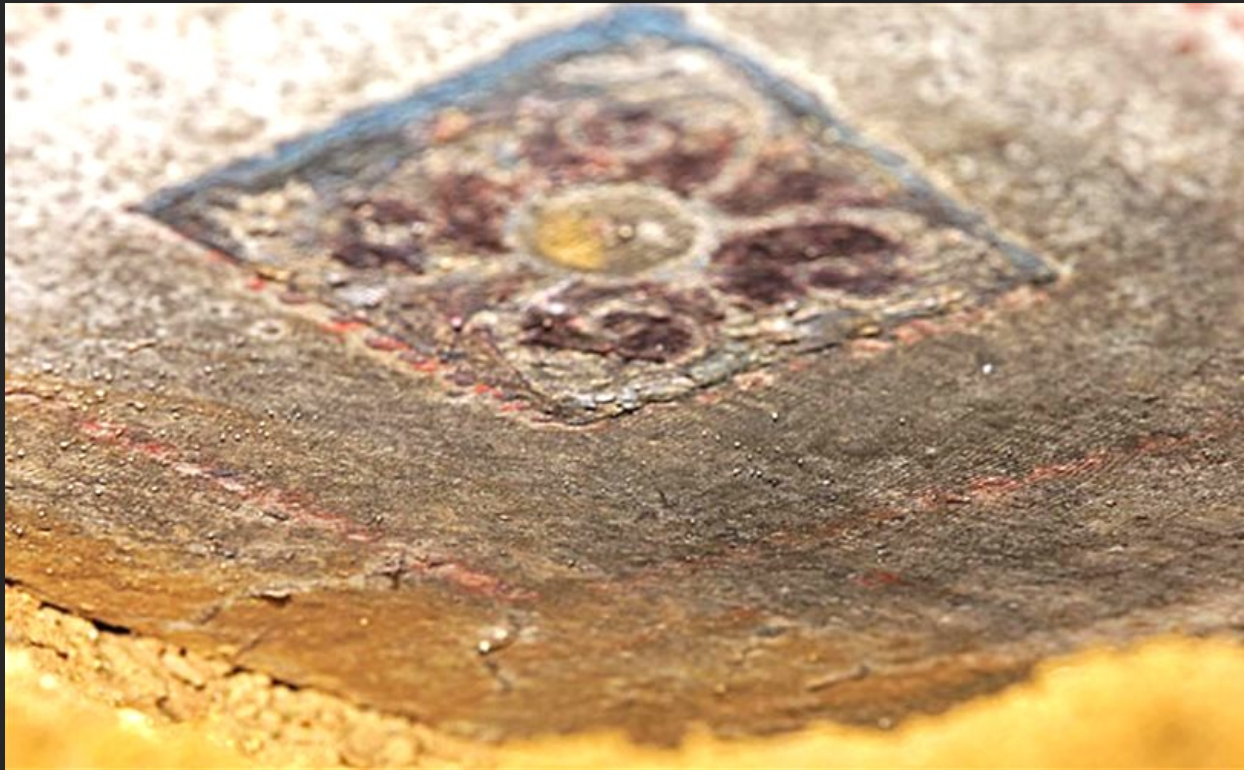# Contextual Information Visualization and Interaction

- 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 aquisition
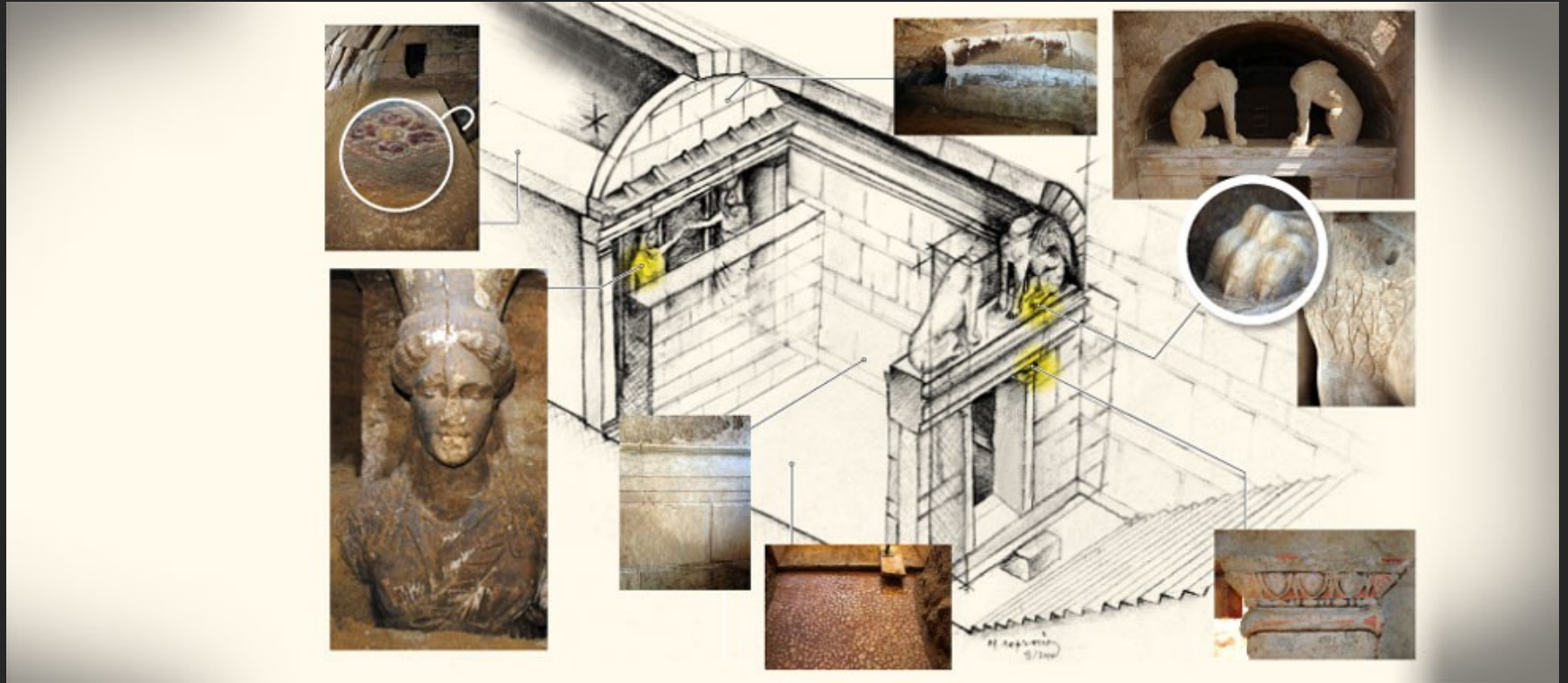
Context in Visualization

Amfipolis: Ontological Description and pictures

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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
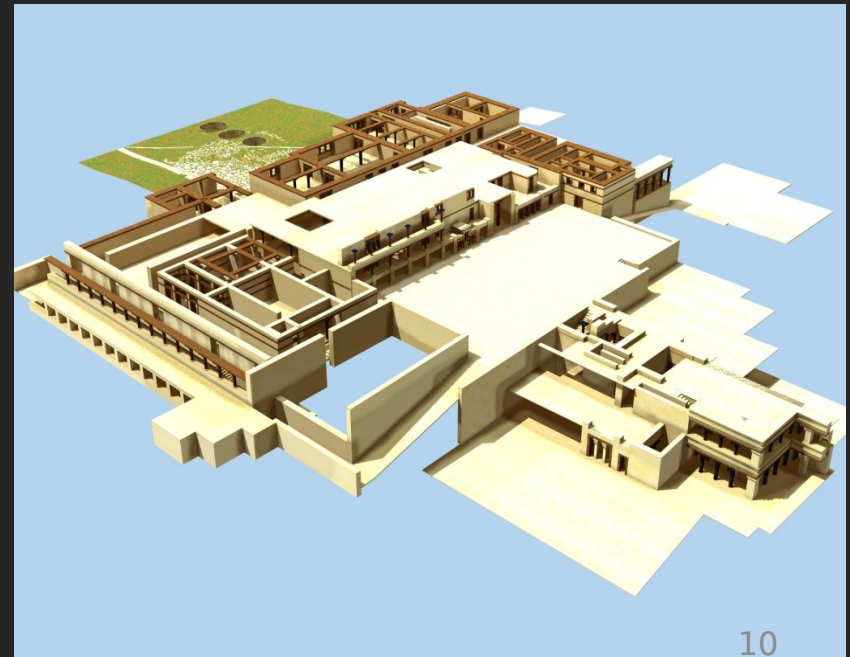
Visualization and Interaction in Internal Spaces

- 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.
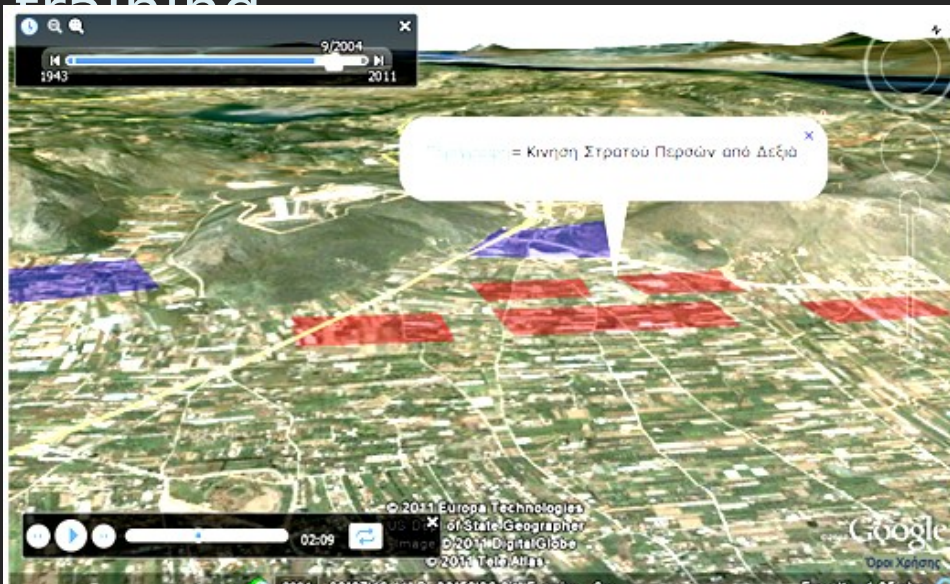
Contextual Geovisualization

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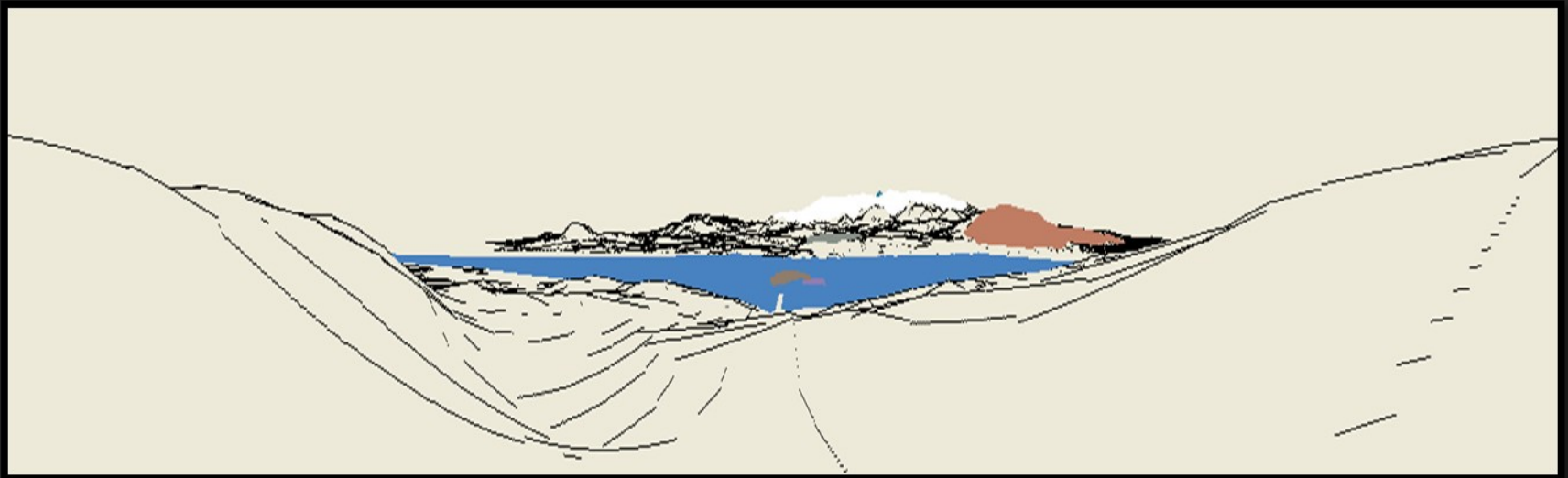
Event Geovisualization

- 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

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
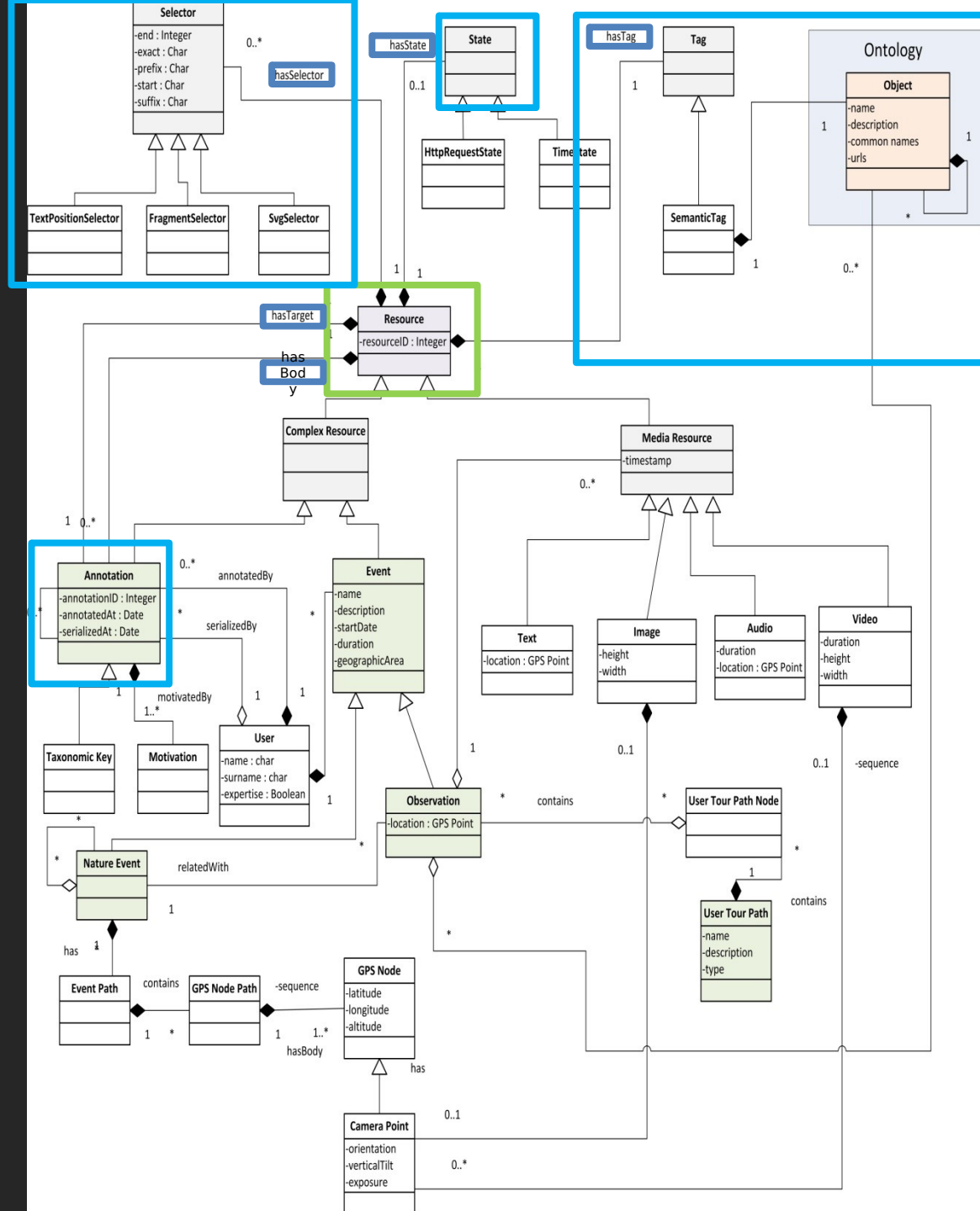
Multimedia Annotations

- 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

- Related to provenance, sense making and knowledge distillation

- Important to many Domains, Open Liked Data Publishing
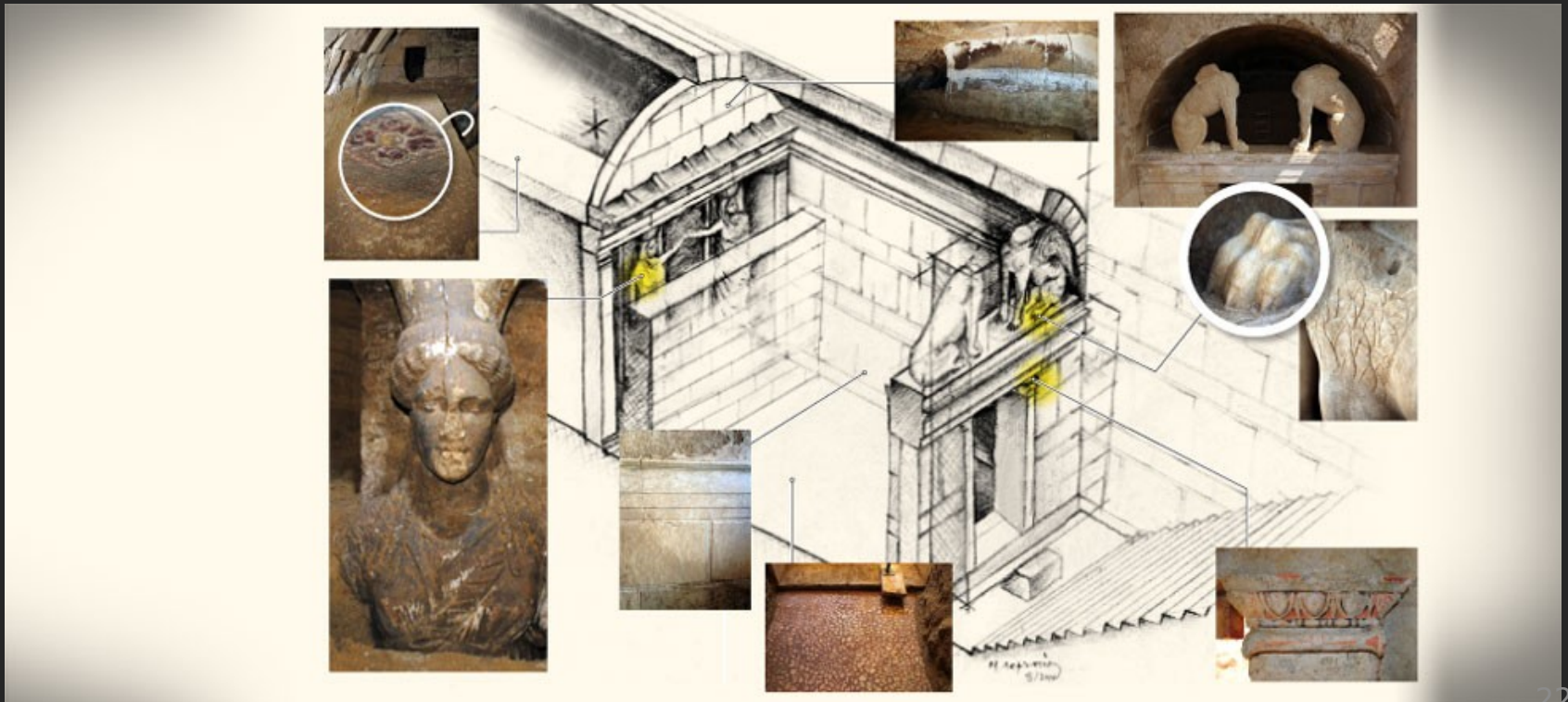
Meaningful Contexts

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