



Ερευνητικό Κέντρο Αθηνά
Athena Research Center

Ερευνητικό Κέντρο Καινοτομίας στις Τεχνολογίες
της Πληροφορίας, των Επικοινωνιών, της Γνώσης

Research and Innovation Center in Information,
Communication and Knowledge Technologies

Σεμινάριο
“Διαχειδωτικές τεχνικές στην επιστήρη της συντήρησης Έργων Τέχνης”
Θεσσαλονίκη 17, 18, 19 Φεβρουαρίου 2012
ΔΤΜΣ Προστασία, Συντήρηση, Αποκατάσταση

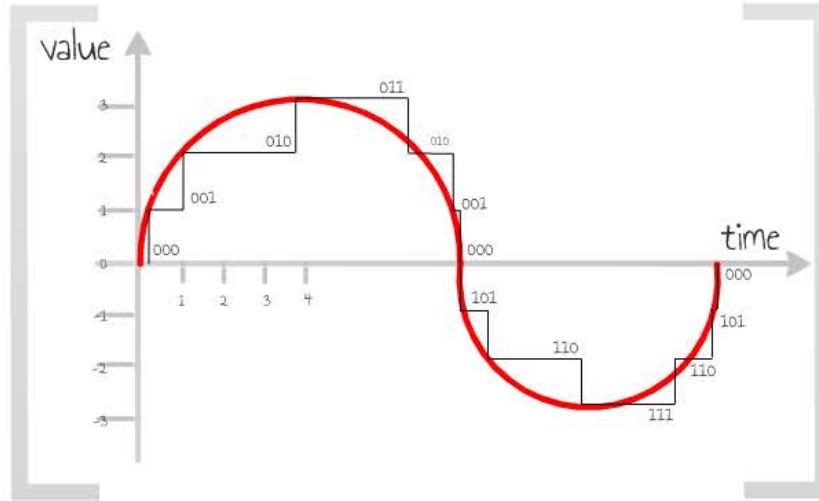


Technologies for 3D digital data management and dissemination



George Pavlidis
Principal Researcher
Cultural and Educational Technology Institute

Digital?



What's with that '3D'?

We are 4D beings and perceive a 3D universe

3D images

- convey geometry information
- can dissociate structure from color
- can produce different versions of reality
- can return back to the real world

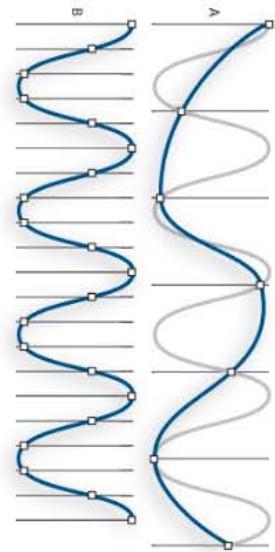
why?

from infinity down to earth and the human mind.

- we get a sequence of numbers...in most cases just 2 digits by "sampling" the original in specific time points

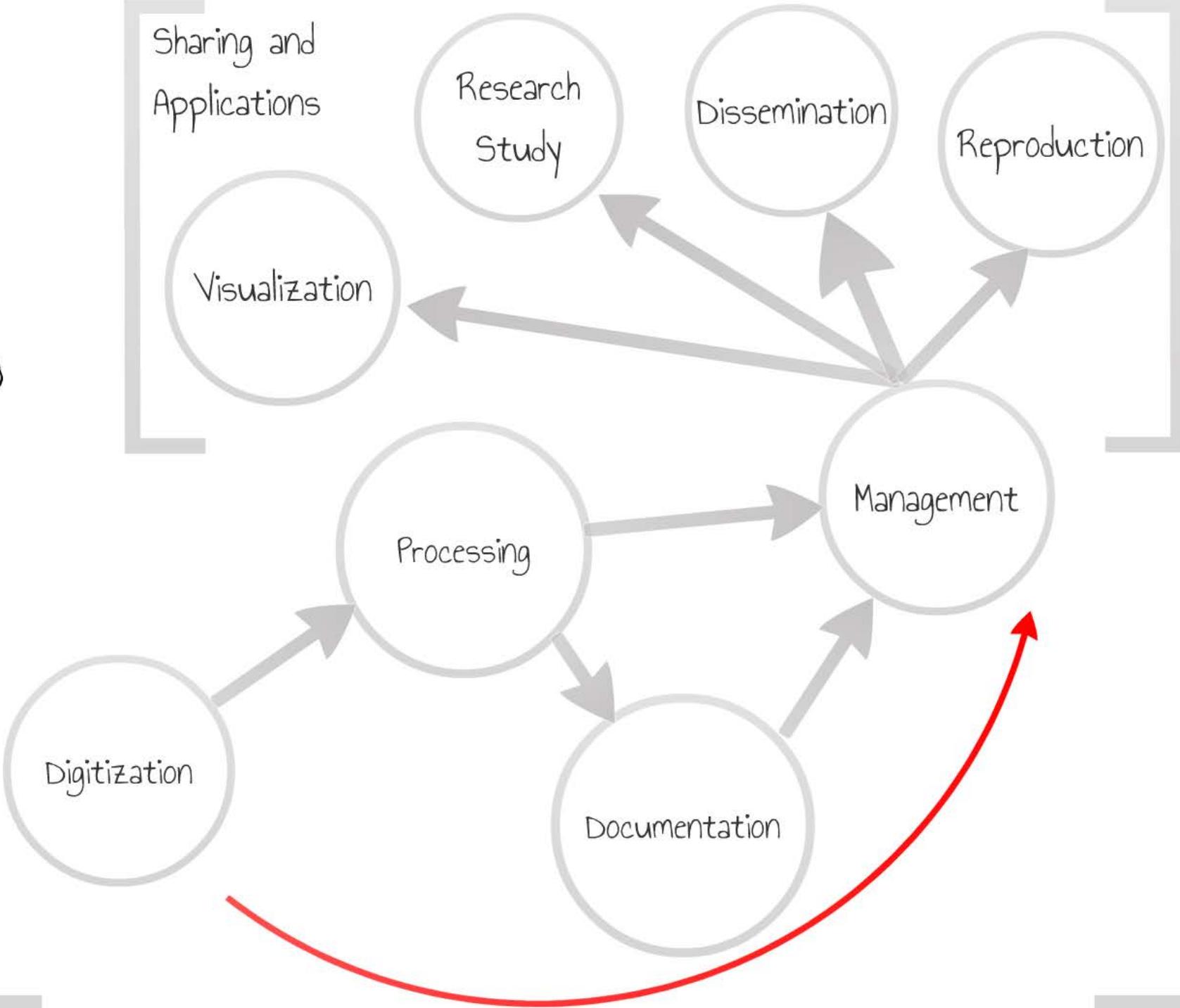
sequences of distinct numbers

- are easy to handle
- are easy to correct in case of errors
- are easy to encode & encrypt
- are easy to compress & save storage/transmission size & time
- lead to devices and technology
 - with small size
 - low power consumption
 - easy processing and filtering
 - guarantee better quality
 - make the internet possible
 - ...



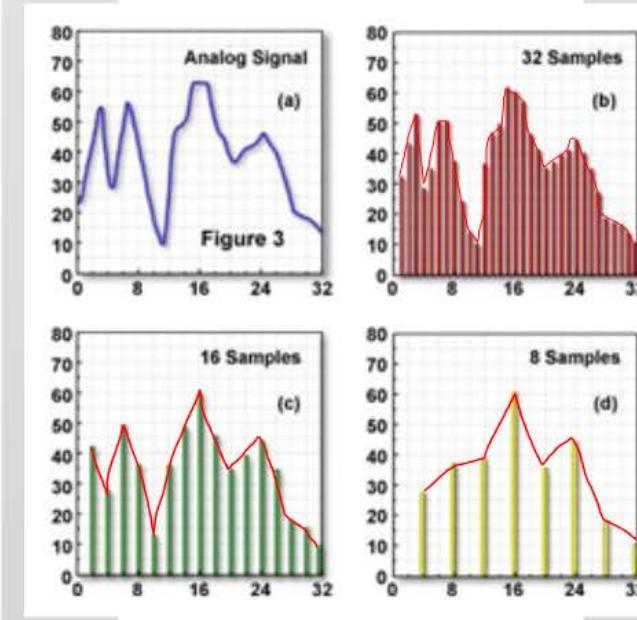
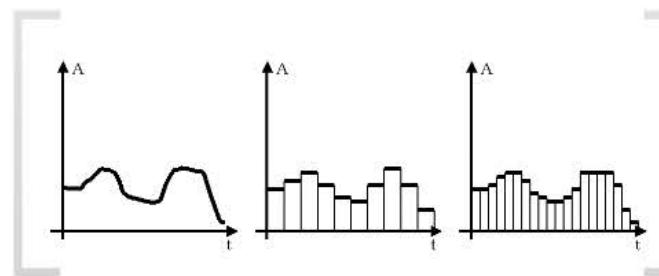
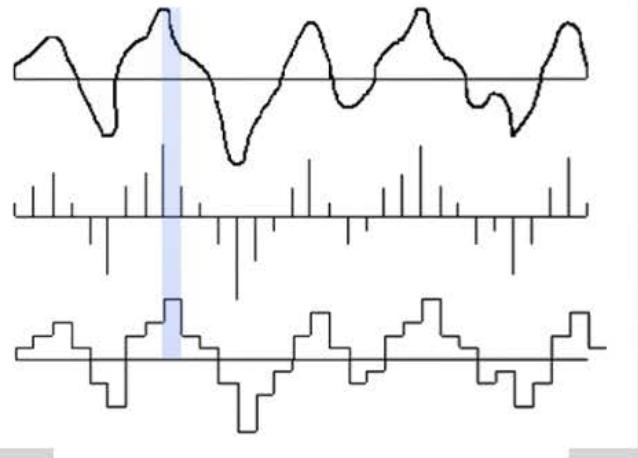
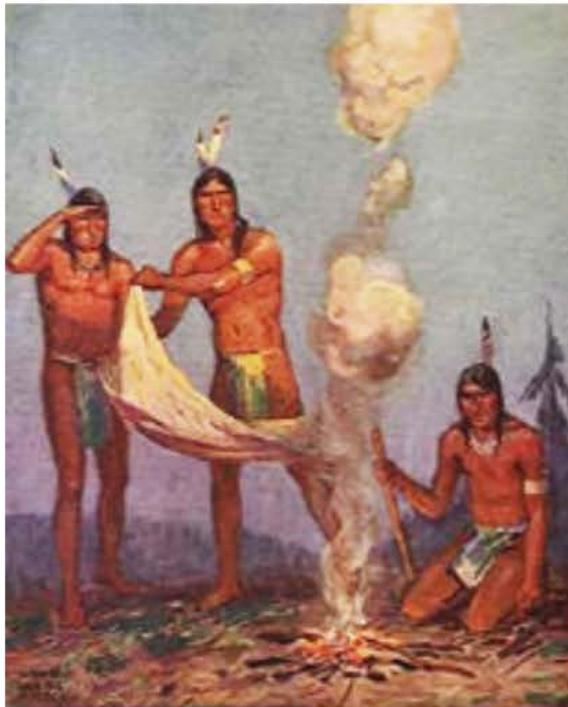
But...sampling over "discrete" time? How frequent?

Data Life Cycle



Digitization

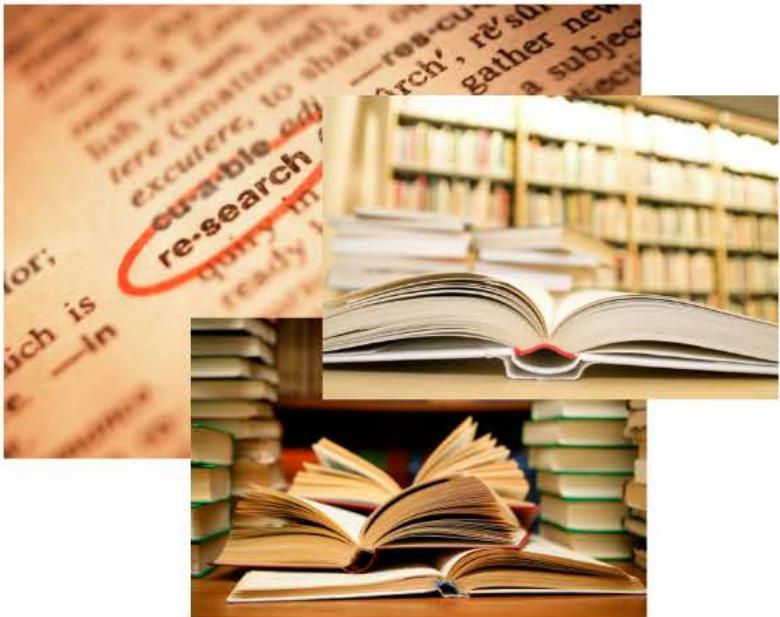
A - -
B - - . .
C - - - .
D - - - .
E - . . .
F - . - - .
G - - -



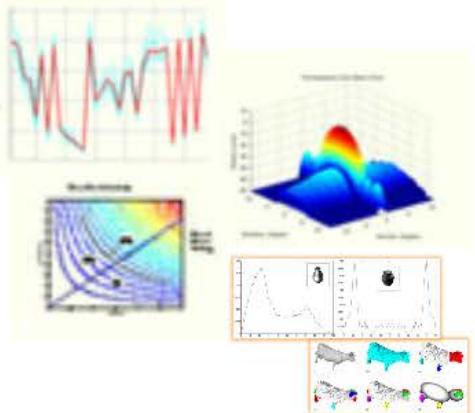
Decimal	Digital
0	0
1	1
2	10
3	11
4	100
5	101
6	110
7	111
8	1000
9	1001
10	1010



Documentation



Data analysis and feature extraction



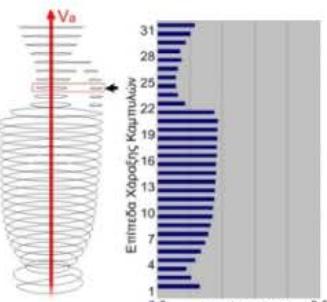
Metadata

- Descriptive metadata / manually entered
- Versioning, data management metadata
- Mathematical descriptions of data features
- Copyrights

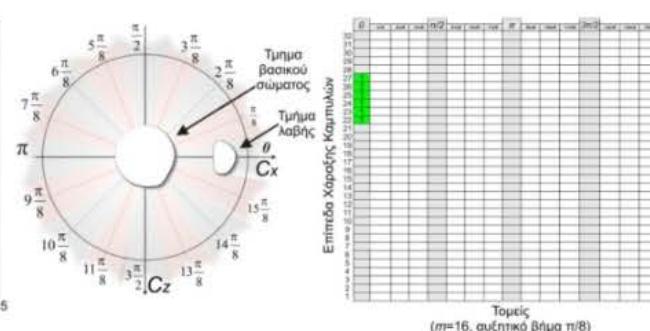
Mathematical descriptions

Content-based descriptions

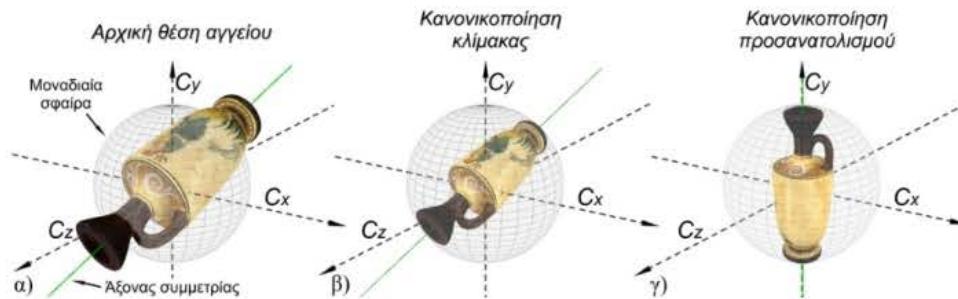
- Automated content analysis
- Feature extraction
- Content-based identification



α) Μονοδιάστατο δίάνυσμα χαρακτηριστικών του προφίλ (32 επίπεδα χάραξης)



β) Διαδικός Πίνακας Θέσης Προσαρτημάτων (32x16)



Method for partial/complete identification of morphological features of 3D pottery

Άγγειο επερώτηση	Κοντινότερος γείτονας				

<http://www.ipet.gr/3DPSE>

More semantic descriptions

Even more content-based descriptions

3D scenes

- monuments
- architecturals
- urban areas
- open spaces



Annotation of 3D scenes to empower (semantic with hierarchies)

- content-based retrieval / navigation within 3D scenes
- predefined queries
- topological or map-based queries
- instant region of interest navigation
- web-based access

The screenshot displays the 3DSSE interface, which includes a search bar with the query "church", a map view with a highlighted region, and a list of PDF documents related to the current scene.

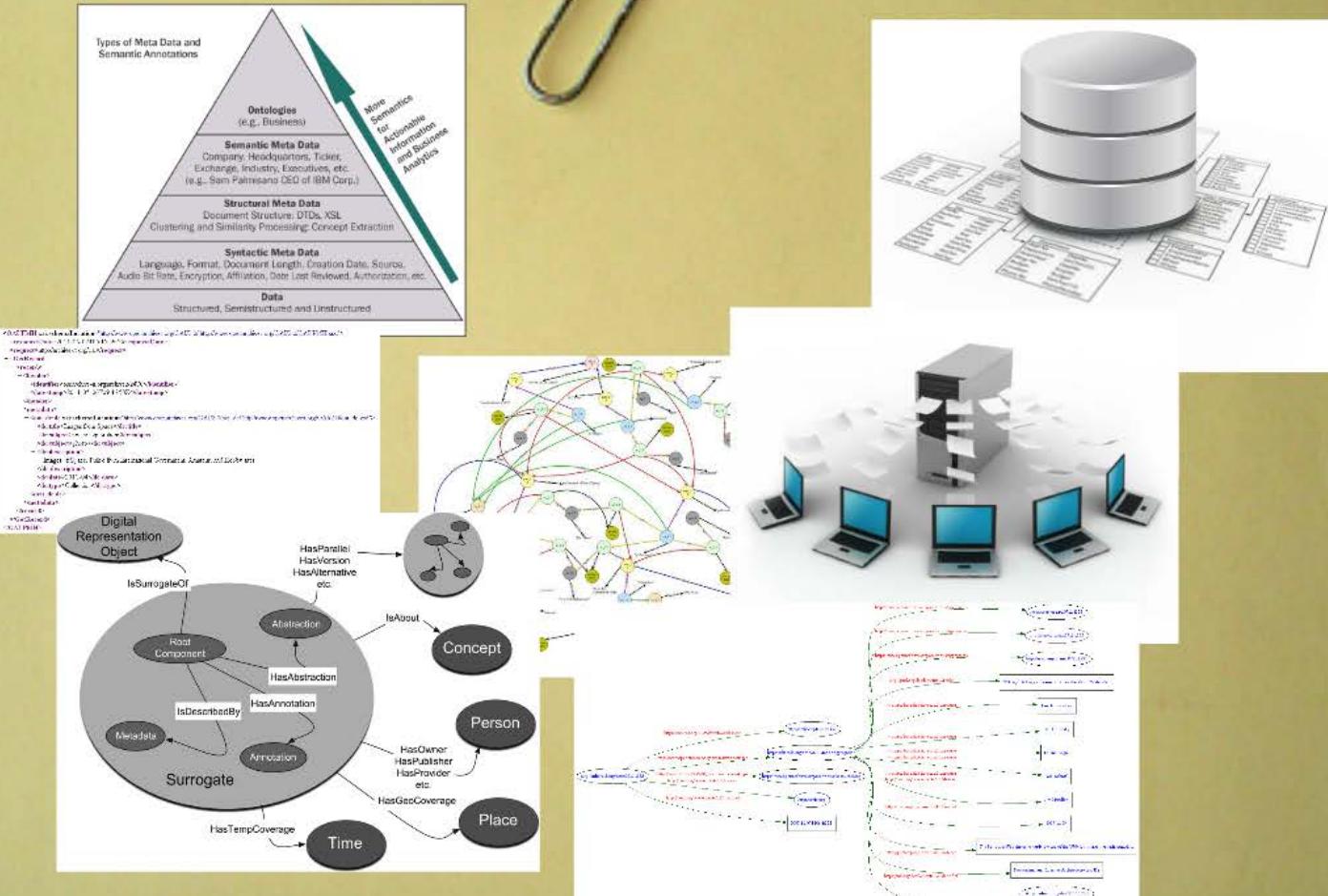
Annotations on the right side of the interface:

- "Root element of the current 3D scene"
- "List of relevant PDFs in the current 3D scene"

Below the interface, the URL <http://www.ipet.gr/3DSSE> is written.

Management

Data and metadata

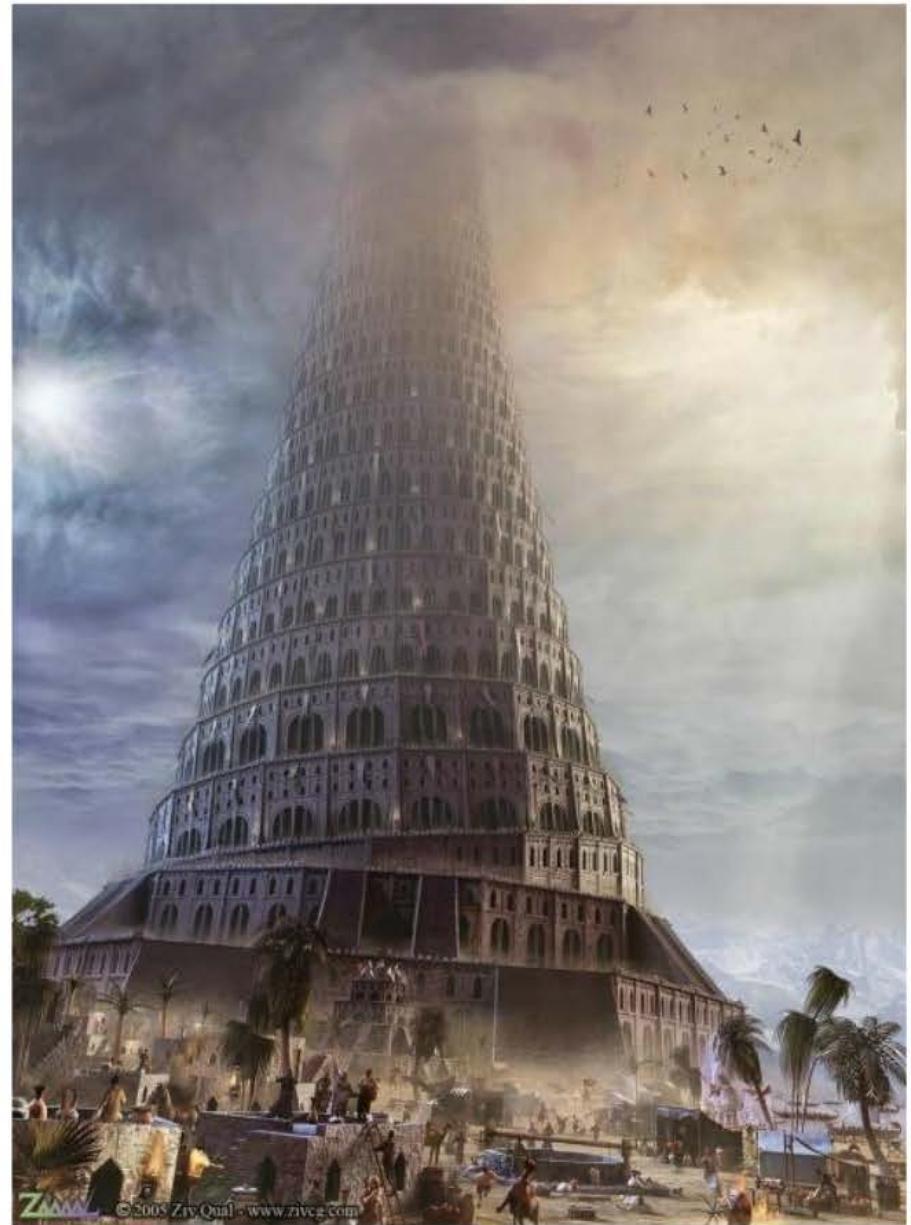


The Tower of Babel

Zillions of cultural data
that keep piling up

But who can access and use
all these data?

Do we, again, stand before
a tower of Babel?



ZIVCG ©2005 Ziv Quil - www.zivcg.com

Interoperability

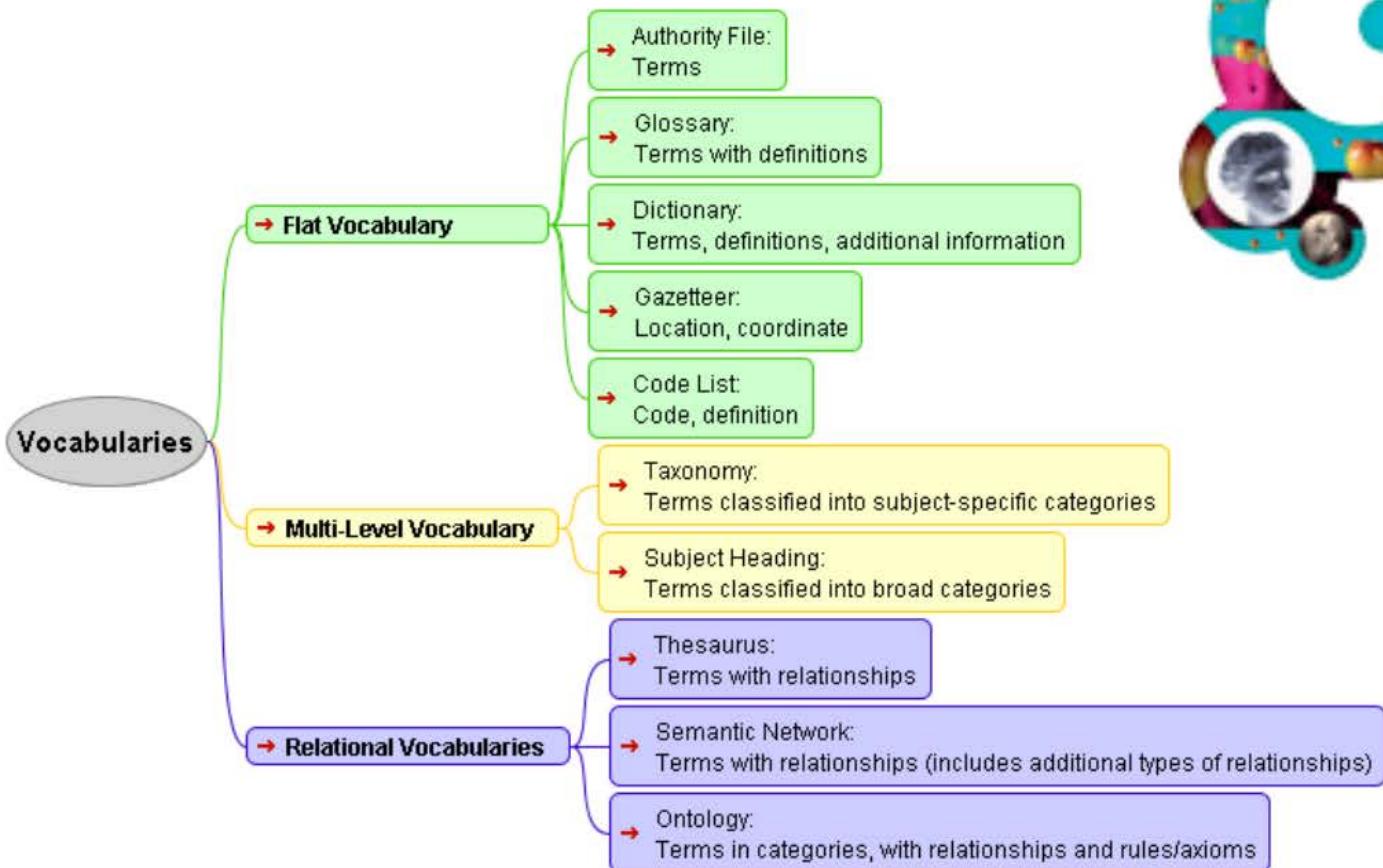
Standardization

with ontology defining the domain



Wrap it up

with controlled vocabularies



Storage

Factors that influence the selection of a storage system

- Access times
- Data rates
- Multi-user access
- Capacity
- Usage frequency
- Lifetime of the medium
- Storage and usage conditions
- Cost per storage unit



Digital curation

- Collecting verifiable digital assets
- Providing digital asset search and retrieval
- Certification of the trustworthiness and integrity of the collection content
- Semantic and ontological continuity and comparability of the collection content

Warning!

- Storage format evolution and obsolescence
- Rate of creation of new data and data sets
- Broad access and searching flexibility and variety
- Comparability of semantic and ontological definitions of data sets

Visualization / Presentation of 3D data



Immersive environments

- User loses connection to reality
- User wears HUD and acts in controlled environment

Non-immersive desktop environments

- 3D presentation on screen
- User usually has to wear glasses (colored/shutter/polarizer)

Projected environments

- Virtual environment is projected in real controlled space
- User typically uses glasses (polarizer)

Augmented environments

- Virtual objects are being projected on real-world images

Visualization / Presentation of 3D data

Immersive environments



Factors to consider

- Audience size
- To immerse or not to immerse
- Interaction level
- Costs

Projected environments



Non-immersive desktop environments

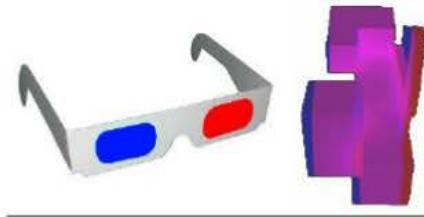


Augmented reality



Stereo vision

Colored glasses (red-green/blue/cyan)



Polarizer glasses



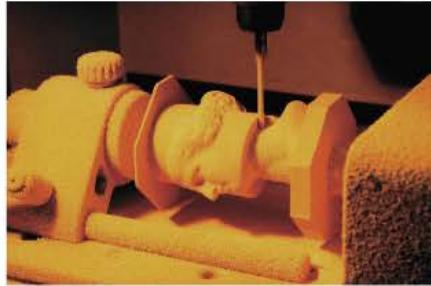
Shutter glasses



Holography



Reproduction



3D milling



3D deposition

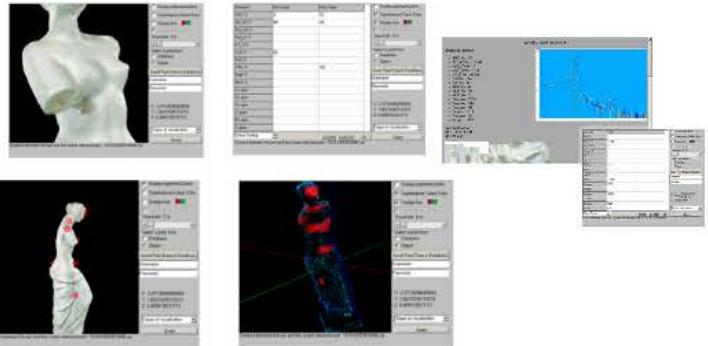


Stereolithography

Applications for the experts

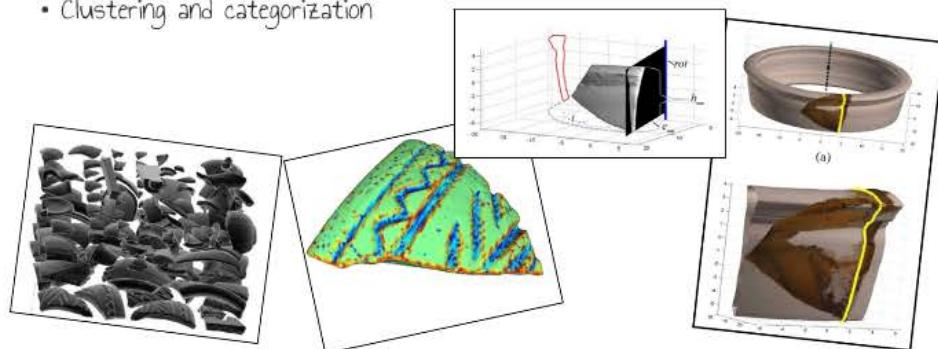
Research tools for modeling, analysis and feature identification

3D GIS-like representations and queries on artifacts

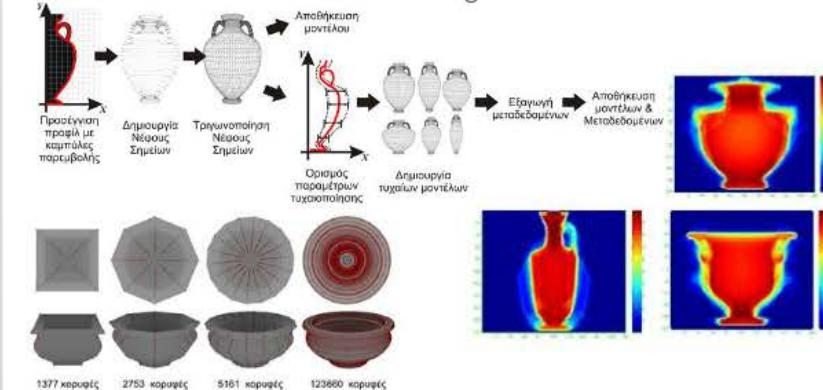


Enhancement of the study of artifacts

- Automated or semi-automated reconstruction from fragments
- 3D modeling of vessels from fragments and photos
- Curvature analysis - symmetry defects identification
- Geometric measurements and calculations
- Clustering and categorization



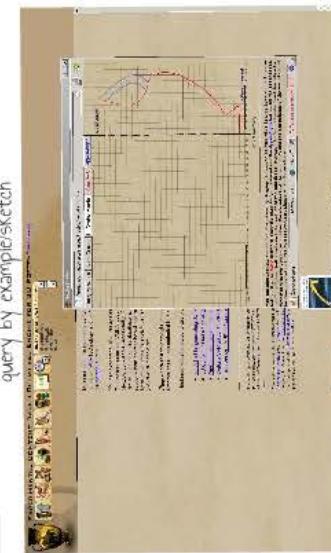
QP - Semi-automated 3D vessel modeling



A real reconstruction problem



query by example/sketch



A real reconstruction solution



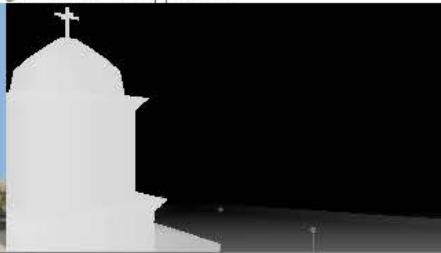
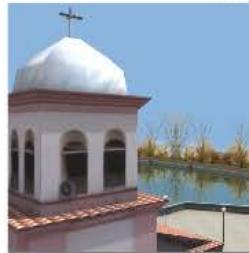
Applications for the rest of us

Informative, educational & recreational

Non-interactive representation movies



Realistic interactive walkthroughs for 3D TV applications

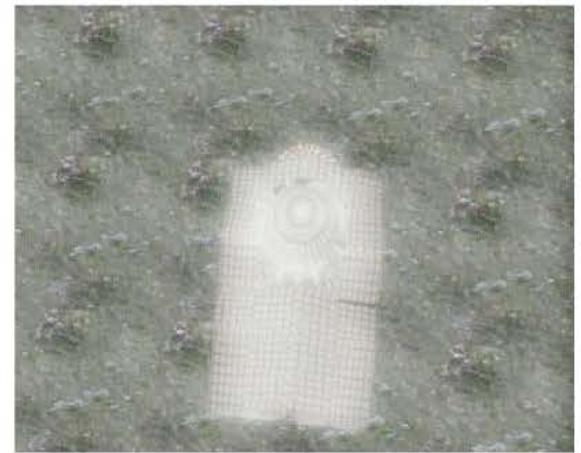


Content-based museum navigation

Mode: Walking



Realistic interactive walkthroughs



- Virtual reconstructions with environment/weather simulations
- Serious games (edutainment)

Wealth of data-numerous possibilities

- Open access
- Research enabled
- Tools/Services
- Story-telling
- Location-based
- Multi-layering
- Interoperability
- Reusability
- Repurposing

