CRMarchaeo: A CIDOC CRM extension to support archaeological excavations

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Archaeology and heterogeneity …

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Archaeological excavation

- **Destructive activity !!**
- Lack of documentation could cause the loss of important information forever

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What is CRMarchaeo

- Extension of CIDOC CRM to support archaeological excavation process
- To facilitate the semantic encoding, exchange, interoperability and access of existing archaeological documentation
- Starting from standards and models already in use by national and international cultural heritage institutions
- Enriched by continuous collaboration with various communities of archaeologists from different countries and schools
- Relies on concepts provided by *CRMsci* extension
  - geological and stratigraphic principles that govern archaeological stratigraphy
  - extending and adapting these principles for archaeology

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The CRMarchaeo Model

- Besides others, we have analyzed
  - **collection databases** (artifacts, numismatic etc.)
  - **5 different national methods** of excavation recording
  - **10 different kinds** of analytical investigation, including DNA, thermoluminescence etc.
  - **temporal gazetteers** and "thesauri of periods" (*PeriodO*)
- Archaeologists, physicists, chemists, microbiologists, biologists and other specialists
  - surprising analogy of procedures, which could be modeled as generic concepts
- ***CRMarchaeo+ CRMsci***: a coherent global ontology for deep integration of scientific and cultural-historical evidence and facts, probably the most elaborate and generic currently existing for descriptive sciences

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The CRMarchaeo Model

- Collaboration between many cultural heritage institutions
- Unifying efforts of many European projects
  - EPOCH, ARIADNE, PARTHENOS …
- Officially approved by CRM SIG to be formally and methodologically compatible with CIDOC CRM
- Open to every possible integration and addition that may become necessary as a result of its practical use on real archaeological problems
- Intended to be maintained and promoted as an international standard

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CRMarchaeo „ancestors“: CRM EH

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CRMarchaeo and Stratigraphy

- Basic idea on which archaeology is based
  - "*… the **features** of an archaeological site are to be found in the **stratified context**, which is investigated by an **archaeological excavation**"*

    [Harris 1989]
- Basic elements
  - physical arrangement of archaeological stratification
  - events that led to the formation of particular stratigraphic situations
  - activities performed to reconstruct the process

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CRMarchaeo entities

- Stratigraphic **genesis** and **modifications**
- **Natural phenomena** or **human intervention** that led to their creation
- **Nature** and **shape** of existing stratifications and surfaces
- Analysis of the **human remains or artifacts** found within the strata
- Analysis of relative **chronological** order in which stratification was formed

CRMarchaeo potential

- To enable **interpretation of chronological sequences**
  - space-time analysis of a specific site
- To **enable historical reconstructions**
  - identity, life, beliefs, behavior and activities of a given group of people in the past in that specific place
- To **overcome the differences** resulting from the application of **different excavation techniques** and **procedures**
  - different **traditions** and **schools** of archaeology
  - unified view that can express the **common concepts**
  - integration of various **methodologies**

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CRMarchaeo classes: physical features

- **A2 Stratigraphic Volume Unit**

- connected portions of terrain or other solid structure on, in, or under the surface of earth or seafloor exhibiting some homogeneity of structure or substance
- completely bounded by surfaces or discontinuities in substance or structure with respect to other portions of the terrain or surfaces of objects/finds
- may contain physical objects
- the internal continuity and the boundaries should be of a kind that can be attributed to a single genesis event or process

CRMarchaeo classes: physical features

- **A3 Stratigraphic Interface**

- coherent parts of the boundary surface resulting from a stratigraphic genesis event or process
- marks the extreme limit of the effect of a genesis or modification event, by indicating where the effect of this event ended
- each event of creation/destruction of a deposition layer implies the creation of new interfaces
- 2 main types of interface:
  - surfaces confining strata
  - surfaces only -> formed by the removal or destruction of existing stratifications

CRMarchaeo classes

- **A8 Stratigraphic Unit**: comprises *S20 Physical Features* that are either *A2 Stratigraphic Volume Units* or *A3 Stratigraphic Interfaces*

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Observing Physical Constellations

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Derivation of Temporal Relations

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CRMarchaeo: Stratigraphic Genesis

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CRMarchaeo classes: activities

- A1 Excavation Process Unit

"...And right above the Stone Age strata you can clearly see artefacts from the 'Iron Age'!"

- activities of excavating in the sense of archaeology, documented as a coherent set of actions of progressively recording and removing matter from a pre-specified location under specific rules

- intended to remove matter within the boundaries of a particular stratigraphic unit, or pre-declared spatial extent such as a trench

- results in the production of a set of recorded (documentation) data that should be sufficient to provide researchers enough information regarding the consistence and spatial distribution of the excavated segment of matter

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Modeling Excavation Activities

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In situ findings

- A1 Excavation Process Unit

- states of instances of *E18 Physical Things* of being partially or completely embedded at a particular position with relative stability in one or more *A2 Stratigraphic Volume Units*.
- used to document the fact of embedding generally with respect to the surrounding matter
- allows for specifying temporal bounds for which a particular embedding has been existing

CIDOC CRM Core
CRMsci
CRMarchaeo

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CRMarchaeo classes: activities

- A9 Archaeological Excavation

- general concept intended as a coordinated set of activities performed on an area considered as part of a broader topographical, rural, urban, or monumental context
- usually under the responsibility of a coordinator, officially designated, which is legally and scientifically responsible for all the activities carried out and is also responsible for the documentation of the whole process

CRMarchaeo: Future works

- Extending the model
  - Concept of Archaeological Site/Archaeological Campaign
- Inference making mechanism (*CRMinf*)
- Testing the model against existing archaeological archives
  - ARIADNE Project -> item level integration
  - ICCD Italian archaeological model
  - English Heritage, ADS, DANS, DAI …
  - Would you like to contribute?
    - http://www.ics.forth.gr/isl/CRMext/

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Thank you

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