Frank Schwarzbach, Frank Henze, Nadine Magdalinski, Benjamin Thurm, Philipp Gerth, Felix F. Schäfer, Alexander Schulze

OpenInfRA: A Web-based Information System for Documentation and Publication of Archaeological Research Projects

- Goals and Concepts

funded by DFG Deutsche Forschungsgemeinschaft
OUTLINE

- Overview and motivation
- Overall goals
- Special issues
OpenInfRA

(Open Information System for Research in Archaeology)

A web-based system for **data capturing, storage, analysis** and **publication** of **field projects** in **archaeology** and **neighboring disciplines**.
Main results of shortcoming analysis

Data are modeled, captured, processed, stored, analyzed and presented on a project-specific manner

→ high cost of building own IT solutions
→ use of the data only within the limits of the project
→ no sustainability of digital data after the project has ended

→ isolated, non-sustainable solutions

Improvement is both a technical and organizational challenge!
**OVERVIEW AND MOTIVATION**

OpenInfRA

- **User Interfaces**
  - Data sheets, blank forms
  - Access, query, input, annotation, administration
  - On-demand-Request
  - Web-applications
  - Web-Services (WMS, WFS)

- **Interfaces for Offline Data Exchange**
  - Structured data (XML, CSV)
  - Image and raster data (JPG, TIFF)
  - Metadata (XML, XMP)
  - Database (SQL, XML)
  - GIS (SHP, KML)
  - CAD (DXF, DWG)

- **Interfaces to External Web Applications**
  - Digital library catalog ZENON
  - Photo and object database ARACHNE
  - Gazetteer
  - Engraved prints archive
  - Digital excavation archives
  - Ancient places PLEIADES

**Data Exchange via Web Services**
OVERALL GOALS

Open regarding

- projects of national and international institutions, universities and other organizations
- all methods relevant for archaeological and historical fieldwork, such as excavations, surveys, building documentation, drilling cores, etc.
- large amounts of data of different types, e.g. structured data, text, images, spatial data
- free access for open datasets
- integration/coupling with neighboring systems
- cross-project analysis
- implementation with Open-Source-Software
- use of standards
SPECIAL ISSUES

- General data model
- Multilingualism
- Distributed data management
- Presentation and information retrieval
Use of an existing domain-specific conceptual schema (here e.g. CIDOC-Conceptual Reference Model) plus the associated implementation specifications?

→ savings of analysis and modelling effort
→ subsequent use of the available software
→ high level of semantic and syntactic interoperability

But

→ Users are determined to this particular application schema, the corresponding professional point of view on the “Universe of Discourse” and the underlying concepts.
SPECIAL ISSUES: A GENERAL DATA MODEL

- Topic
- Topic Characteristic
  + ID: Integer
  + Description: PT_FreeText
  + Project: Project
- PropertiesToTopicCharacteristic
  + Multiplicity: Multiplicity
  + Default Value: VL_ValueListValue[0..1]
- Attribute Type Group
  + Description: VL_AttributeTypeGroup
  + Data Type: VL_DataType
  + Domain: VL_Domain[0..1]
  + Unit: VL_Unit[0..1]
- Attribute Type
  + ID: Integer
  + Name: PT_FreeText
  + Description: PT_FreeText[0..1]
- Attribute Value
  + Attribute Value: Generic Type
- Topic Instance
  + ID: Integer
- Properties (abstract)
  + ID: Integer
- RelationshipType
  + Reference_to: VL_Topic
  + Description: VL_RelationshipType

CIDOG-CRM?
SPECIAL ISSUES: A GENERAL DATA MODEL
Advantages

→ high level of flexibility is obtained

→ Newly added topics, attributes and relationships require no changes to the data model and the corresponding software components.

Data exchange with CIDOC-CRM based systems via XSL-Transformation (already implemented).
Central Server ("OpenInfRA Server")

- At all instances the same software is implemented.
- Data can be maintained in parallel in all instances.
- Decentralized instances are mostly located in areas without permanent internet connection.

Decentralized Project Server

Mobile Computer

Mobile Computer

Mobile Computer

Mobile Computer
SPECIAL ISSUES: PRESENTATION AND INFORMATION RETRIEVAL
SPECIAL ISSUES: PRESENTATION AND INFORMATION RETRIEVAL

- Information Retrieval on documents
- Retrieval on spatial-temporal datasets
- Retrieval on relational data
- Results
SPECIAL ISSUES: PRESENTATION AND INFORMATION RETRIEVAL

- text retrieval
- SQL retrieval
SQL-Extension (QSQL2)

```
SELECT ... 
FROM ... 
WHERE ... 
AND  height ~ 1.80 WEIGHTED BY 0.5
```

“Find all sculptures which have the original height (preserved or reconstructed) of around 1.80 m (e.g. around life-size) and search not only in the actual database for stone finds but look also in the old excavations reports which have been attached as PDFs to the excavations datasets.”

OpenInfRA

User interfaces

Access, query, input, annotation, administration

On-demand-Request

Web-Services (WMS, WFS)

Web-applications

Digital library catalog ZENON

Photo and object database ARACHNE

Gazetteer

ancient places PLEIADES

Engraved prints archive

Digital excavation archives

data exchange via web services

Interfaces for offline data exchange

- Structured data (XML, CSV)
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- Metadata (XML, XMP)
- Database (SQL, XML)
- GIS (SHP, KML)
- CAD (DXF, DWG)

Import, export, of files and documents

Access, query, input, annotation, administration

Referencing, parametric request and query

User interfaces

interfaces to external web applications

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OpenInfRA

interfaces for offline data exchange

- Structured data (XML, CSV)
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- Database

Access, query, input, annotation, administration

Access, query, input, annotation, administration

interfaces to external web applications

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- On-demand-Request

Data exchange via web services

Web-applications

Referencing, parametric request and query

Import, export, of files and documents

Structured data, blank forms

metadata (XML, XMP)

Data sheets, blank forms

GIS (SHP, KML)
USER INTERFACE

Login
List View
Detail View
WebGIS
Context
Browser
INTERFACES

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INTERFACES

PLEIADES

Recently Modified Resources

34,743 Ancient Places
30,184 Ancient Names
38,620 Ancient Locations

About Pleiades

Pleiades gives scholars, students, and enthusiasts worldwide the ability to use, create, and share historical geographic information about the ancient world in digital form. At present, Pleiades has extensive coverage for the Greek and Roman world, and is beginning to expand into Ancient Near Eastern, Byzantine, Celtic, and Early Medieval geography.

The most recently modified resources are shown in the map at left.

All published content is accessible to everyone under open license. To join and contribute new or improved content, please see Welcome to Pleiades.

For a complete listing of supporters and contributors, please see the credits page.

Search

Search Site

Advanced Search...

News

Pleiades Downtime!
Thursday, 21 November 2013
Nov 19, 2013

5 September Review Party Canceled
Sep 04, 2013

Last Week in Pleiades
(9 August 2013)
Aug 09, 2013

Last Week in Pleiades
Aug 02, 2013

Pleiades is now on Twitter
Aug 01, 2013

More news...

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web services

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OpenInfRA

interfaces for offline data exchange

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data exchange via web services

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WEB SERVICES

List of map services integrate into:

Desktop GIS client
DATA INTERFACES

interfaces for offline data exchange

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Import, export of files and documents

Data sheets, blank forms

Data exchange via web services

Digital library catalog ZENON
Gazetteer Photo and object database ARACHNE
Digital excavation archives
Engraved prints archive ancient places PLEIADES
Referencing, parametric request and query
Web Services (WMS, WFS)

Access, query, input, annotation, administration

On-demand Request
User interfaces
Vector data:
- position and geometry of finding situations, structural objects, ...
- topography, settlements, land use, infrastructure, ...
- current (measured) situation and reconstructions
- ...

Raster data:
- aerial images / ortho images
- scanned maps and plans
- digital surface and elevation models
- ...

GEO-DATA IN ARCHAEOLOGY

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WEB-GIS ARCHITECTURE

BAALBEK archeological and architectural research

GIS files providing 2D / 3D client browser with 2D and 3D Client

- aerial photograph
- archaeological find database
- archaeological area
- sounding
- profile
- architectural room database
- database of geo-measurements
- topography
- building remains
  - tell phase
  - early imperial period
  - middle imperial period
  - late imperial period
  - late antiquity I
  - late antiquity II
  - early islamic - isl. medieval period I
  - islamic medieval period II
  - ottoman I
  - ottoman II
  - ottoman III
- legend

Research area

- Preview photograph:

<table>
<thead>
<tr>
<th>Name:</th>
<th>Bustan el Khan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Id:</td>
<td>BKH</td>
</tr>
<tr>
<td>Description:</td>
<td>Bereich mit öffentlichen Gebäuden und einer Straße aus römischer Zeit, sowie einem arabischen Bad aus mamlukisch-osmanischer Zeit. Vermutlich auserhalb der römischen Stadtmauer.</td>
</tr>
<tr>
<td>Surface size/ circumference or line length:</td>
<td>23675.97 m² / 670.75 m</td>
</tr>
</tbody>
</table>

Findspot

- Preview photograph:

<table>
<thead>
<tr>
<th>ID:</th>
<th>BAL-BKH-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name:</td>
<td>Peristylegäude</td>
</tr>
<tr>
<td>Area:</td>
<td>Bustan el Khan</td>
</tr>
<tr>
<td>Code:</td>
<td>5</td>
</tr>
<tr>
<td>Description:</td>
<td></td>
</tr>
<tr>
<td>Surface size/ circumference or line length:</td>
<td>3413.71 m² / 257.08 m</td>
</tr>
</tbody>
</table>
3D WEB-GIS – APPLICATION AREAS

3D visualization, query and archiving of single (smaller) objects
- small finds (e.g. ceramic)
- architectural elements (e.g. capitals)
- sculptures without breakdown into individual object parts

3D visualization and analysis of complex objects or building models
- divided into several building parts (walls, ceilings, floors, columns, capitals, stamped tiles, stone marks)
- differentiation of the wall surfaces of a building structure
- distinction of findings/features and reconstruction

2.5D / 3D visualization and analysis of settlements and urban models
- with different phases
- distinction of findings/features and reconstruction
- combined with classic 2D WebGIS
- LOD

3D visualization, query, storage/archiving of original measured 3D data
- especially point clouds
- possibly definition of sections / elevations
visualization of static X3D files

various display options (transparency, color, ...)

"MouseOver" for individual objects

link to data base objects via VRML/X3D anchor
visualization of static X3D files

various display options (transparency, color, ...)

"MouseOver" for individual objects

link to data base objects via VRML/X3D anchor

visualization of point clouds
3D WEB-GIS – PROTOTYPICAL IMPLEMENTATION

- Visualization of static X3D files
- Various display options (transparency, color, ...)
- "MouseOver" for individual objects
- Link to database objects via VRML/X3D anchor
- Visualization of point clouds
- 3D geometries via W3DS from PostGIS
- Standardized "GetScene" request
- Advanced display options
- Combined 2D / 3D geometries from PostGIS
- Textured Terrain Models / Objects

http://geoinformatik.htw-dresden.de/openinfra/3DWebGIS/
Towards a working system

- implementation of core system
- definition of an initial "Topics Framework"
- integration of search/retrieval, WebGIS and 3D
- realization of online-/ offline-concept
- migration of project data from legacy systems
- integration external systems via defined interfaces

- test of implementation
- system introduction

Further information:

www.tu-cottbus.de/openinfra