

Post-processing 3D Models: Database Generation, Data Structuring, and Conceptual Segmentation

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Bundesministerium
für Bildung
und Forschung



3D Data Sets

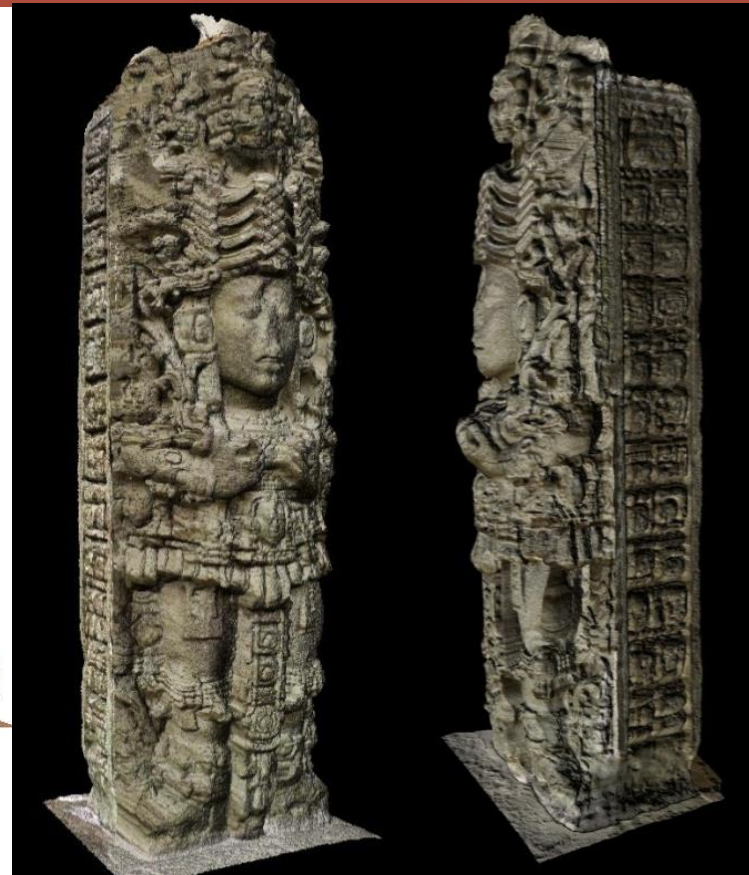




Build a 3DWebGIS system that...

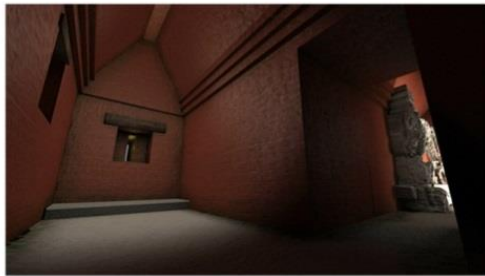
1. curates models for posterity (archive)
2. allows analysis of the models in the context of an online, virtual research environment (VRE)
3. use the models as visual storage containers linked to spatially-referenced archaeological data

- reality-based models at multiple scales
- low-high resolution (from 30 cm – 2 mm)
- aerial and terrestrial laser scanning & photogrammetry

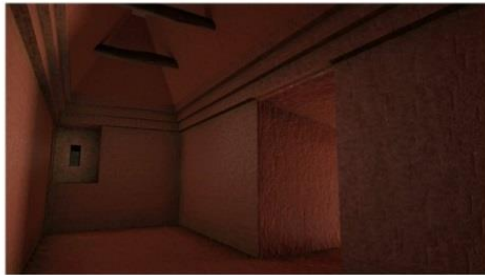


CAD models at multiple scales

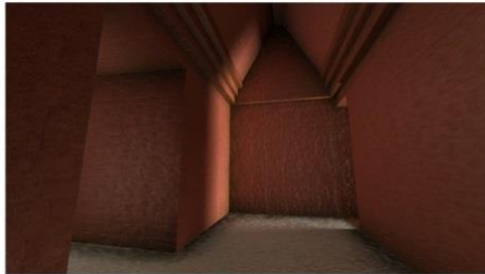
- Sketch Up, 3D Studio Max
- Converted to .obj and segmented into LoD's to load as one approaches the object



WEST ROOM



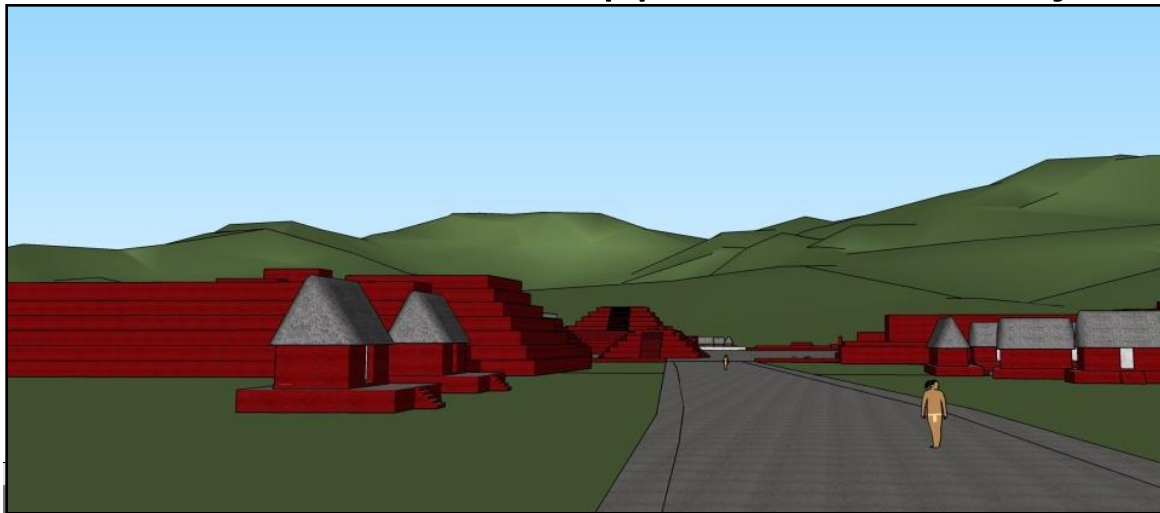
NORTH ROOM

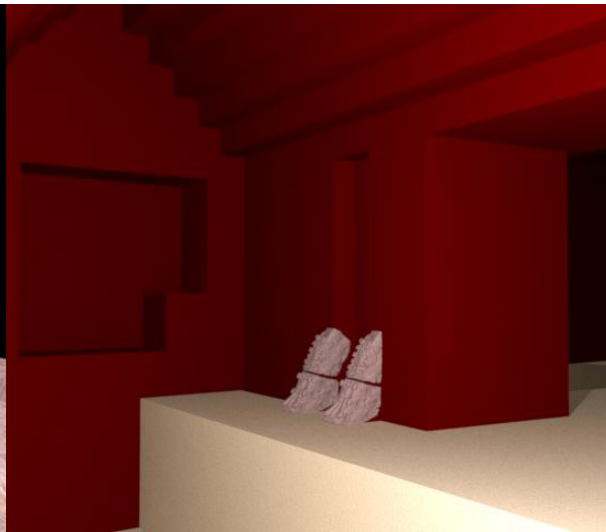
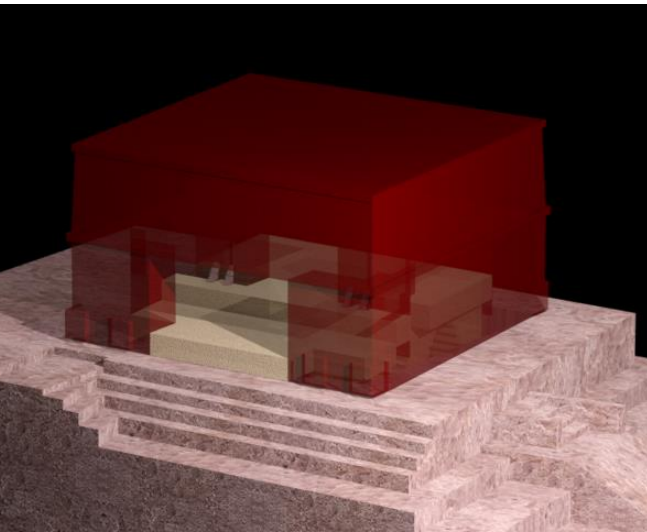
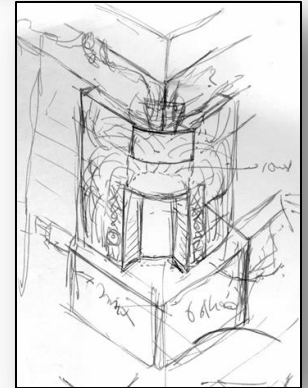
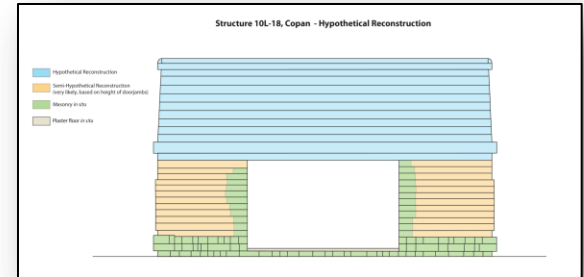
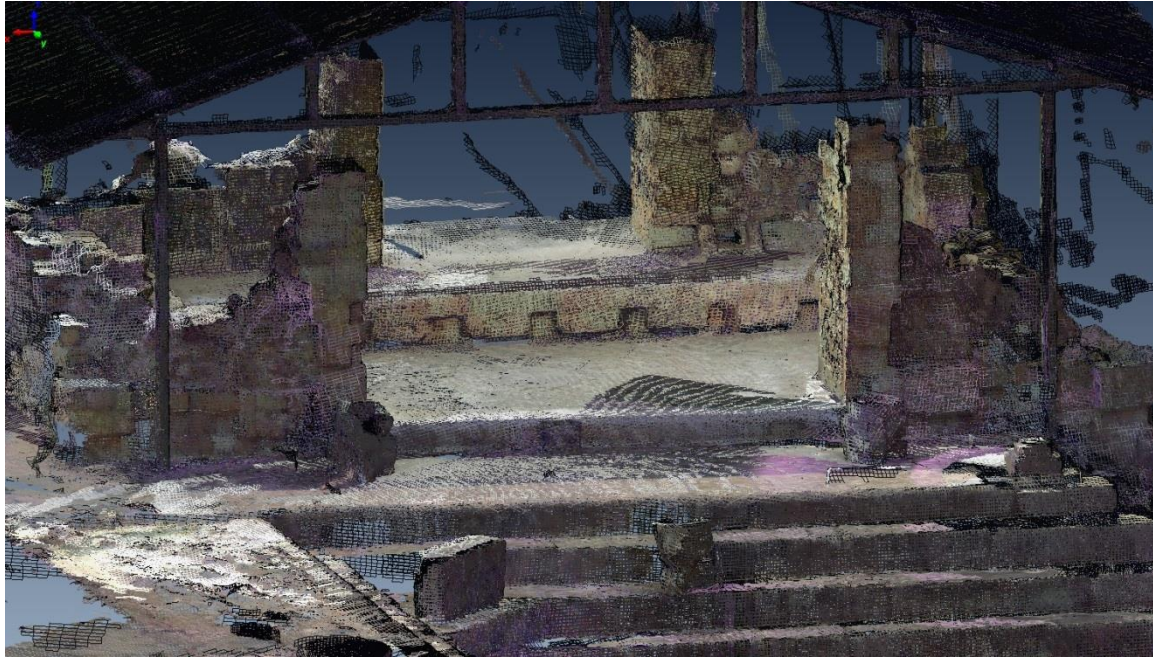



EAST ROOM

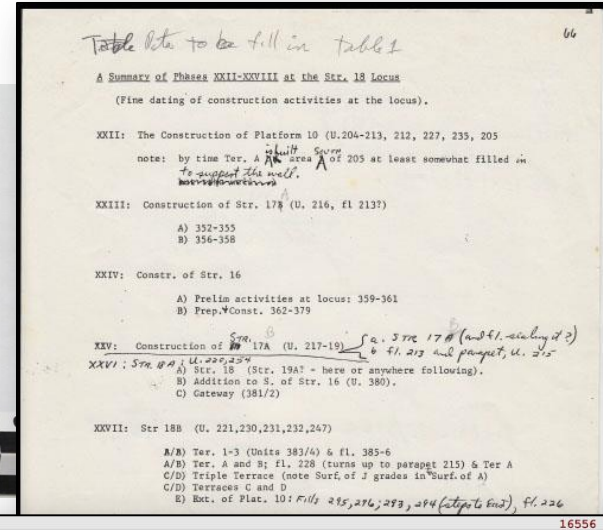


DOORWAY





- CPN
2271
- CPN
1590
- CPN
1668
- CPN
1646
- 



16556

MAYA ARCH 3D

Start Page

3D MODELS

Add New 3D Model

General Information

Title	Temple-22		
Brief Description	3D CAD model of the JvS's hypothetical reconstruction of Temple 22		
Model Type	<input type="text"/>	Reality-Based?	<input type="radio"/> yes <input checked="" type="radio"/> no
Created By	Maurizio Forte et al.	Created On	2011
Software	3D Studio Max		
Attributes	<input type="checkbox"/> Textured <input type="checkbox"/> Color Vertex <input checked="" type="checkbox"/> Segmented <input checked="" type="checkbox"/> Georeferenced		
Georef. Info	<input type="text"/>		
Resolution	<input type="text"/>	Relative Resolution	<input type="text"/>
No. Triangles	<input type="text"/>	No. Points	<input type="text"/>
Copyright	MayaArch3D/UC Merced		
File Name	<input type="text"/>	File Format	<input type="text"/>
File Location	<input type="text"/>	File Size	<input type="text"/>
URL	<input type="text"/>	Data Location	UC Merced

Photogrammetry

Created By	<input type="text"/>	Created On	<input type="text"/>
Cam. Model	<input type="text"/>	Cam. Lense	<input type="text"/>
Geometric Cal.	<input type="text"/>	Radiometric Cal.	<input type="text"/>
No. of photos	<input type="text"/>	File Format	<input type="text"/>
Avg. GSD	<input type="text"/>	File Size	<input type="text"/>
		Image Type	<input type="radio"/> digital <input type="radio"/> analog

Laserscan

Drawings&Maps

Existing Drawings ? ☒ yes ☐ no

New

Temple 22 CAD Model

Project

Illustrator

Year

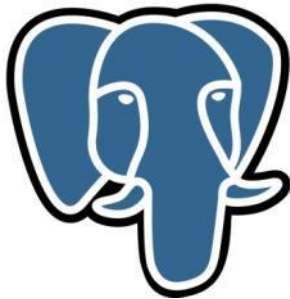
Type 3D Model

Go

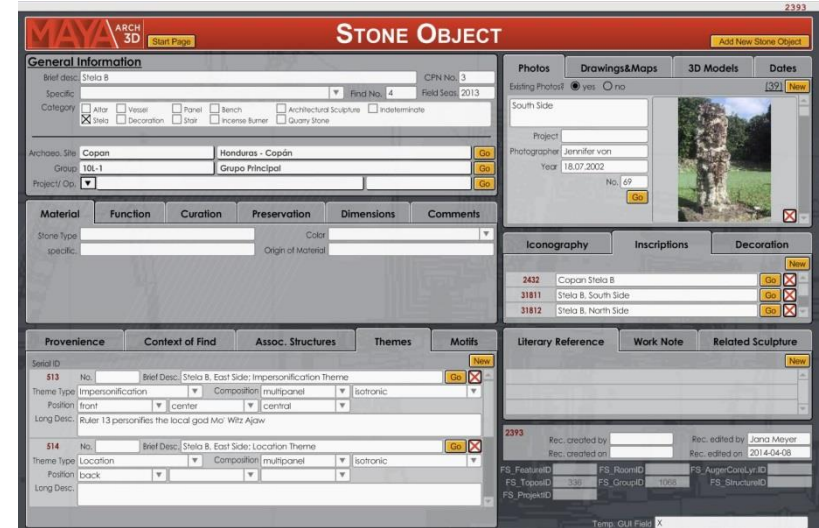
Link to Record:

Structure 10L-22_ID 2533

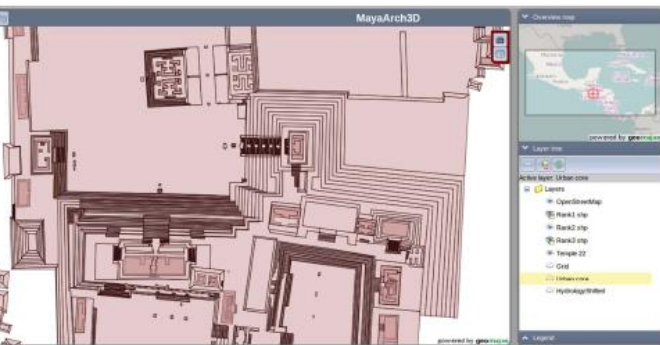
PostgreSQL



Database for 2D and 3D geometries



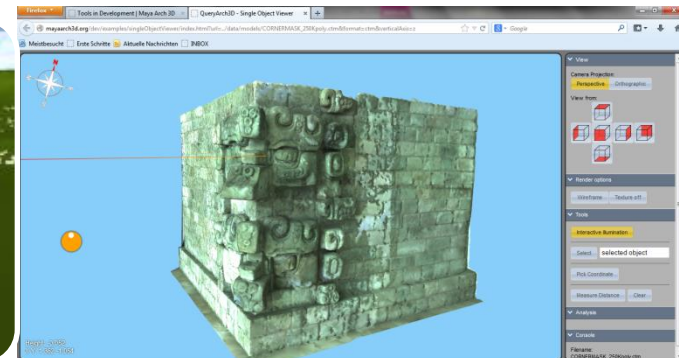
Archaeological Database



2D Browser



3D World Browser



High-resolution SingleObject Viewer



MAYAARCH3D

Version 1.80 (Stand 04. Dezember 2012)

ARCHAEOLOGICAL SITE

ADMINISTRATION

GROUP / SUB-SITE

PROJECT / OP

UNIT

STRUCTURE

PLAZA

BURIAL

LOTS (FEATURES)

ROOM

WALL

DECORATION

OBJECT ASSEMBLAGE

SINGLE-FIND OBJECTS

STUCCO-FRAG.

CERAMIC

STONE OBJECT

LITHICS

SHELL

BONE

SEAL

OTHER FIND

- METALL

STUCCO TYPE

ICONOGRAPHY

INSCRIPTION

[PHOTOS](#)

[MISTAKES & REQUESTS](#)

[DRAWINGS AND MAPS](#)

[SERIALNUMBERS](#)

[3D MODELS](#)

[DEPLOY CLONE](#)

[DATING](#)

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[LITERATURE](#)

[EXPORT LISTS](#)

[COORDINATES](#)

[SHOW PHOTO LISTS](#)

[GRID](#)

[ARCHIVAL DOCUMENTS](#)

CLOSE

aktuell angemeldet:
admin

2393

MAYA ARCH 3D STONE OBJECT

[Start Page](#)
[Add New Stone Object](#)

General Information

Brief desc. CPN No.

Specific Find No. Field Seas.

Category

<input type="checkbox"/> Altar	<input type="checkbox"/> Vessel	<input type="checkbox"/> Panel	<input type="checkbox"/> Bench	<input type="checkbox"/> Architectural Sculpture	<input type="checkbox"/> Indeterminate
<input checked="" type="checkbox"/> Stela	<input type="checkbox"/> Decoration	<input type="checkbox"/> Stair	<input type="checkbox"/> Incense Burner	<input type="checkbox"/> Quarry Stone	

Archaeo. Site [Go](#)

Group [Go](#)

Project/ Op. [Go](#)

Material

Stone Type

specific.

Function

Color

Origin of Material

Provenience

Serial ID [New](#)

513 No. Brief Desc. [Go](#) [X](#)

Theme Type Composition isotronic

Position

Long Desc.

514 No. Brief Desc. [Go](#) [X](#)

Theme Type Composition isotronic

Position

Long Desc.

Context of Find

Assoc. Structures

Themes

Motifs

Preservation

Dimensions

Comments

Photos


Existing Photos? ☒ yes ☐ no [39] [New](#)

South Side

Project

Photographer

Year No. [Go](#)



Iconography

2432 [Go](#) [X](#)

31811 [Go](#) [X](#)

31812 [Go](#) [X](#)

Inscriptions

Decoration

Literary Reference

[New](#)

Work Note

Related Sculpture

[New](#)

2393

Rec. created by

Rec. created on

Rec. edited by

Rec. edited on

FS_FeatureID

FS_RoomID

FS_AugerCoreLyr.ID

FS_TopoSID

FS_GroupID

FS_StructureID

FS_ProjektID

Temp. GUI Field X

Filemaker Pro Software. Used by DAI archaeologists for data-entry and data structuring. Supports 2d images, PDFs, video, sound, etc., but not well equipped for 3D models


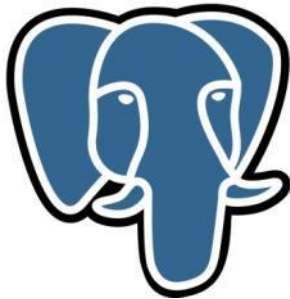
MAYA ARCH 3D		3D MODELS		Add New 3D Model	
General Information					
Title	Stela B				
Brief Description	laser scan				
Model Type	Laser Scan	Reality-Based?	<input checked="" type="radio"/> yes <input type="radio"/> no		
Created By	Alessandro Rizzi	Created On	2010		
Software	Innovmetric Polyworks				
Attributes	<input checked="" type="checkbox"/> Textured <input type="checkbox"/> Color Vertex <input type="checkbox"/> Segmented <input type="checkbox"/> Georeferenced				
Georef. Info					
Resolution	3mm	Relative Resolution			
No. Triangles	3801096	No. Points	1902955		
Copyright	MayaArch3D/FBK				
File-Name	stelaB	File-Format	wrl	File-Size	321,172KB
File Location					
URL		Data Location	FBK		
Photogrammetry			Laserscan		
Created By	Fabio Remondino	Created On	2009		
Scanner Model	Leica Scanstation 2	Parameter			
No. of Scans	4	Avg. Sampling Dist.			
Drawings&Maps					
Existing Drawings ? <input checked="" type="radio"/> yes <input type="radio"/> no New					
Stela B 3D Model					
Project		Illustrator		Type	3D Model
Year		Go			
Link to Record:					
Stone Object, CPN 3, ID 2393					

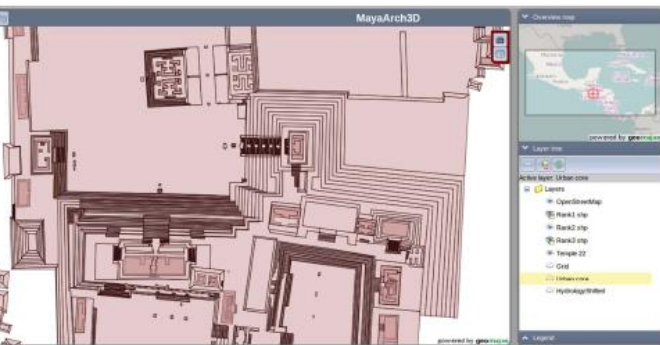
Table for managing meta-data on the 3D models themselves

PostgreSQL



Database for 2D and 3D geometries

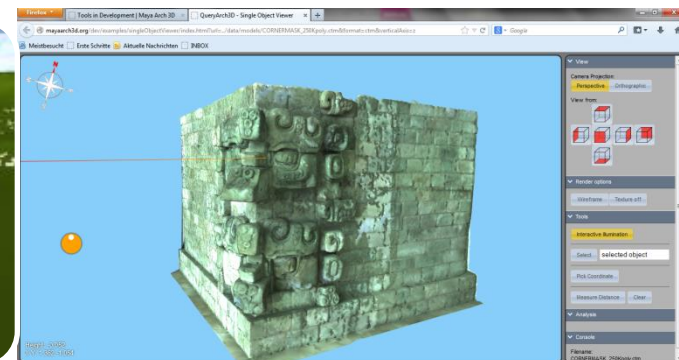
Archaeological Attribute Database (IDAI.field)



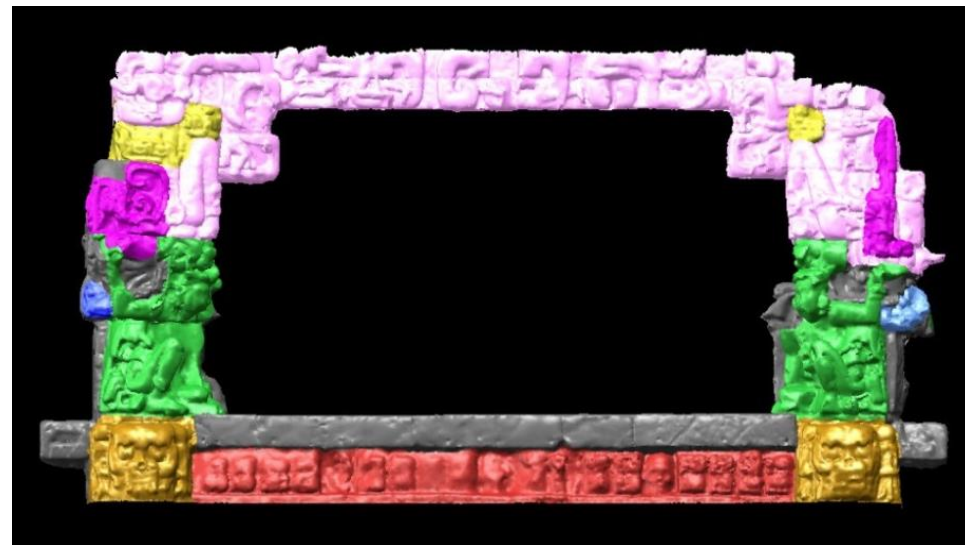
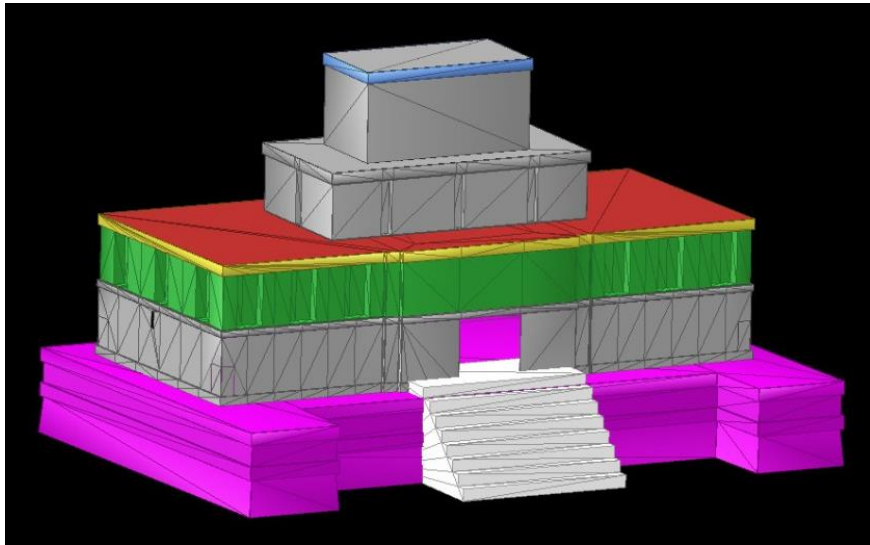
2D Browser



3D World Browser



High-resolution SingleObject Viewer





111: Temple Substructure
Structure; ID: 16809

115: Temple sub. Tomb
Lot (Feature); ID: 7519

113: Temple sub. Stair
Lot (Feature) (W); ID: 15150

113: Temple sub. Stair
Lot (Feature) (N); ID: 16508

114: Temple sub. Platform
Lot (Features); ID: 16543

201: Temple sub. Tomb Ceiling
Lot (Feature); ID: 31802

202: Temple sub. Tomb Floor
Lot (Feature); ID: 31798

204: Temple sub. Tomb Stairs
Lot (Feature); ID: 15193

200: Temple sub. Tomb Wall
Lot (Feature) (N); ID: 16639

200: Temple sub. Tomb Wall
Lot (Feature) (E); ID: 16640

200: Temple sub. Tomb Wall
Lot (Feature) (S); ID: 16641

200: Temple sub. Tomb Wall
Lot (Feature) (W); ID: 16642

230: Temple sub. Tomb Wall Niche
Lot (Feature); ID: 31805

230: Temple sub. Tomb Wall Niche
Lot (Feature); ID: 31806

232: Temple sub. Tomb Wall Door
Lot (Feature); ID: ???

230: Temple sub. Tomb Wall Niche
Lot (Feature); ID: 31803

230: Temple sub. Tomb Wall Niche
Lot (Feature); ID: 31804

139: Temple super. Storey Outer Wall
Lot (Features) (W); ID: 14153

139: Temple super. Storey Outer Wall
Lot (Features) (E); ID: 15244

139: Temple super. Storey Outer Wall
Lot (Features) (N); ID: 15245

140: Temple super. Storey Room
Room (N); ID: 7573

165: Temple super. Storey Room Bench
Lot (Features); ID: 15129

144: Temple super. Storey Room Ceiling
Lot (Features); ID: 31800

166: Temple super. Storey Room Floor
Lot (Features); ID: 31796

145: Temple super. Storey Room Wall
Lot (Features) (N); ID: 16464

145: Temple super. Storey Room Wall
Lot (Features) (E); ID: 16450

145: Temple super. Storey Room Wall
Lot (Features) (S); ID: 16507

145: Temple super. Storey Room Wall
Lot (Features) (W); ID: 16509

151: Temple super. Storey Room Wall Door
Lot (Features) (E Jamb); ID: 15623

151: Temple super. Storey Room Wall Door
Lot (Features) (W Jamb); ID: 15624

149: Temple super. Storey Room Wall Niche
Lot (Features) (E); ID: 31793

149: Temple super. Storey Room Wall Niche
Lot (Features) (W); ID: 31794

151: Temple super. Storey Room Wall Door
Lot (Features) (E Jamb); ID: 15625

151: Temple super. Storey Room Wall Door
Lot (Features) (W Jamb); ID: 15626

140: Temple super. Storey Room
Room (S); ID: 7585

145: Temple super. Storey Room Wall
Lot (Features) (N); ID: 31807

144: Temple super. Storey Room Ceiling
Lot (Features); ID: 31801

166: Temple super. Storey Room Floor
Lot (Features); ID: 31797



151: Temple super. Storey Room Wall Door
Lot (Features) (E Jamb); ID: 15623

151: Temple super. Storey Room Wall Door
Lot (Features) (W Jamb); ID: 15624

149: Temple super. Storey Room Wall Niche
Lot (Features) (E); ID: 31793

149: Temple super. Storey Room Wall Niche
Lot (Features) (W); ID: 31794

151: Temple super. Storey Room Wall Door
Lot (Features) (E Jamb); ID: 15625

151: Temple super. Storey Room Wall Door
Lot (Features) (W Jamb); ID: 15626



How to communicate the archaeologists' needs?



Main Structure - SN: 2526



Superstructure - SN: 16730



What to do about corners?

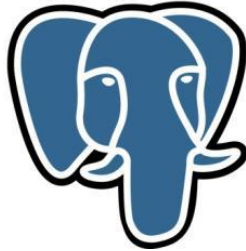


Exterior East Wall - SN: 15244

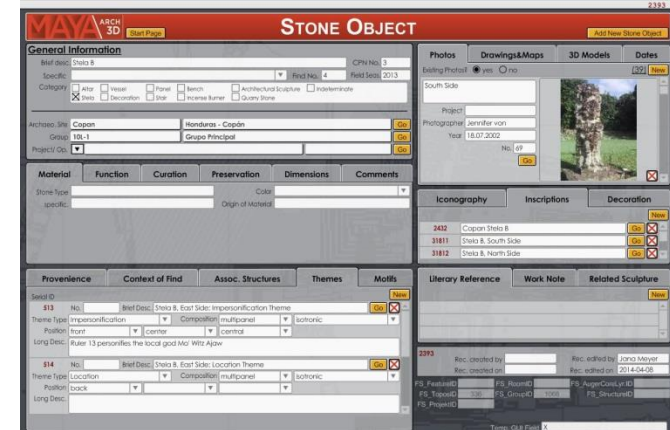


Ext. West Wall - SN: 14153

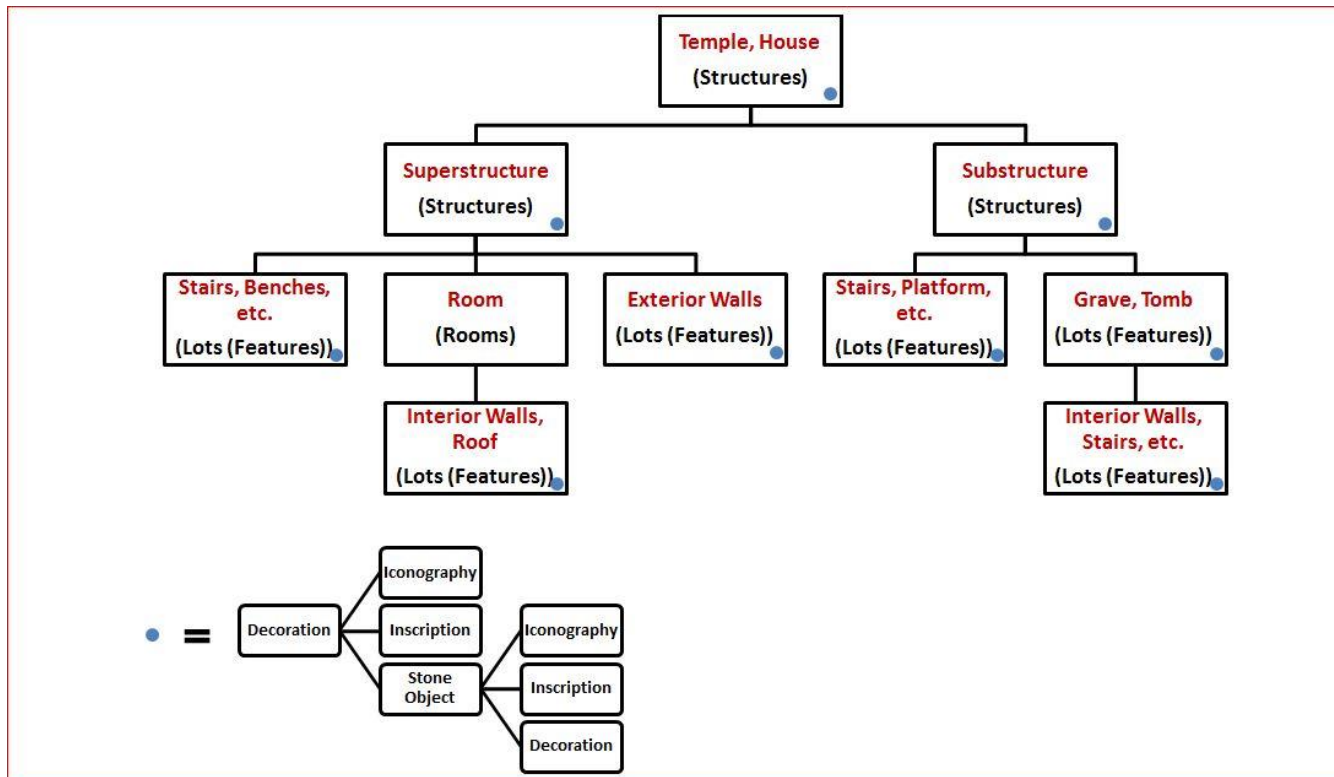
PostgreSQL

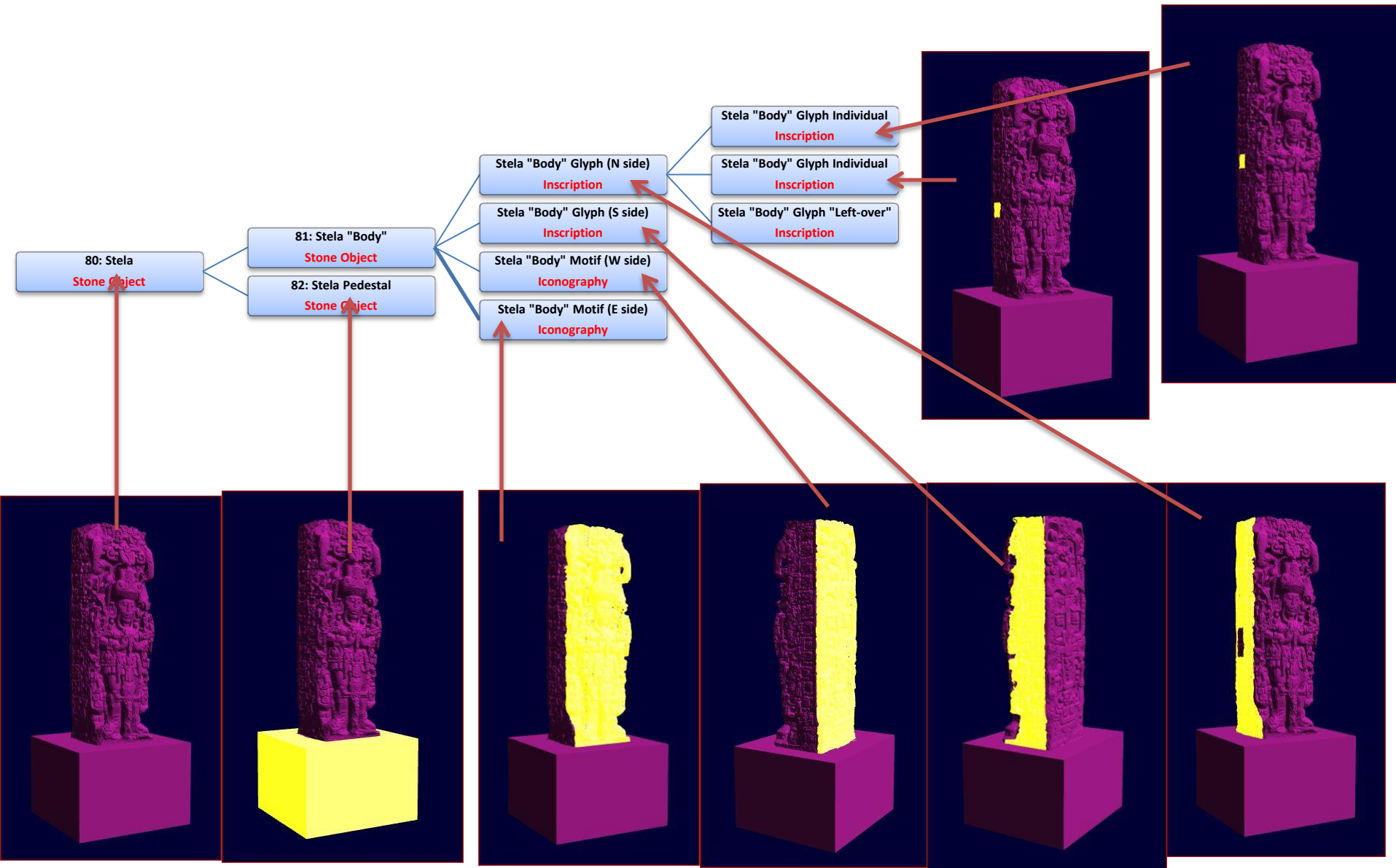


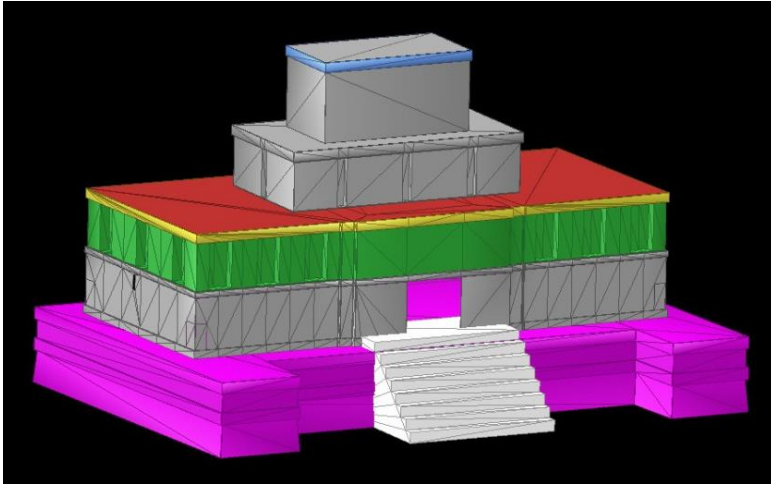
Database for 2D and 3D geometries



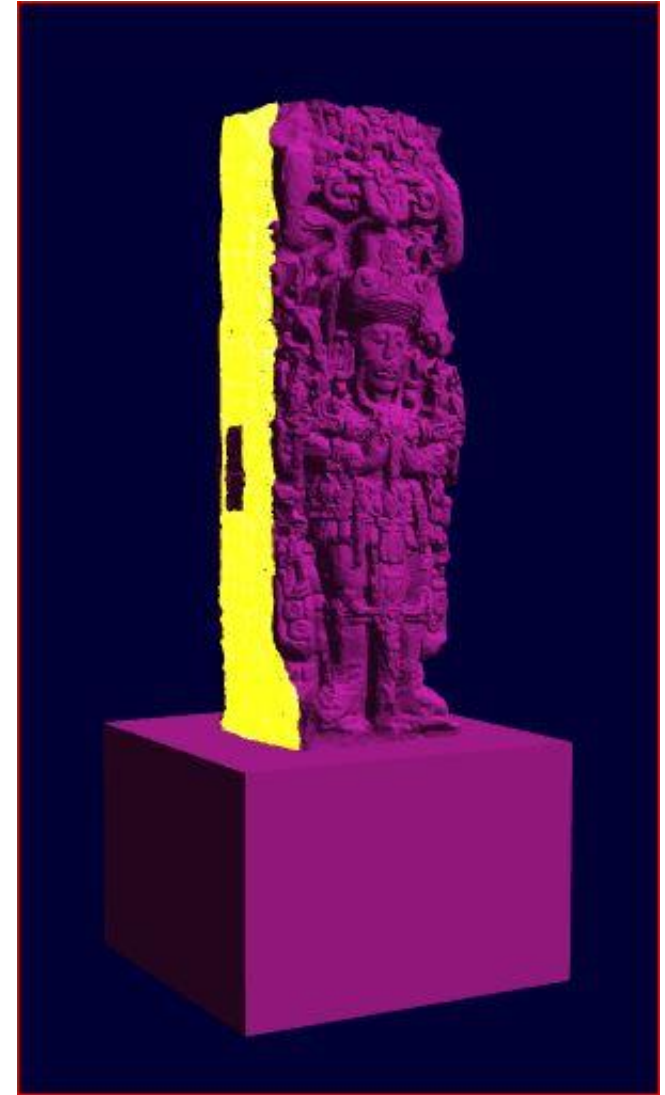
Archaeological Database





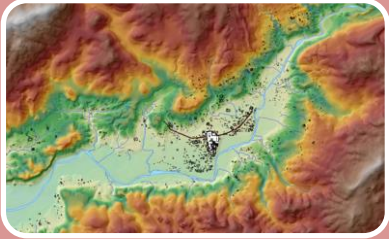


1. Segmentation is time-consuming. What about procedural segmentation (automatic recognition of model parts) for Maya architecture?
2. Structuring meta-data to match 3D object hierarchies requires close collaboration
3. The result must make sense for the model, AND maintain the usability of the database(s) from which the data is retrieved





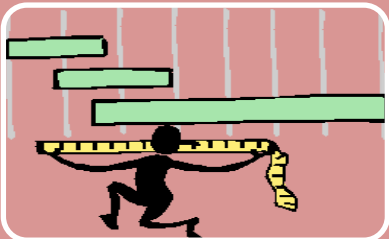
visualize uncertainty (physical or temporal)



visualize settlement and architectural change over time



visualize LiDAR data for analysis online



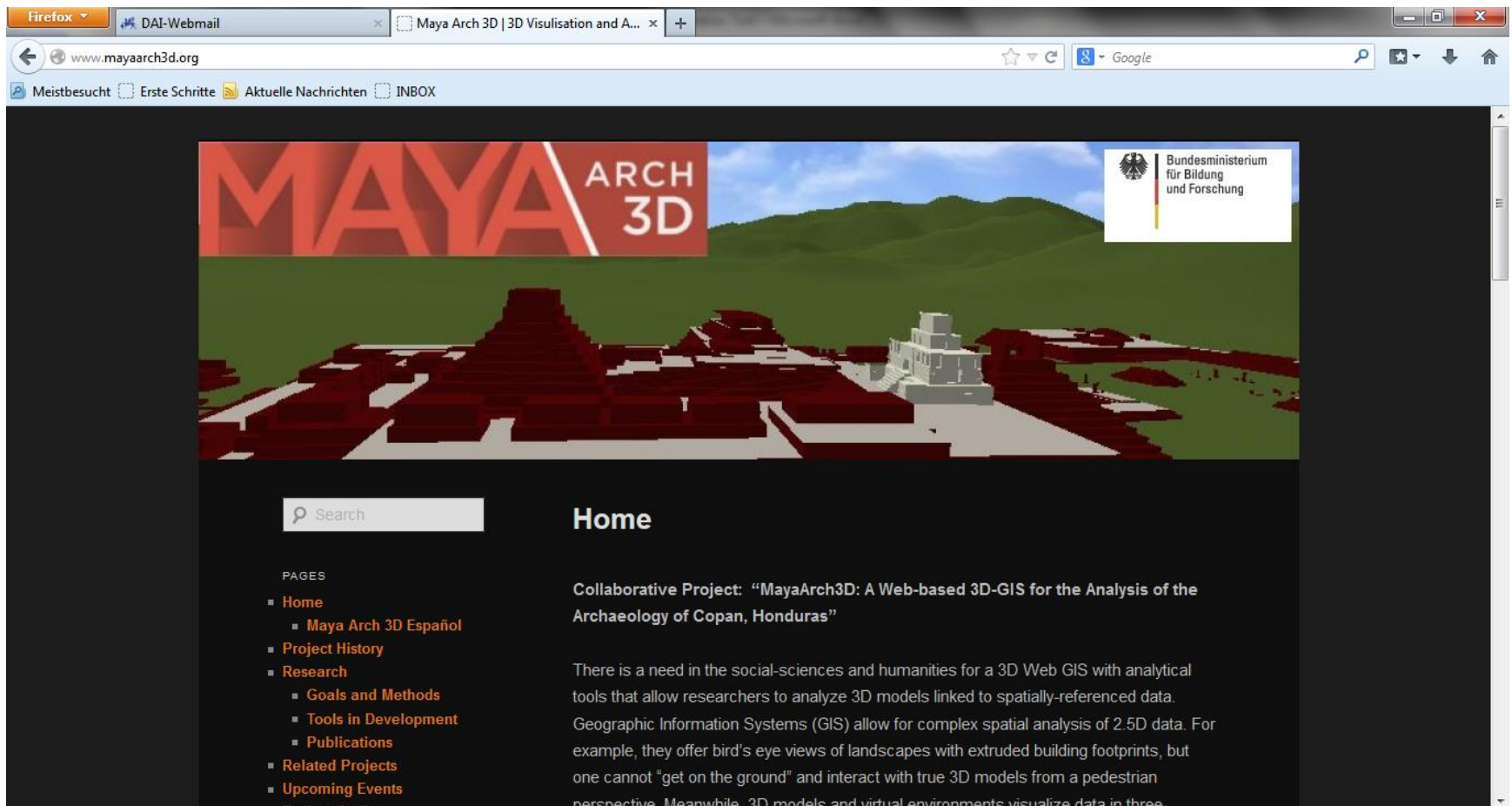
use standards to share data with other databases- Arachnae, Europeana, etc

To ensure that a 3D model is useful for scientific research even after the model has been generated...there is still a great deal of work to do with structuring and segmenting the data!

In researching this process, we have developed...

- a standard set of meta-data that should be collected for 3D models in cultural heritage
- a conceptual data structure for segmenting 3D models of archaeological structures and monuments.

Plan for plenty of time for the 3D modeler and disciplinary specialist to collaboratively post-process and annotate their models for long-term accessibility, usability, and transparency.



www.MayaArch3D.org

Thank you!