Web3D Collaborative Naval Visualization Workshop

3D Metadata Model(s)

for Archival Data Publication

VIRGINIA TECH

Challenges in 3D Model Management

- What is the part number / identifier for this ?
- Where did this 3D model come from?
- What tools and algorithms were used to acquire and process it?
- Does this model have a real counterpart?
- ...

GeoVisualization

Derived

Products

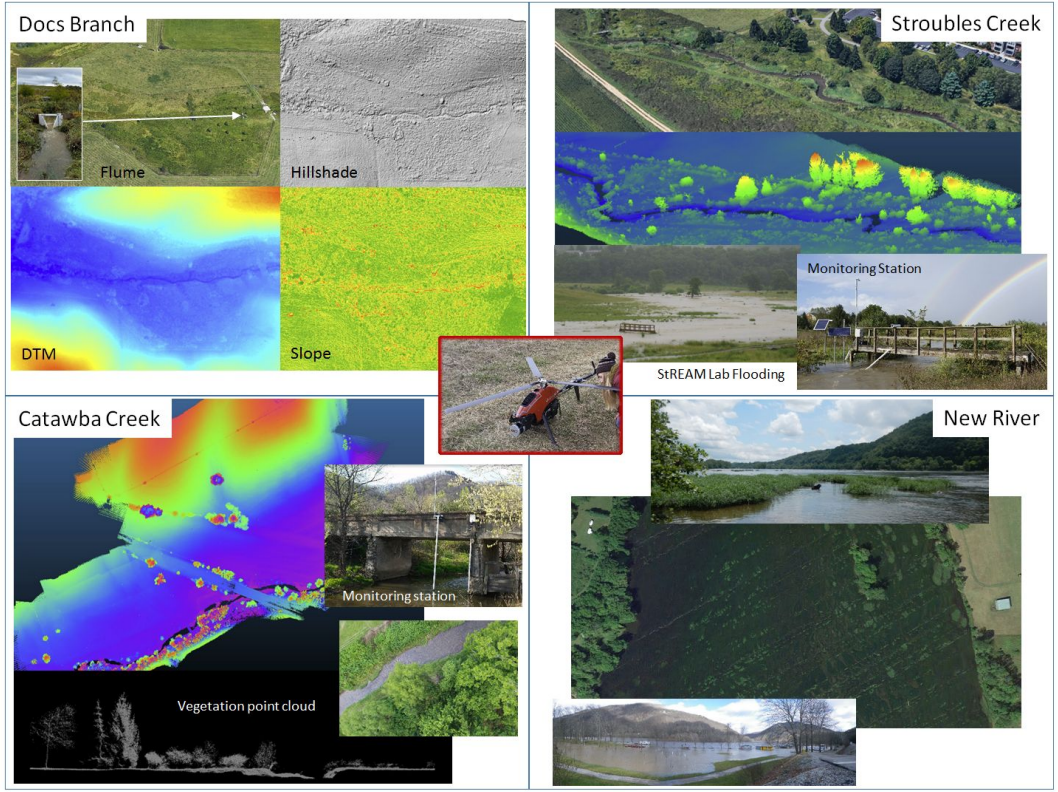
GPS:

DTM (TIN),

Aspect

Slope

CHM



Processing

There are many processing options depending in the acquisition platform, the goals of the dataset, and the target products.

Considerations:

- No one tool or vendor has a future-proof solution (AI and processing algorithms continue to evolve)
- Data may need to move between multiple tools at different stages of processing
- X3D's metadata capability means that shapes can be annotated w provenance, parts numbers, etc

Web3D Approach

Describing Digital Twins and 3D Model Surrogates:

1. Identify Relevant Vocabularies (Reference Terms, Ontologies, ...)
2. Show Exemplars with encoded X3D Metadata
3. Work with WWW technology stack to scale to large collections of models and 3D interactive services

X3D and Metadata

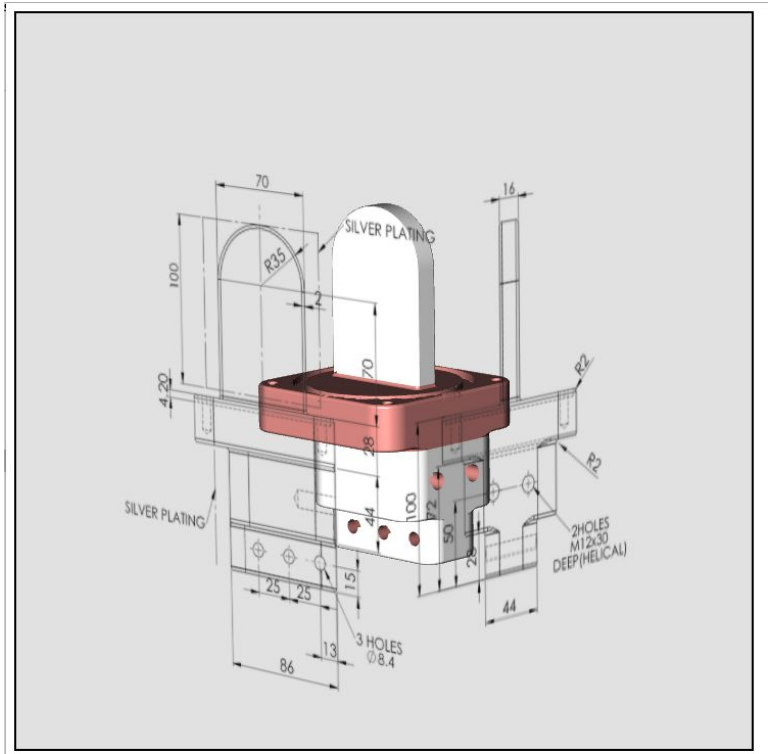
Describing 3D models and scenes:

- Provide structured data methods and API for accessing metadata information
- Must support many vocabularies and data types
- X3D Metadata nodes can refer to any X3D node: <MetadataSet> allows extensibility to complex vocabularies

X3D Metadata Examples

- 3DPS WG: CAD Models w parts catalog references
- Heritage WG: VT examples of Smithsonian
- Medical WG: SNOMED CT, FMA : Medical and Clinical terms

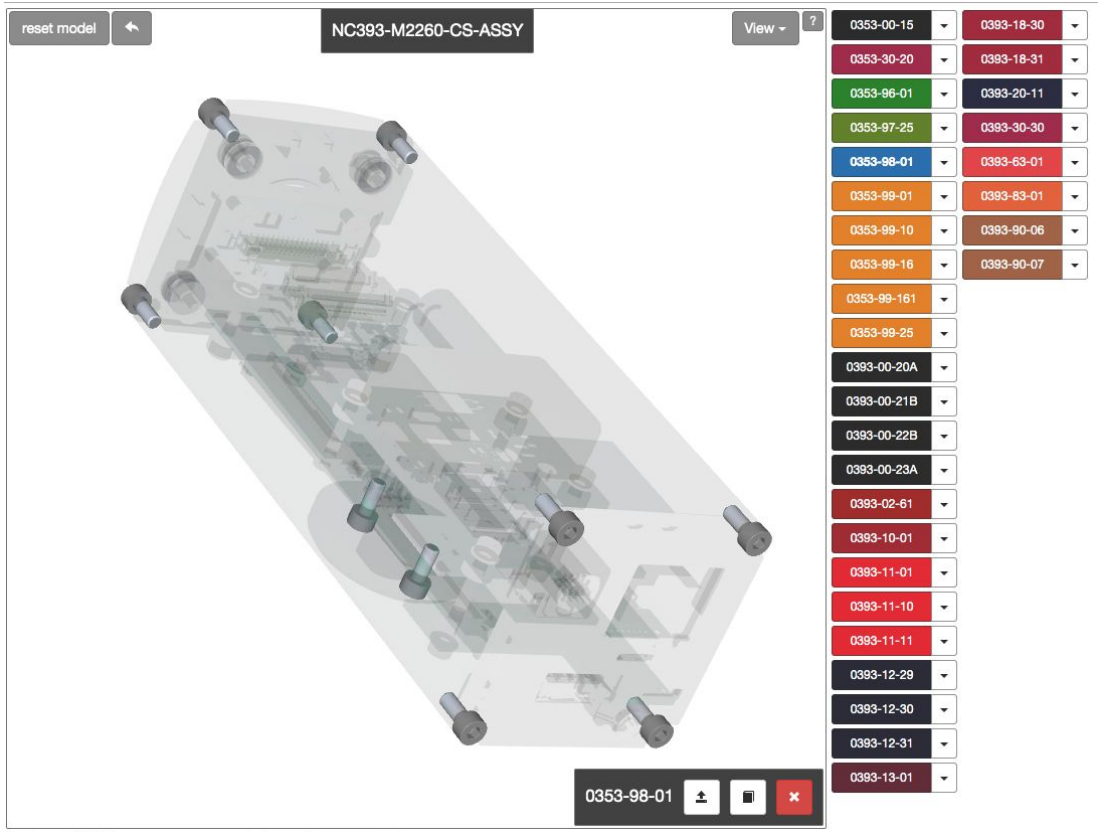
Integrate 3D and 2D drawings



3D CAD model and 2D drawings courtesy of Supreme Enterprises.

http://www.kshell.com/pages/web3d201811/visibility/index.html

Product Catalog



https://community.elphel.com/x3d/index.html?animate&model=/x3d/x3d_model_files/x3d/NC393-M2260-CS-ASSY.x3d

STEP to X3D

Generated from STEP file from the NIST Conformance Suite.

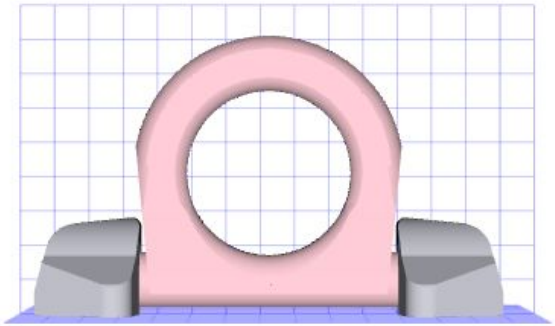
https://www.web3d.org/x3d/content/examples/ConformanceNist/STEP/CTC05/NistCtc05Asme1Ap203SpriX3dom.xhtml

Product Demonstration

Part: VRBS-4-t Welded Lifting Point
Manufacturer: RUD

STEP (AP203) CAD file obtained from
PART Community online catalog.

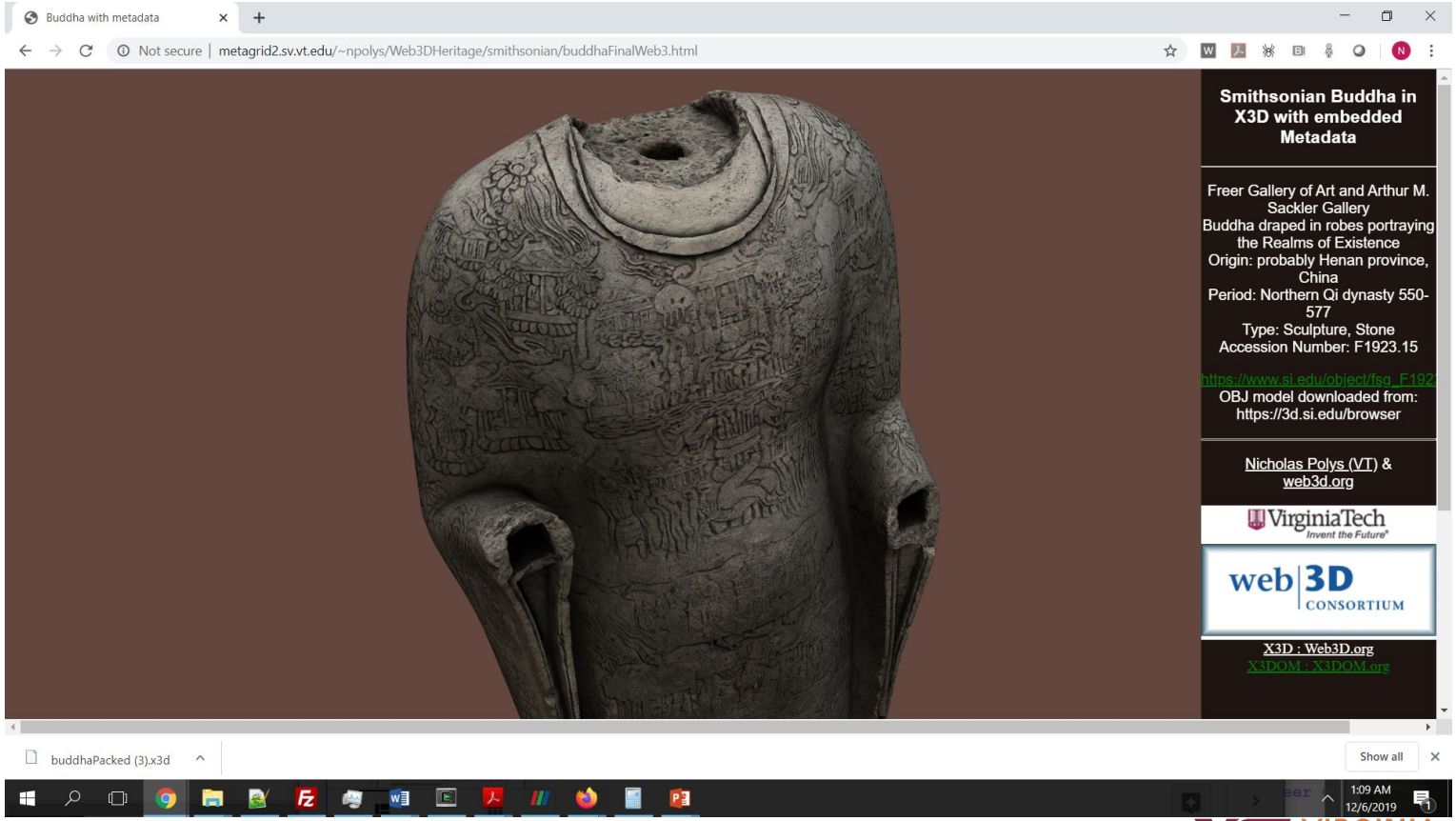
X3D Download



Show 1 cm. grid Show Swivel Freedom Reset View

Model may be rotated by dragging with mouse

http://www.kshell.com/pages/rwclp/clp.xhtml


Buddha with metadata
Not secure | metagrid2.sv.vt.edu/~npolys/Web3DHeritage/smithsonian/buddhaFinalWeb3.html
Smithsonian Buddha in X3D with embedded Metadata
Freer Gallery of Art and Arthur M. Sackler Gallery
Buddha draped in robes portraying the Realms of Existence
Origin: probably Henan province, China
Period: Northern Qi dynasty 550-577
Type: Sculpture, Stone
Accession Number: F1923.15
https://www.si.edu/object/fsg_F192
OBJ model downloaded from: https://3d.si.edu/browser
Nicholas Polys (VT) & web3d.org
VirginiaTech
Invent the Future
web 3D CONSORTIUM
X3D : Web3D.org
X3DOM : X3DOM.org
buddhaPacked (3).x3d
Show all
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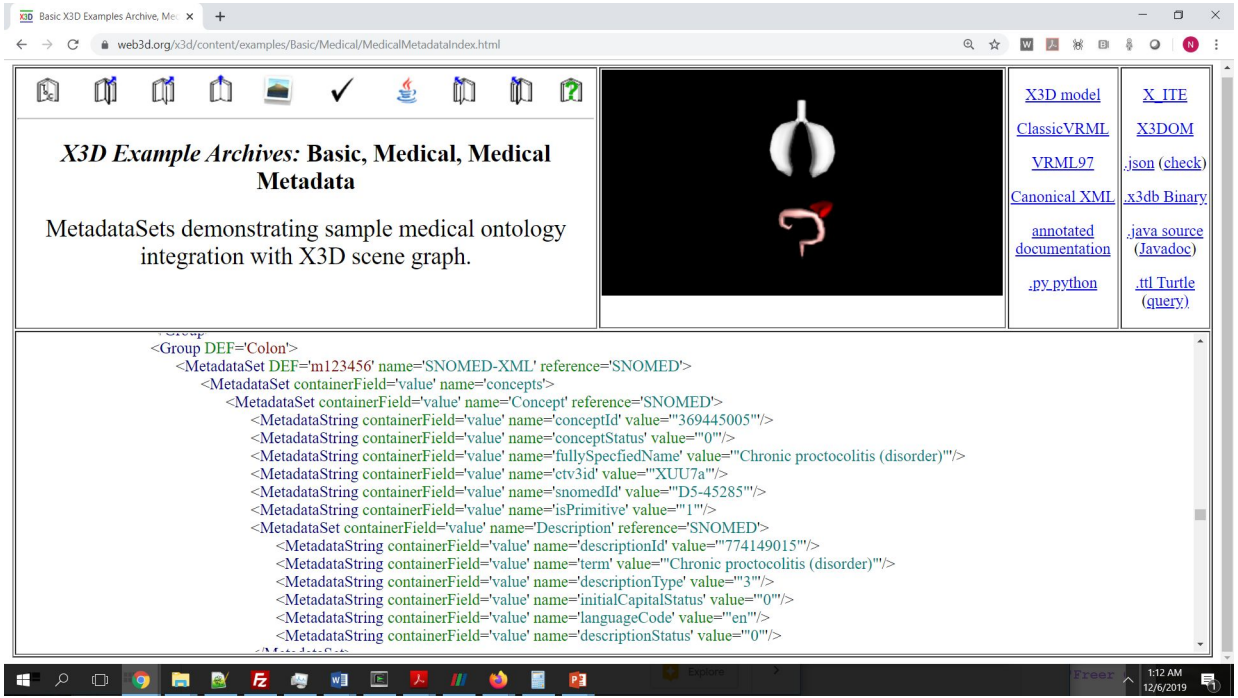
Emerging Metadata Vocabulary

Smithsonian and Library Community :

3D Metadata Model

Medical Example:

SNOMED and FMA terms in X3D

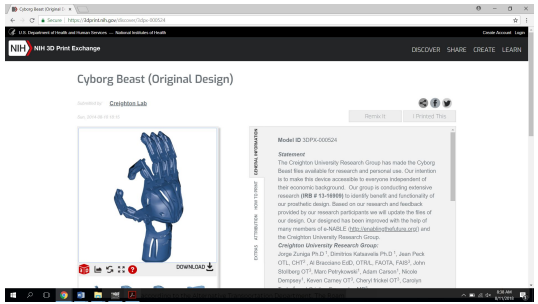


Next Steps

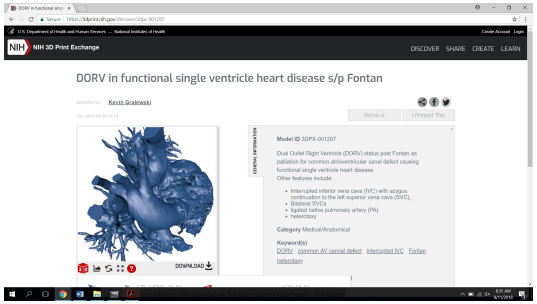
- Develop more examples of diverse vocabularies and X3D IT architectures (all Working Groups)
- Develop Recommendations and Specifications for expressing and using these relationships in X3D

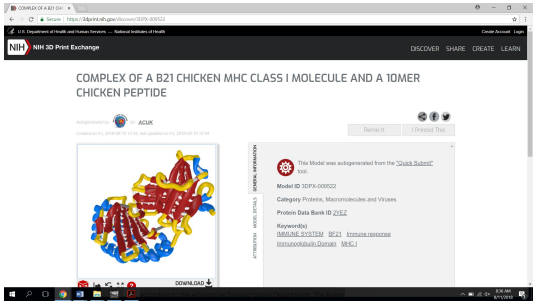
www.web3d.org

NIH X3D Printing 3dprint.nih.gov



NIH 3D PRINT EXCHANGE





web 3D CONSORTIUM

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Processing: Lidar

Typical tasks:

- Remove noise and errors
- Get statistics of the point cloud
- Resample / reduce
- Generate 3D surface model
  - Scan angle can be used as a normal vector each point, resulting in better surfaces
  - May include approaches like Poisson disk sampling, marching cubes, draping, or ball-and pivot
  - Object detection / segmentation

Processing Lidar

- Commercial tools like Esri, Geomagic, Photoscan are black-boxes and users must rely on the companies to validate and test for confidence in the result
- Open source 3D tools like MeshLab, Blender, and CloudCompare are commonly used and the b asis for our pipelines
- Python's Laspy library makes loading and manipulating .las data easy; e.g.:
  - Las2x3d.py

Requirements

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Requirements

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Requirements

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Requirements

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