Web3D Collaborative Naval Visualization Workshop

3D Metadata Model(s)

for Archival Data Publication
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?
- ...

Advanced Research Computing: arc.vt.edu
GeoVisualization

Derived Products

GPS:
- DTM (TIN),

Aspect

Slope

CHM
Processing

There are many processing options depending on 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 with 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.

Product Catalog

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

Advanced Research Computing: arc.vt.edu
STEP to X3D

NistCtc05Asme1Ap203Spri.x3d

NIST Product and Manufacturing Information (PMI) Complex Test Case 5.

Generated from STEP file from the NIST Conformance Suite.
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
Emerging Metadata Vocabulary

Smithsonian and Library Community:

3D Metadata Model
Medical Example:
SNOMED and FMA terms in X3D

X3D Example Archives: Basic, Medical, Medical Metadata
MetadataSets demonstrating sample medical ontology integration with X3D scene graph.
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
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 basis 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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