Web3D 2011 Tutorial: Advanced X3D

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Yvonne Jung: ***Fraunhofer IGD***

Jeff Weekly, Don Brutzman: ***Naval Postgraduate School***

Tutorial Outline

Recent work in the Web3D Consortium

Heading to ISO this month!

- X3D : Advanced Features
  - X3D Basics
  - Advanced rendering (Yvonne Jung)
  - Volumes
  - Geospatial
  - CAD
  - Units (Jeff Weekly)
  - Authoring


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Open Standards

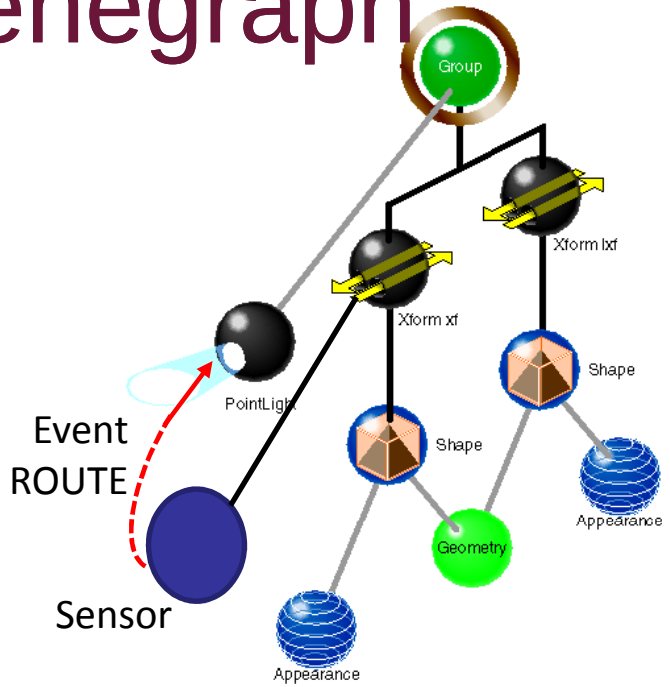
www.web3d.org

- Portability
- Durability
- IP-independence
- International recognition and support

X3D: the Standard Scenegraph

Scene graph for real-time interactive delivery of virtual environments over the web:

- Meshes, lights, materials, textures, shaders
- Integrated video, audio
- Animation
- Interaction
- Scripts & Behaviors



- Multiple encodings (ISO = XML, VRML-Classic, Binary)
- Multiple Application Programming Interfaces (ISO = ECMA, Java)

- X3D 3.3 includes examples for Volume rendering, CAD and Geospatial support!

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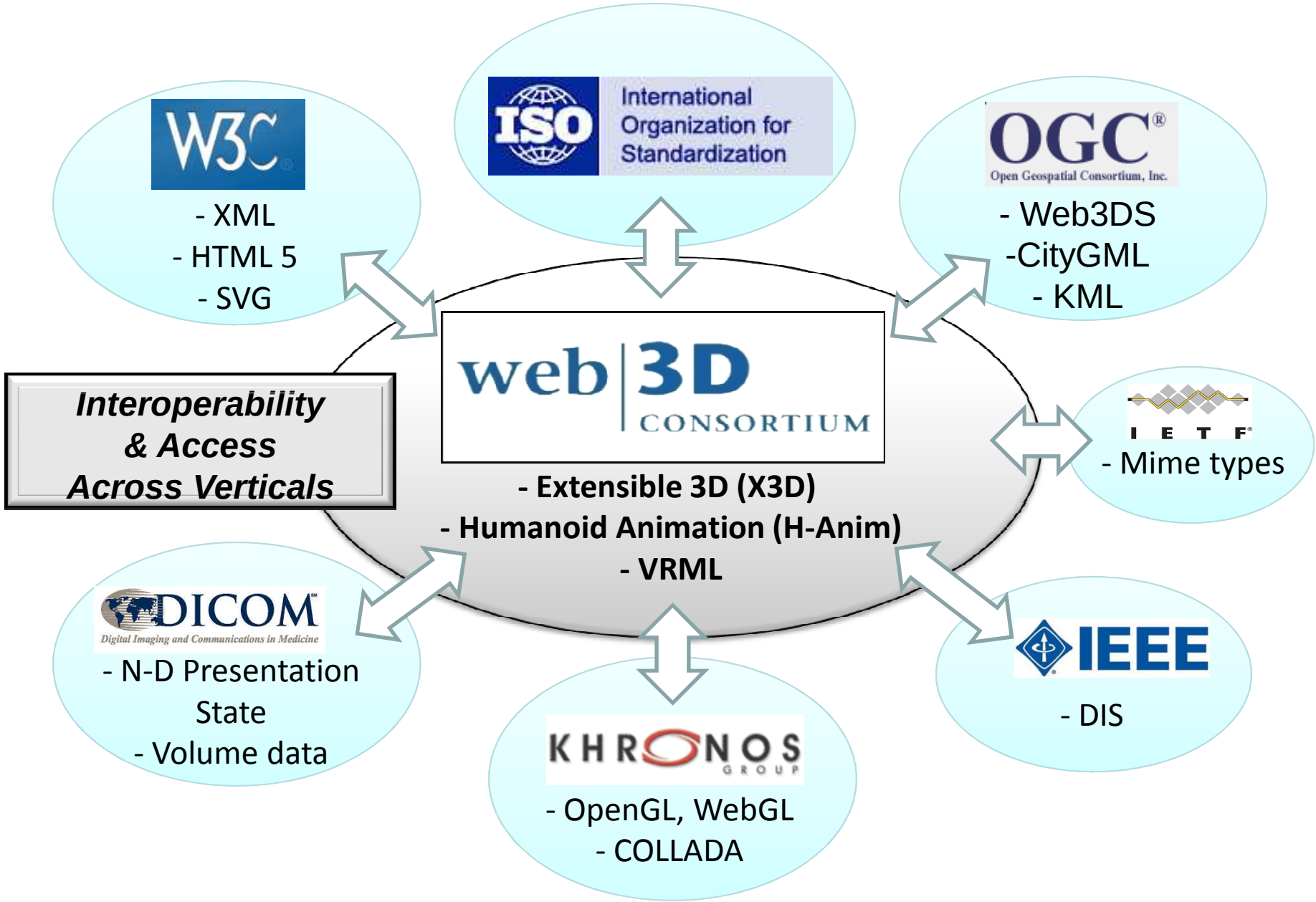
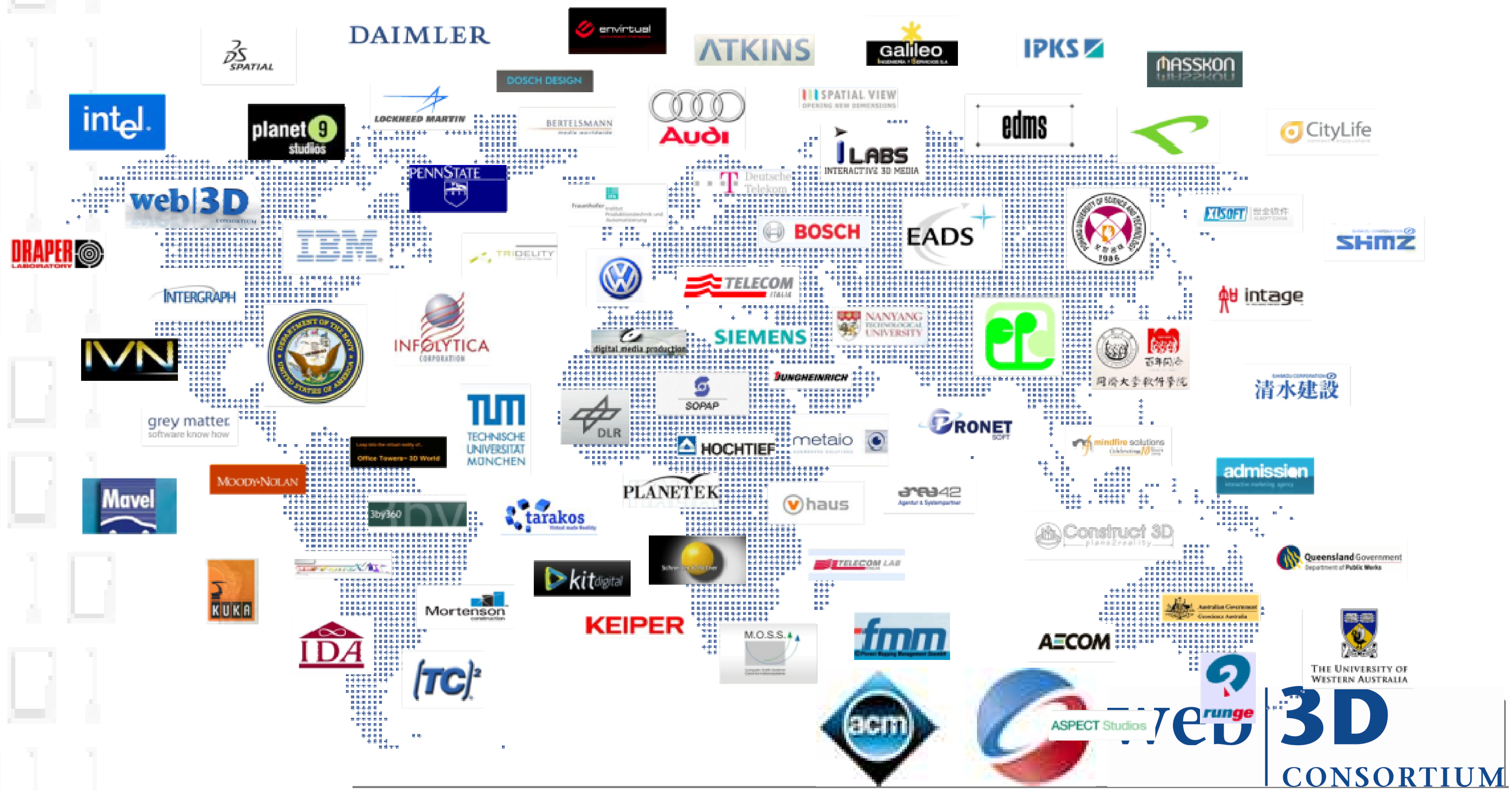
Web3D Collaboration & Convergence



Adoption


DAIMLER
envirtual
ATKINS
Galileo
IPKS
MASSKON
DOSCH DESIGN
intel
planet 9 studios
LOCKHEED MARTIN
BERTELSMANN
Audi
SPATIAL VIEW
edms
CityLife
I LABS
INTERACTIVE 3D MEDIA
PENNSTATE
web3D
Deutsche Telekom
BOSCH
EADS
DRAPER LABORATORY
IBM
TRIDELITY
SHMZ
INTERGRAPH
TELECOM ITALIA
intage
NANYANG TECHNOLOGICAL UNIVERSITY
INFOLYTICA CORPORATION
SIEMENS
digital media production
JUNGHEINRICH
清水建設
SOPAP
grey matter
software know how
DLR
TECHNISCHE UNIVERSITÄT MÜNCHEN
metaio
RONET
mindfire solutions
HOCHTIEF
Office Towers - 3D World
MOODY•NOLAN
admission
Mavel
PLANETEK
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tarakos
Construct 3D
3by360
Queensland Government
kit digital
KUKA
Mortenson
KEIPER
TELECOM LAB
M.O.S.S.
IDA
TC
fmm
AECOM
THE UNIVERSITY OF WESTERN AUSTRALIA
acm
ASPECT Studios
runge
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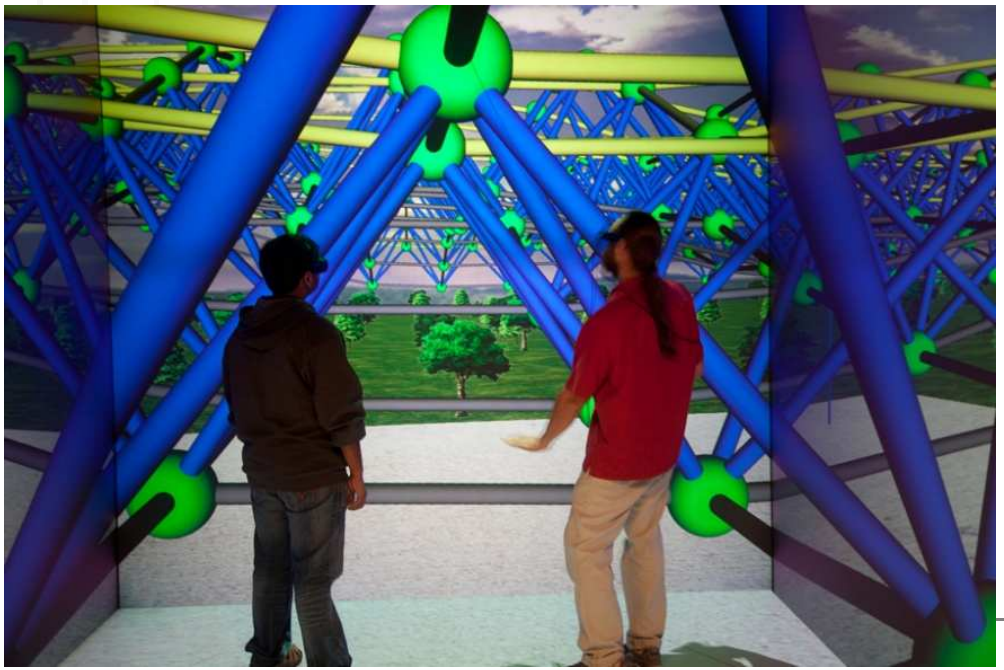
Immersive X3D

- Virginia Tech Visionarium: VisCube
  - Multi-screen, clustered stereo rendering
  - 1920x1920 pixels per wall (x 4)



- Infitech Stereo
- Wireless Intersense head & wand
- Instant Reality

VT Visionarium

- Output from VMD

Jory Z. Ruscio, Deept Kumar, Maulik Shukla, Michael G. Prisant, T. M. Murali, and Alexey V. Onufriev, ``Atomic level computational identification of ligand migration pathways between solvent and binding site in myoglobin", Proceedings of the National Academy of Sciences, (USA), 15, 9204-9209 (2008).

From Gallery at:
Snoid.sv.vt.edu

VT Visionarium

From Gallery at:
Snoid.sv.vt.edu

Mobile X3D

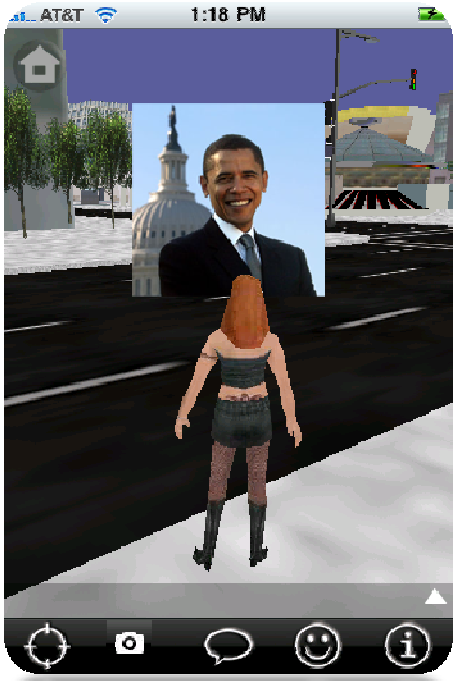
Demonstrated platforms

- Commercial: Raygun (IPhone, Android, Win CE)
- Opensource: FreeWRL (now Windows, IPhone and Android)
- Several other acadmic projects exist

RayGun on iPhone with THE DARK DESIGN Game

Kyoto, Japan

San Francisco, with Clue



London

London

Mobile Multi-user X3D on IPad (Raygun)

RayGun

planet 9 studios

acm

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Mobile X3D

- Mobile X3D Study Group at SC24 Plenary Meeting
- Korean Chapter very active
- Aligns with Web3D AR Working group and W3C's Declarative 3D Community Group
- Efforts continue!


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Advanced Rendering

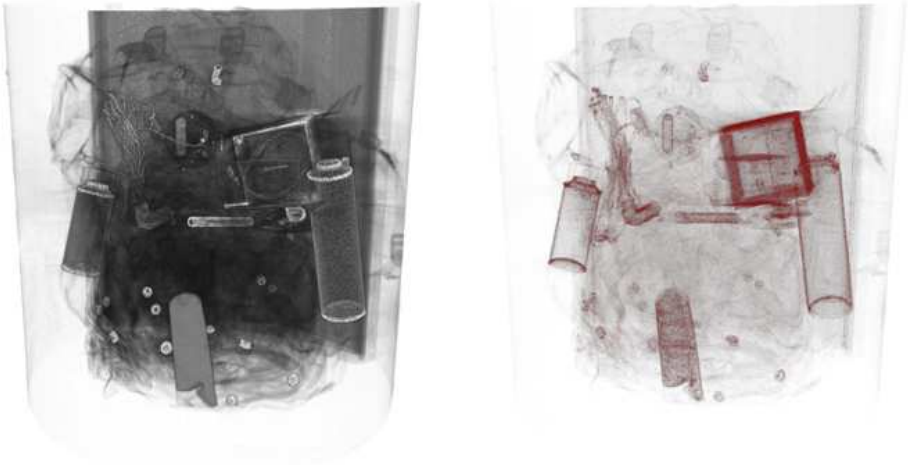
- Yvonne Jung, Ph.D.
  - Fraunhofer IGD

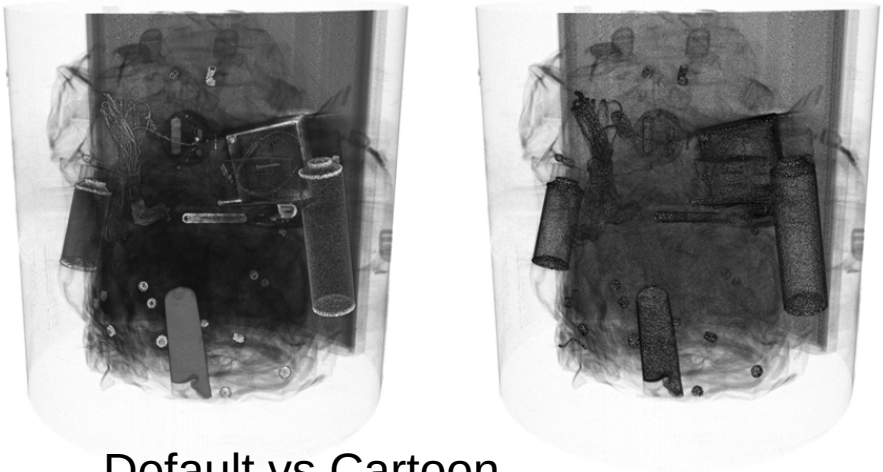
Volume Rendering

- New Component in 3.3
- VolumeData (may include segmentation or Isosurface information)
- VolumeRenderStyles
  - Composable
  - Can be assigned to different segments
- Two volumes (eg. X-ray + CT) can be blended

Examples

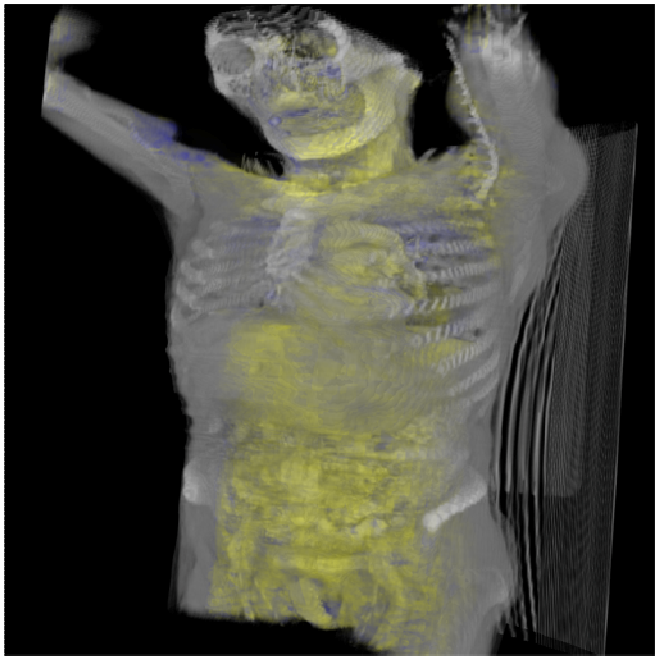
Default vs Composed

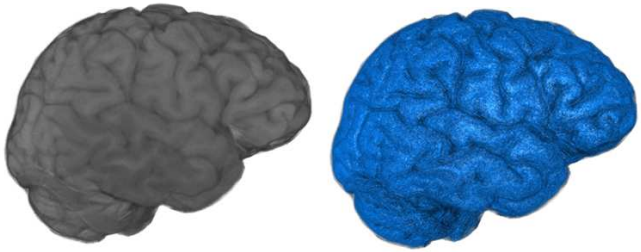




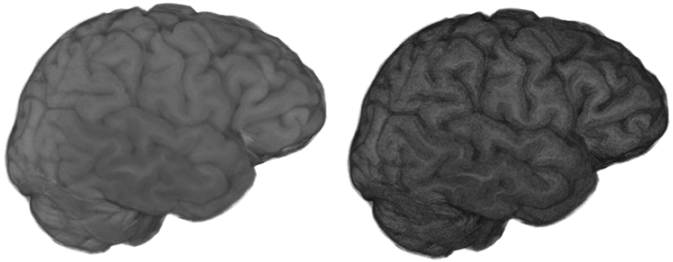
Default vs Cartoon

Blended volumes





Default vs Shaded



Default vs Edge Enhanced

Volume Rendering

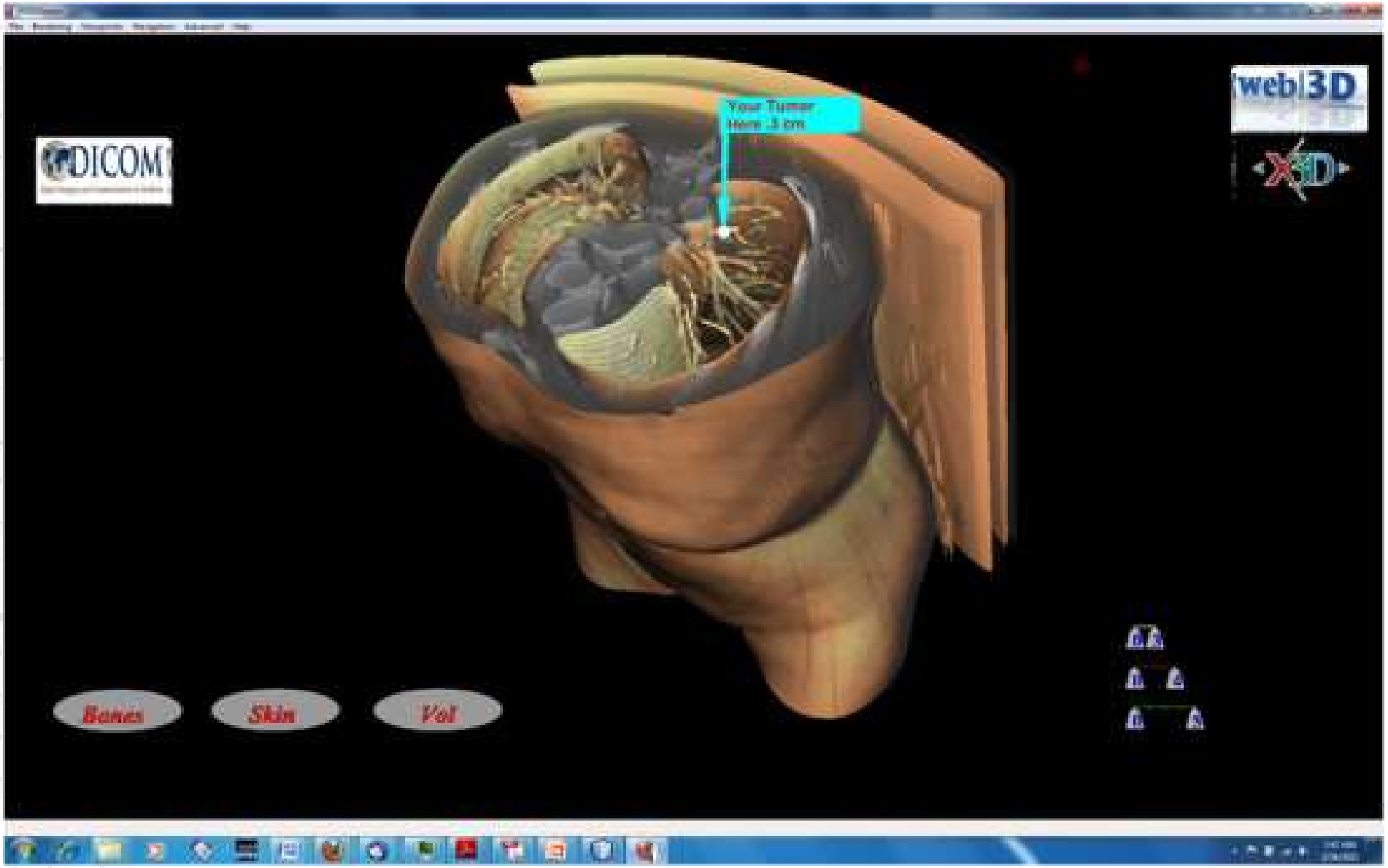
- Images at
  - https://snoid.sv.vt.edu/~andywood/medX3D_images/
- Movies available at
  - https://snoid.sv.vt.edu/~andywood/medX3D_examples/Videos/
- Implementations:
  - H3D.org (opensource)
  - InstantReality.org (commercial)

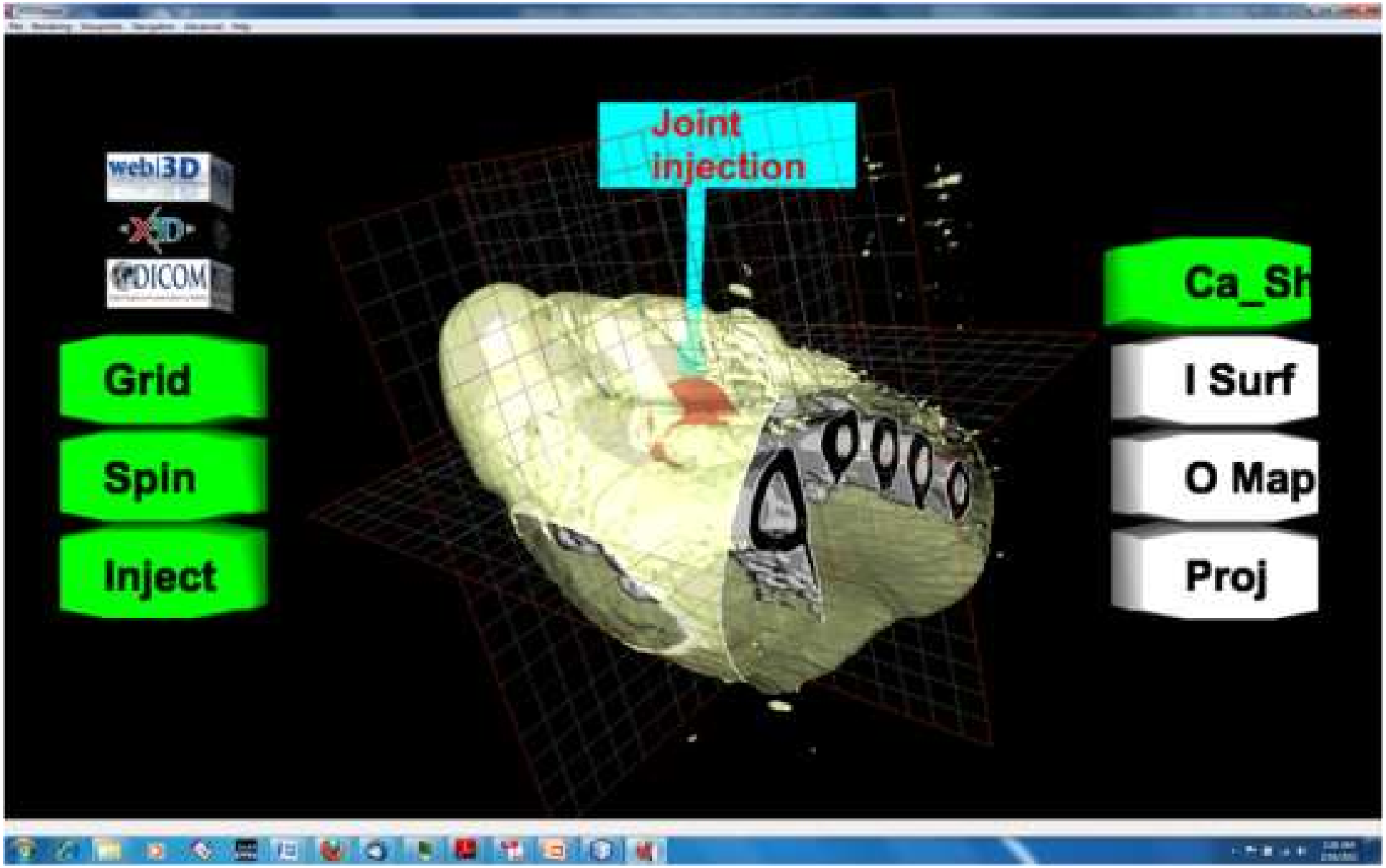
Volume Example

See: https://snoid.sv.vt.edu/~andywood/medX3D_examples/

```
<VolumeData  dimensions='1 1 1' useStochasticJittering='true' >
    <ComposedVolumeStyle>
        <SilhouetteEnhancementVolumeStyle
    silhouetteBoundaryOpacity='1' silhouetteRetainedOpacity='.1'
    silhouetteSharpness='10'/>
        <EdgeEnhancementVolumeStyle gradientThreshold='.8'
    edgeColor='.5 0 0' />
    </ComposedVolumeStyle>
    <ImageTexture3D containerField="voxels“
    url='"./Datasets/backpack.nrrd"' >
    </ImageTexture3D>
</VolumeData>
```

Volume Examples




Joint injection
web3D
X3D
DICOM
Grid
Spin
Inject
Ca_Sh
I Surf
O Map
Proj

demos

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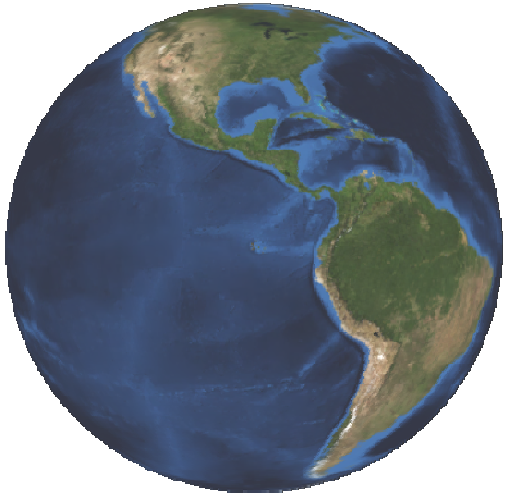
Geospatial



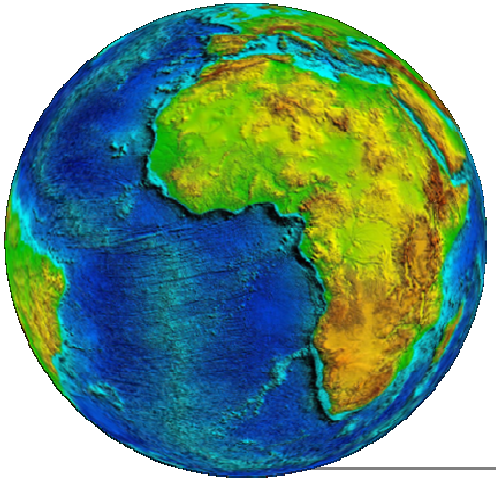
- X3D-Earth Working Group
- Double precision
- geoCoords and geoSystem

geoSystem default value is ["GD" "WE"]

- "GD" means geodetic
- "WE" means WGS84 ellipsoid, i.e. the World Geodetic System of 1984 (updated 2004)

Geospatial

- Geo* Nodes include:
  - GeoCoordinate, GeoElevationGrid, GeoLOD, GeoTransform
  - GeoPositionInterpolator
  - GeoViewpoint, GeoProximitySensor, GeoTouchSensor



Geospatial Component

Engines with X3D-Earth Support:

Instant Reality: commercial C++

- www.instantreality.org

Xj3D: open source Java

- www.xj3D.org

FreeWrl/FreeX3D: open source C++

- http://freewrl.sourceforge.net

BS Contact Geo: commercial C++

- http://www.bitmanagement.de

NOW ON:
OGC's 3D Portrayal Interoperability Experiment (PIE) w/ several Web3D members!


3DBlacksburg.org

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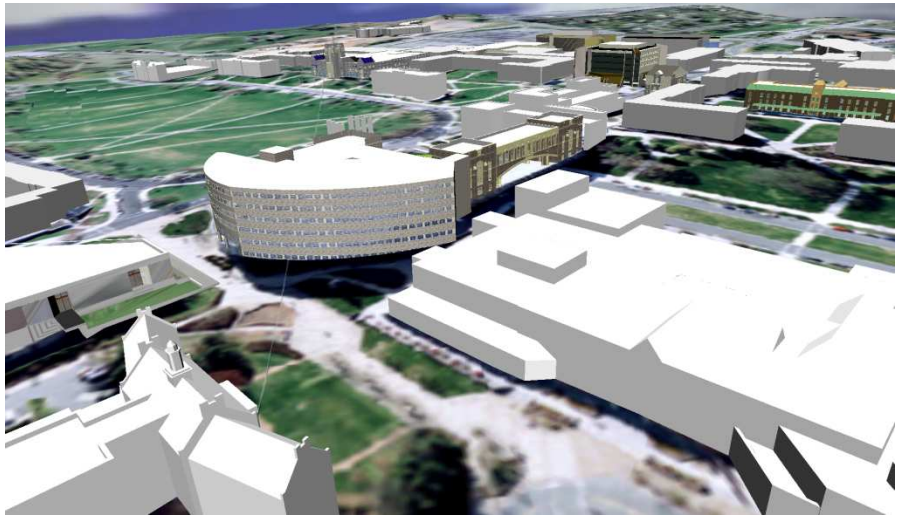
3D Blacksburg



- n-D City model
- Enterprise scale GIS infrastructure
- International standards:
  - Web3D (X3D)
  - OGC (Sensor Web)
- Integrates sensor feeds and video analytics for situational awareness

3D Blacksburg Mirror World

demo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CAD

- New activity in this WG !
  - Europe, Korea, US
- BREPS
- Reconstruction from parametric history
- See the Workshop materials
- Web3D Member wiki


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Augmented Reality

- Newly chartered working group
- US, Europe, Korea
- Coordinating with the community group arstandards.org
- Aligns with Mobile Profile ?
- See Web3D Videos

  (esp. from Fraunhofer IGD)


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Units

- New statement
- XML:
  - <head> …
    <unit category='length' conversion_factor='
    0.001' name='milli'/> </head>
- VRML-Classic:
  - unit { category length
  - conversion_factor 0.001
  - name milli }

The Web3D Consortium 2011

www.web3d.org

- Current SIGs:
  - Augmented Reality
  - eLearning
- Current Projects:
  - DICOM n-D Presentation
  - OGC 3D PIE
  - W3C Declarative 3D Group
- Current Chapters:
  - Korea
  - China

Authoring

Jeff Weekly, Naval Postgraduate School

- Camera nodes
- Increase cinematic control
- Machinima

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References

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References 1

X3D: Extensible 3D Graphics for Web Authors by Don Brutzman and Leonard Daly, Morgan Kaufmann Publishers, April 2007, 468 pages.

- http://x3dGraphics.com

X3D Resources and X3D Basic Examples Archive

- http://www.web3d.org/x3d/content/examples/X3dResources.html
- http://www.web3d.org/x3d/content/examples/Basic/DistributedInteractiveSimulation


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References 2

X3D-Edit Authoring Tool

- https://savage.nps.edu/X3D-Edit

X3D Scene Authoring Hints

- http://x3dgraphics.com/examples/X3dSceneAuthoringHints.html

X3D Graphics Specification

- http://www.web3d.org/x3d/specifications
- Also available as help pages within X3D-Edit