Web3D Opportunities for AEC BIM using X3D Graphics export to the Web

Architecture Engineering Construction AEC Hackathon

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Hack

Etymology 1 [edit]

From Old English *tohaccian* ("hack to pieces")

Verb [edit]

hack (*third-person singular simple present* **hacks**, *present participle* **hacking**, *simple past and past participle* **hacked**)

1. (*transitive*) To chop or cut down in a rough manner. [from around the 12th c.]
   *They **hacked** the brush down and made their way through the jungle.*
   [quotations ▼]
2. (*intransitive*) To cough noisily. [from the 19th c.]
   *This cold is awful. I can't stop **hacking**.*
3. To withstand or put up with a difficult situation. [from the 20th c.]
   *Can you **hack** it out here with no electricity or running water?*
4. (*transitive*, *slang*, *computing*) To hack into; to gain unauthorized access to (a computer system, e.g., a website, or network) by manipulating code; to crack.
5. (*transitive*, *slang*, *computing*) By extension, to gain unauthorised access to a computer or online account belonging to (a person or organisation).
   *When I logged into the social network, I discovered I'd been **hacked**.*
6. (*computing*) To accomplish a difficult programming task.
   *He can **hack** like no one else and make the program work as expected.*
7. (*computing*) To make a quick code change to patch a computer program, often one that is inelegant or that makes the program harder to maintain.
   *I **hacked** in a fix for this bug, but we'll still have to do a real fix later.*
8. To work on an intimately technical level.
   *I'm currently **hacking** distributed garbage collection.*
9. (*ice hockey*) To strike an opponent's leg with one's hockey stick.
   *He's going to the penalty box after **hacking** the defender in front of the goal.*
10. (*ice hockey*) To make a flailing attempt to hit the puck with a hockey stick.
    *There's a scramble in front of the net as the forwards are **hacking** at the bouncing puck.*
11. (*baseball*) To swing at a pitched ball.
    *He went to the batter's box **hacking**.*
12. To strike in a frantic movement. [quotations ▼]

AEC Hackathon

architecture:engineering:construction

http://www.aechackathon.com

wiktionary

Personal backround

- Don't know much (yet) about AEC, but...
- Am keen to learn more, glad to be here!
- Spent years at sea inside long steel tube
- Spent years in shipyards taking apart and rebuilding submarines
  - Can wear hard hat and steel-toed boots
- Son studying Architectural Engineering at California Polytechnic in San Luis Obispo
- X3D is unlocking CAD, let's repeat for BIM!

What is Extensible 3D (X3D)?

X3D is a royalty-free open-standard file format

- Communicate animated 3D scenes using XML
- Run-time architecture for consistent user interaction
- ISO-ratified standard for storage, retrieval and playback of real-time graphics content
- Enables real-time communication of 3D data across applications: archival publishing format for Web
- Rich set of componentized features for engineering and scientific visualization, CAD and architecture, medical visualization, training and simulation, multimedia, entertainment, education, and more

What is Extensible 3D (X3D)?

3D publishing standard for Web

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Web3D Consortium

Web3D Consortium founded in 1998 to protect, support and advance the VRML specification

- http://www.web3D.org

Continued efforts on new technology by multiple working groups led its successor, X3D

- http://www.web3D.org/x3d

Non-profit organization of many stakeholders ensures that X3D remains royalty free, relevant

- Partnership of industry, agency, academic and professional members

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Historical background: VRML

Virtual Reality Modeling Language (VRML) began in 1994, seeking to create 3D markup for Web

- Numerous candidates considered by an open community of interested practitioners
- SGI's OpenInventor won the initial competition
- VRML 1.0 developed over the next year
- VRML 2.0 restructured some nodes, added features

VRML advanced to International Standard 14772 by ISO in 1997

Web3D, ISO and X3D

Web3D implementation, evaluation, approval then formal review by the International Organization of Standardization (ISO) have made X3D an approved standard for archival real-world use, both on and off the Web.

Experts from 12-15 nations review our specs.

Immediate adoption by other governing bodies helps to increase deployment.

Nevertheless all changes and additions originate within Web3D working groups.

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X3D Specifications

X3D graphics is defined by a set of specifications

These "specs" are developed by working-group volunteers as part of the Web3D Consortium

- Nonprofit organization with business, nonprofit, academic and professional members
- http://www.web3D.org
- Efforts include editing, implementing and evaluating

Specification results reviewed and approved by International Organization of Standards (ISO)

- http://www.iso.ch

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Specification availability

The X3D specifications are online at

- http://www.web3d.org/x3d/specifications
- also embedded in the X3D-Edit help system

The X3D specifications are published by the Web3D Consortium and International Organization of Standardization (ISO)

- Web3D versions are published in HTML for free online
- ISO publishes .pdf versions and requires purchase

Feedback on X3D specifications is always welcome

- http://www.web3d.org/x3d/specifications/spec_feedback

Community rules

Thanks to an open process, IPR-protection rules and steady innovation by Web3D members, new X3D features continue to evolve and grow into great capabilities

Lots of working groups have formed, worked, faded, regrouped, persevered and succeeded

Web3D members and public mailing lists still keep these successes building, year after year

Intellectual property rights (IPR)

Web3D and W3C have similar policies

- Any known patented technology must be declared by members prior to consideration in safe haven of working groups
- Any patented technology contributions must be licensed on a royalty-free (RF) basis for inclusion in an openly used Web standard http://www.web3d.org/membership

Caveat: any legal problem can be solved, but only in advance!

Must innoculate against patent problems

Open source: at least one

2 independent interoperable implementations

- Required for Web3D approval, standardization
- Commercial codebases are welcome too, of course

Open for any use, without license fees

- Free = freedom to innovate, and freedom to fix!
- Not necessarily free cost – your mileage may vary
- More like “free puppy”, not “free beer”

Common shared example implementations

- Can provide a self-sustaining business model for continued activity, improvement
- Can clear up logjams when companies can’t resolve interoperability issues due to proprietary code

Interoperability - what's the difference?

Multiple paths, but often confused as equal

Standard: proven process for content interoperability, scalability, compatibility, licensing, growth, success

Specification: Algorithm descriptions, necessary detail

- But: might hide royalty problems, such as GIF imagery debacle in 1990s

Open source software: pile of (maybe repeatable) code

- But: usage licensing is not same as source-code licensing

Market share dominance: biggest competitor wins?

- Companies (or at least investors) hope to "own" 3D
- But: many defunct companies, dead-end technologies
- Everyone ends up with much smaller market than the Web

X3D: Royalty free (RF) for any purpose

- Just like all of the W3C Recommendations
- Technical contributions are welcome
  - Patents are OK, just can't charge anyone
  - Stable evolution, group consensus, running code
  - We stabilize best practices, extensions keep going
- Open source + commercial implementations
- Many different business models can use this
  - Apparently a well-kept secret here in valley??
  - Web3D community is assembling all pieces, parts needed to build end-to-end industry workflow

X3D Resources: many

X3D Resources

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Open Standards for Real-Time 3D Communication

Extensible 3D (X3D) Graphics is the royalty-free open standard for viewing and archiving interactive 3D models on the Web.

This page lists numerous resources that support X3D and Virtual Reality Modeling Language (VRML), its compatible predecessor.

Applications | Authoring Software | Authoring Support | Books | Conformance | Conversions | Examples | Export | License | Mobile | PowerPoint | Quality Assurance (QA) | References | Security | Showcase | Tooltips | Training | Video | X3D-Edit | X3D Scene Authoring Hints | Contact

Applications, Players and Plugins for X3D / VRML Viewing

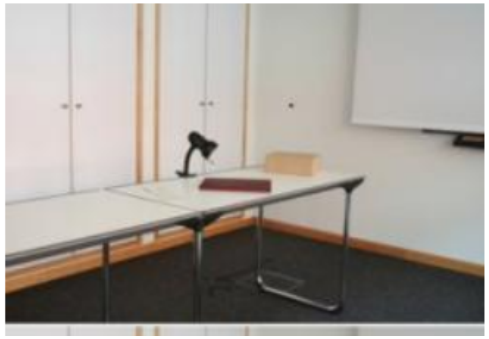
Extensible 3D (X3D) is the third-generation successor to the Virtual Reality Modeling Language (VRML), providing full backwards compatibility and adding functionally equivalent XML and compressed-binary file encodings.

- Player support for X3D components provides a feature comparison of major X3D viewers.
- Example test scene, shown using the various X3D encodings:
  HelloWorld (.x3d XML, .x3dv ClassicVRML, .wrl VRML97, .html listing, .xhtml X3DOM, .x3db compression, C14N canonicalization, and .png image)

Augmented Reality (AR)

Executive Summary:

The Augmented Reality (AR) Working Group was formed to address the needs of projecting computer generated information into the real world. The Working Group focuses on utilizing and extending X3D capabilities to support augmented reality (AR) and mixed reality (MR) applications.



Augmented and Mixed Reality has been getting popular as various applications were introduced since smartphones broke into wider consumer market. While current AR applications on smartphones focus on information browsing services, mostly providing text and 2D image based information to the users, AR and MR are three-dimensional interfaces by nature, and it will gain more focus on providing 3D graphics content as the technology gets mature.

Consortium formed a special interest group on AR initiatives in July 2009. Several Web3D Consortium member projects has been showcasing the feasibility of AR in X3D, particularly X3DOM open source produced by Fraunhofer IGD. Meanwhile, Web3D Korea Chapter members also proposed couple of proposals for extending X3D standard to support AR and MR visualization. Based on these efforts, Web3D consortium moved forward to forming the AR Working Group in order to explore wide variety of possibilities to extend X3D capabilities

Related Pages

- Augmented Reality Working...
- ARC Event Model Supporting AR & MR...
- ARC Reference Model for Real...
- Standard Reference Model for...
- Instant Augmented Reality
- Augmented and Mixed Reality
- dARsein: Augmented Reality...
- Augmented Reality Occlusion...
- Experimental Snapshot...

video: telemaintenance with X3D AR

Internationalization (I18N)

web3D CONSORTIUM *Open Standards for Real-Time 3D Communication*

HelloTaiwan.xhtml

(embedded X3D source)

HOME NEWS & EVENTS ▼ X3D ▼ ABOUT WEB3D ▼ WIKI WORK GROUPS ▼ SPECIFICATIONS ▼ MEMBER AREA

Internationalization for X3D

Call for Contribution for "Hello World" scenes for many nations!

Many people know about the X3D scene HelloWorld.x3d which shows the basic structure and syntax of the language. Here are various encodings of that scene: HelloWorld.x3d, view source, X3DOM, X3D's ClassicVRML encoding, and VRML97.

This scene was inspired as a basic test that follows a common pattern. You might know that there are many "Hello World" programs for many different programming languages. VRML and X3D are both illustrated on Wikipedia as part of (so far) 234 programming languages. [Wikibooks]

You might also know about Internationalization Internationalization (I18N) which is the use of different languages in documents. XML provides excellent I18N support for the Web. X3D also provides excellent I18N support, allowing the use of numerous different encodings, text directions, horizontal/vertical, etc.

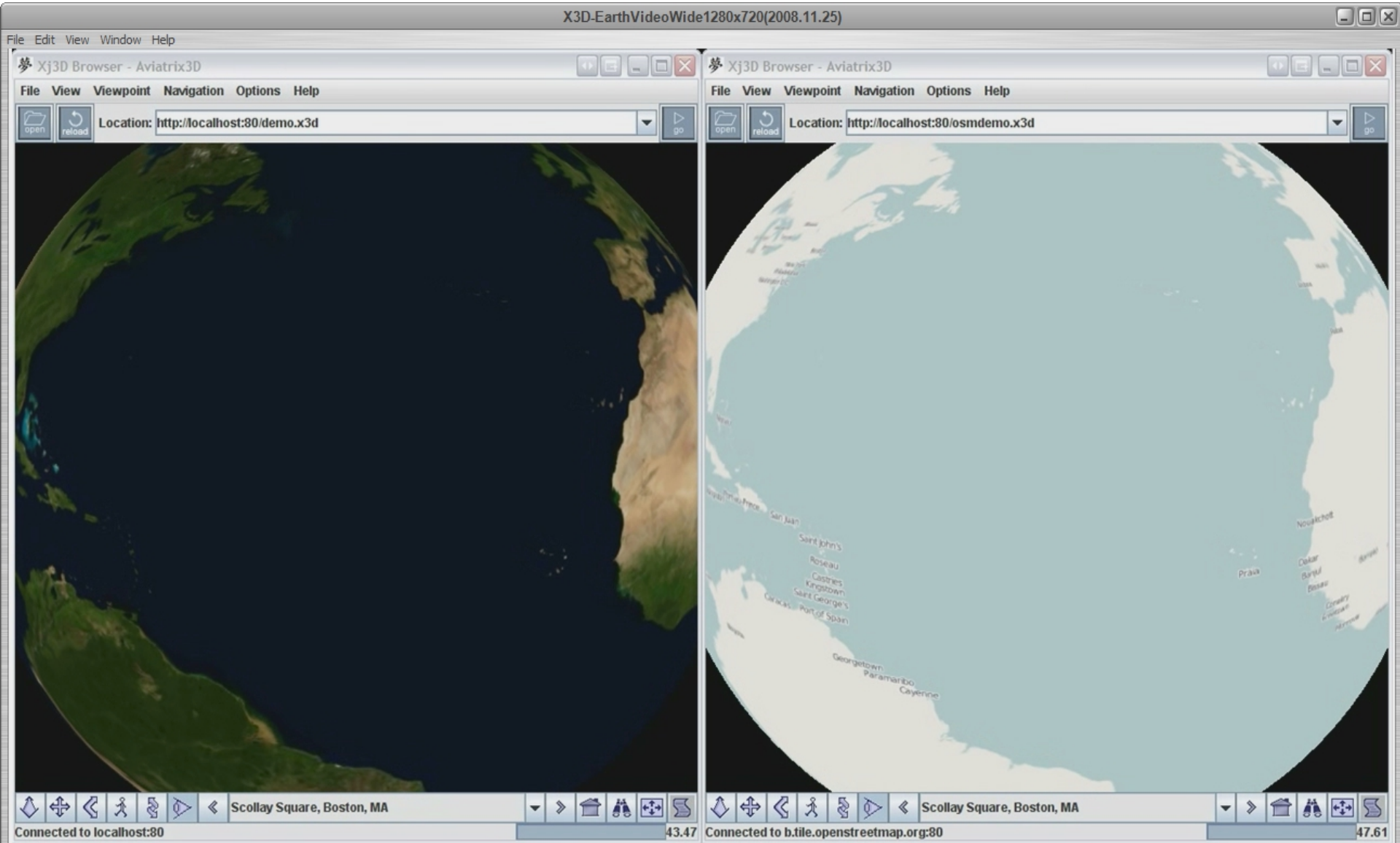
To encourage demonstrations of good I18N content in X3D, people in the X3D community are invited to post scenes illustrating their own language of choice. This work also tests whether different X3D players work well. Our first example scene is HelloTaiwan.x3d in the various encodings of that scene: view source, X3DOM, X3D's ClassicVRML encoding, and VRML97.

Other contributions are welcome! You can send them either to the x3d-public mailing list (subscribe to the list) or to Leonard Daly and Don Brutzman directly. It would be great to get a lot of nations and regions represented, enabling browser companies to test their support. All contributed examples will be maintained online.

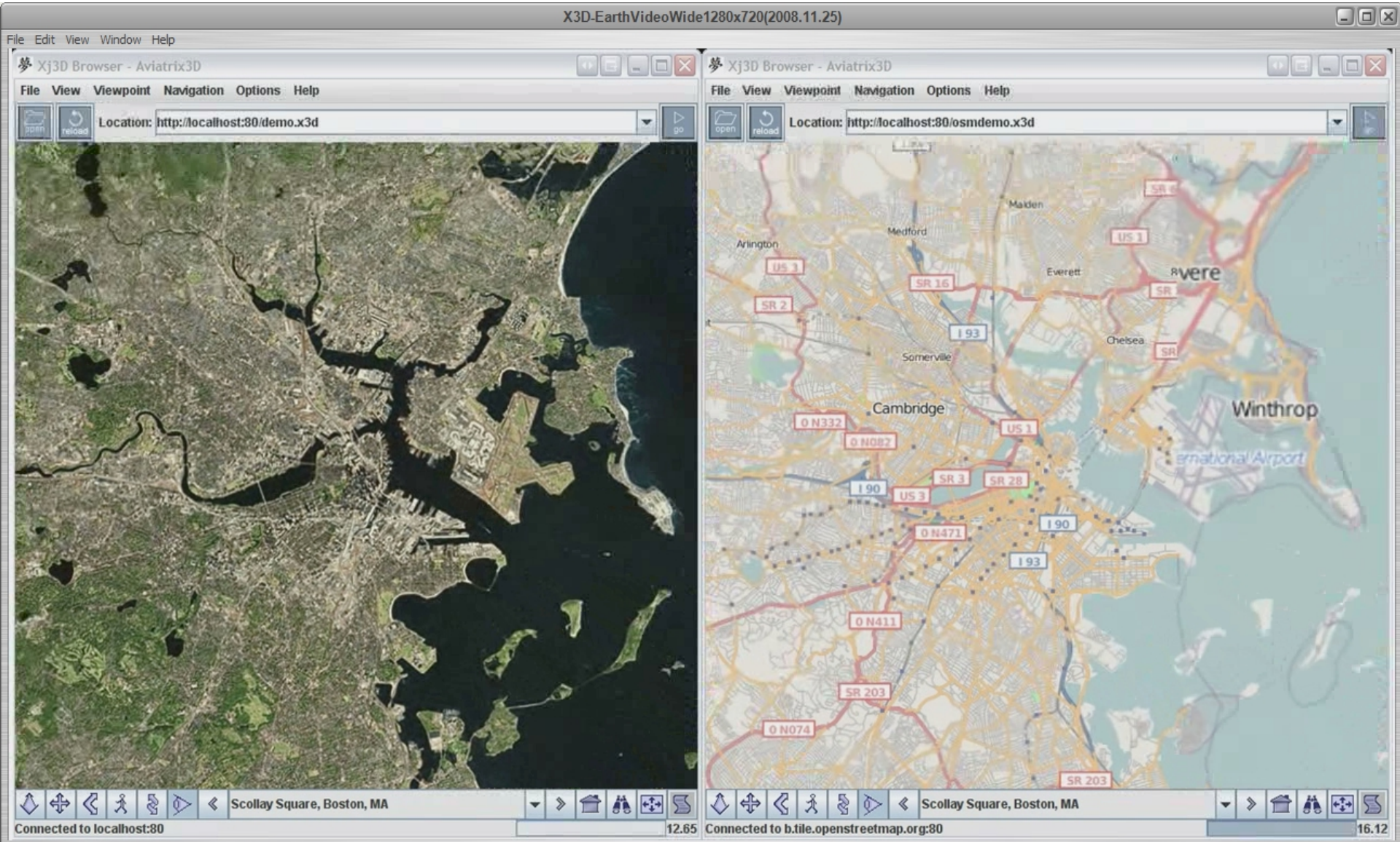
GIS Interoperability

- X3D Earth: "mash up" globe data on-the-fly from OpenStreetMap and OpenAerialMap
  - OpenAerialMap reconstitution now in progress
- Converting outputs from Open Geospatial Consortium (OGC) formats and tools
- NPS is building full-fidelity globe for DTED datasets using a supercomputer-class cluster
  - Will repeat for other datasets, others are welcome to use our code/assets
  - Thesis publication by Dale Tourtelotte August 2010

X3D Earth OpenStreetMap exemplar



X3D Earth OpenStreetMap exemplar



Exemplar effort:

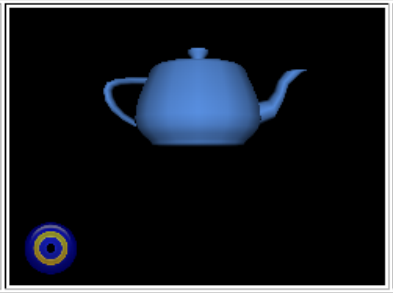
CAD extensions for X3D

Teapot.x3d example (header)

http://www.web3d.org/x3d/content/examples/Basic/CAD/Teapot.x3d

***Basic, CAD:* Teapot**

Teapot model demonstrating proper hierarchy of CAD nodes.



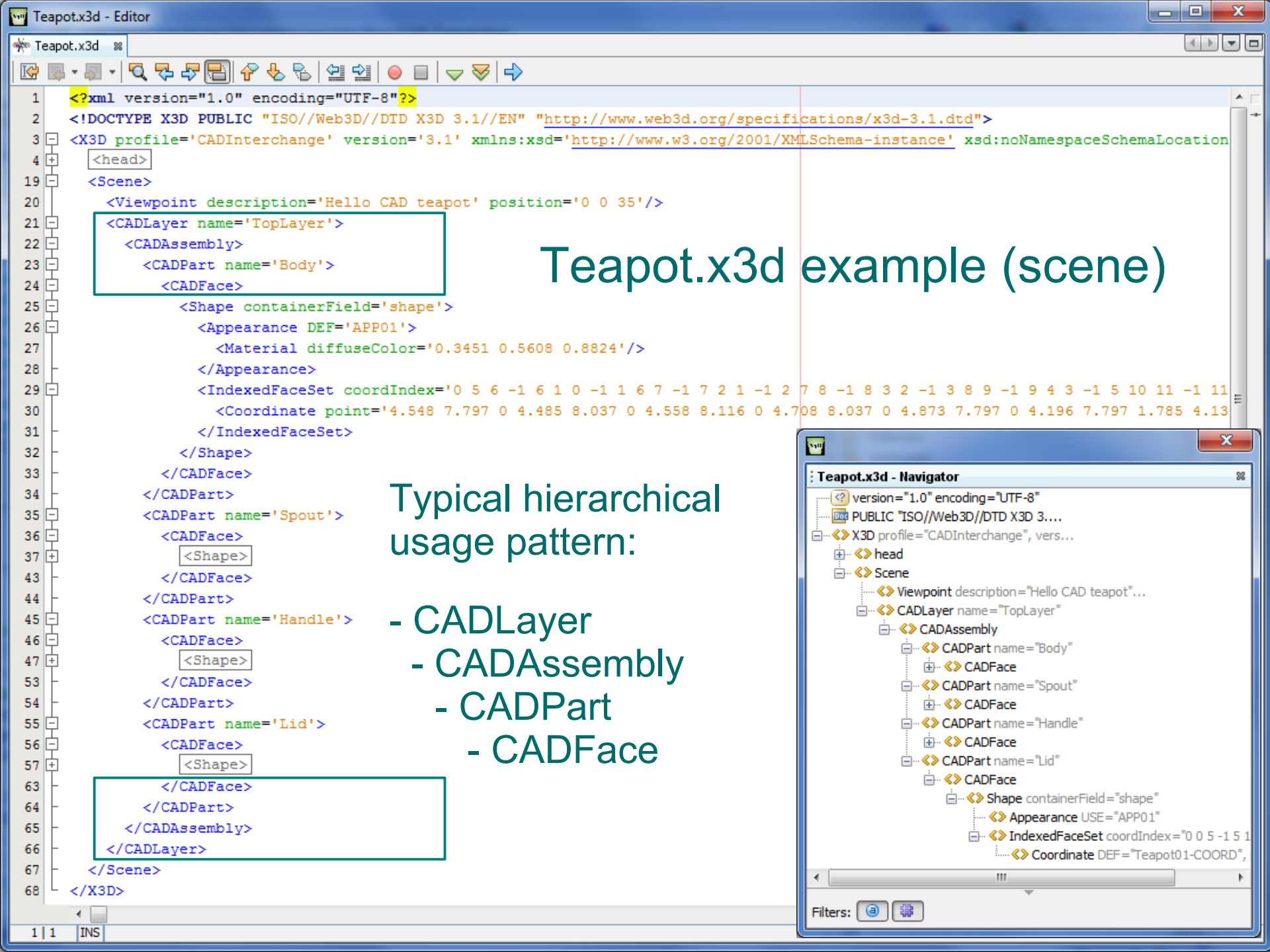
launch	links
X3D	VRML97
X3DV	XHTML
X3DB	C14N

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE X3D PUBLIC "ISO//Web3D//DTD X3D 3.1//EN" "http://www.web3d.org/specifications/x3d-3.1.dtd">

<X3D profile='CADInterchange' version='3.1' xmlns:xsd='http://www.w3.org/2001/XMLSchema-instance' xsd:noNamespaceSchemaLocation=' http://www.web3d.org/specifications/x3d-3.1.xsd '>
    <head>
        <component level='2' name='CADGeometry'/>
        <meta name='title' content='Teapot.x3d'/>
        <meta name='description' content='Teapot model demonstrating proper hierarchy of CAD nodes.'/>
        <meta name='creator' content='Alan Hudson'/>
        <meta name='translator' content=' Xj3D, http://www.xj3d.org '/>
        <meta name='created' content='1 December 2005'/>
        <meta name='modified' content='10 March 2009'/>
        <meta name='reference' content=' http://www.web3d.org/x3d/specifications/ISO-IEC-19775-Amendment1-X3DAbstractSpecification/Part01/components/CADGeometry.html '/>
        <meta name='reference' content='TeapotOriginal.x3dv'/>
        <meta name='subject' content='X3D CAD CADInterchange profile'/>
        <meta name='identifier' content=' http://www.web3d.org/x3d/content/examples/Basic/CAD/Teapot.x3d '/>
        <meta name='generator' content='X3D-Edit 3.2, https://savage.nps.edu/X3D-Edit'/>
        <meta name='license' content='../license.html'/>
    </head>
    <!--
```

Index for DEF nodes: APP01, Teapot01-COORD
Index for Viewpoint image: Viewpoint_1

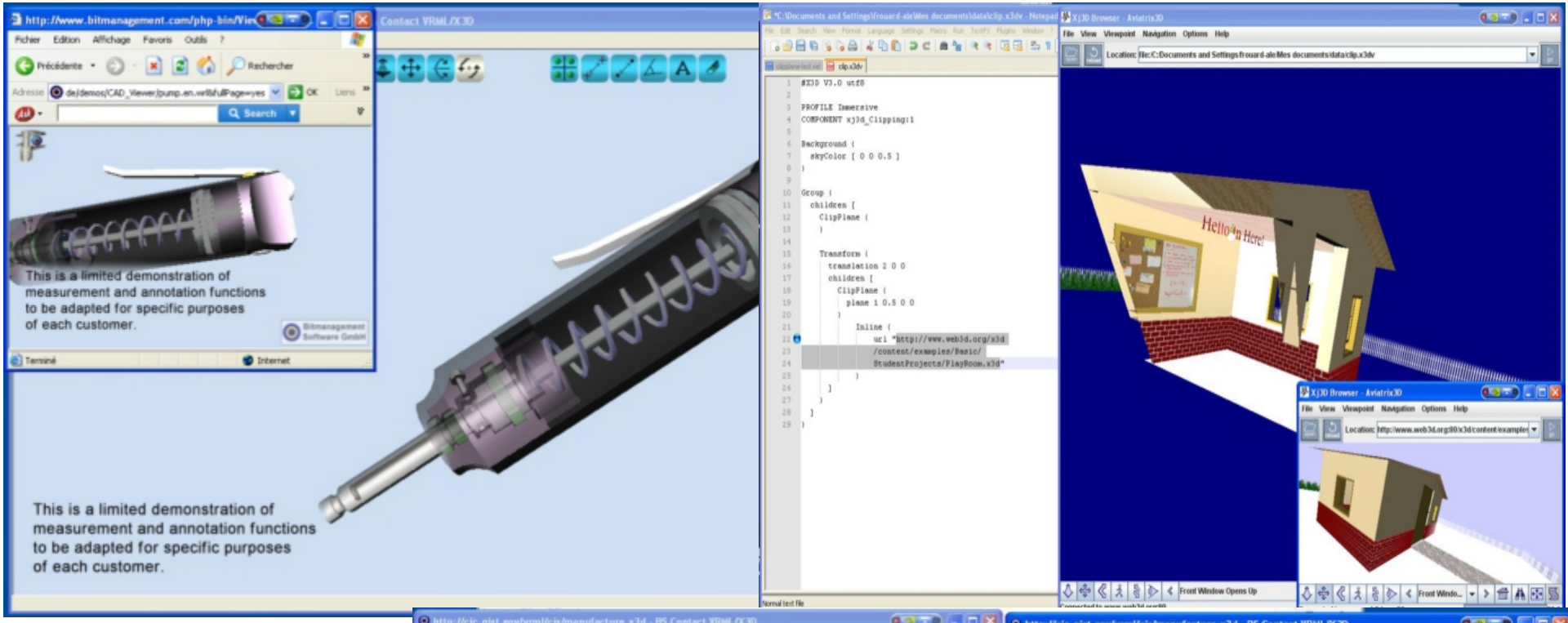
```
    -->
```

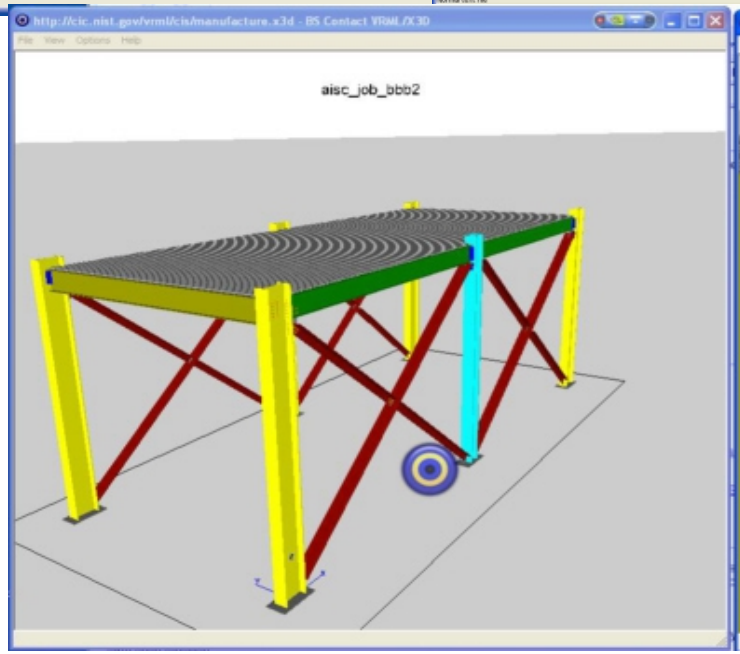


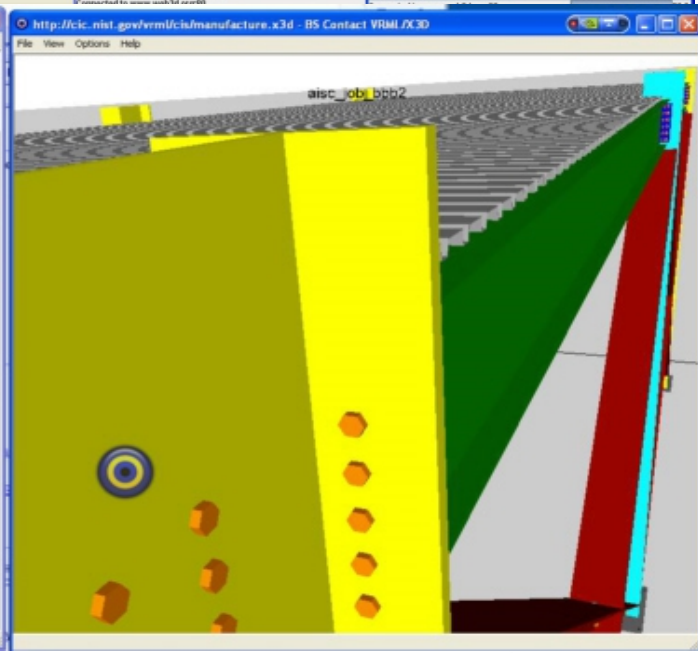
Teapot.x3d example (scene)

Typical hierarchical usage pattern:

- CADLayer
  - CADAssembly
    - CADPart
      - CADFace







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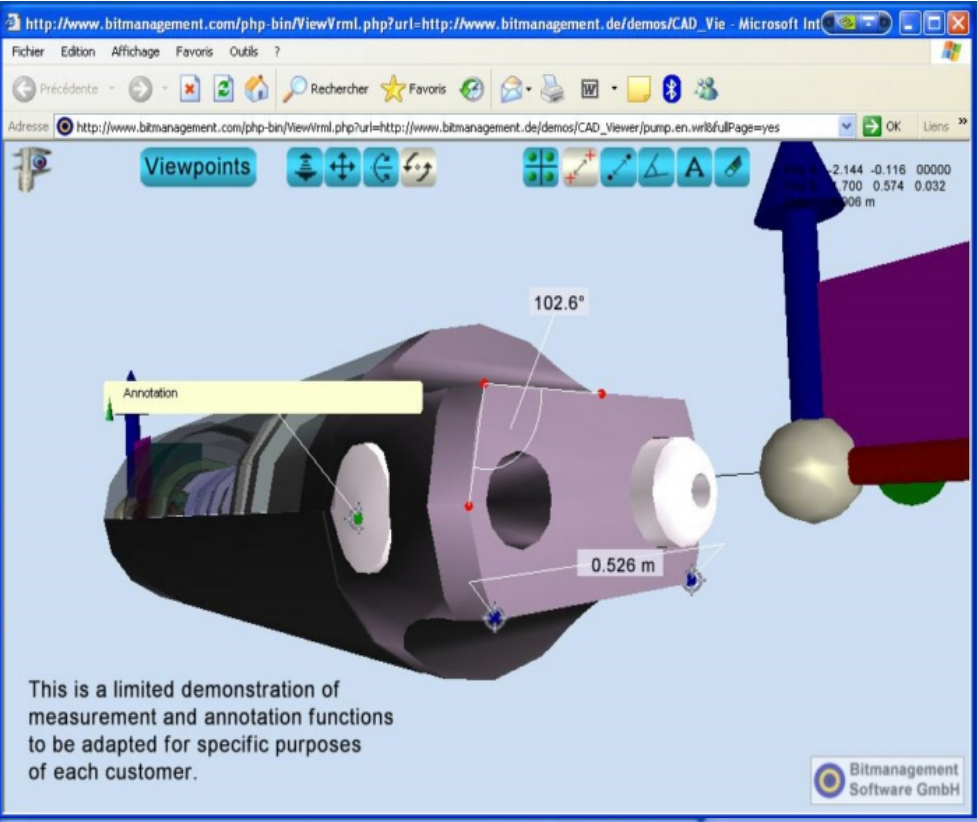
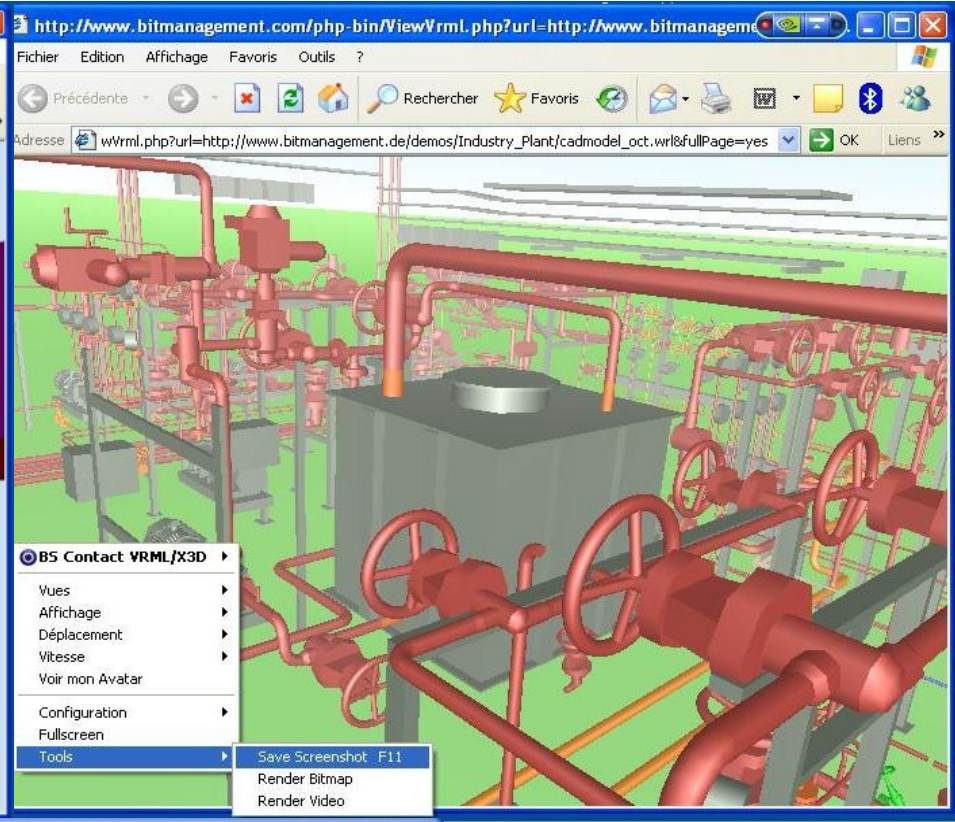
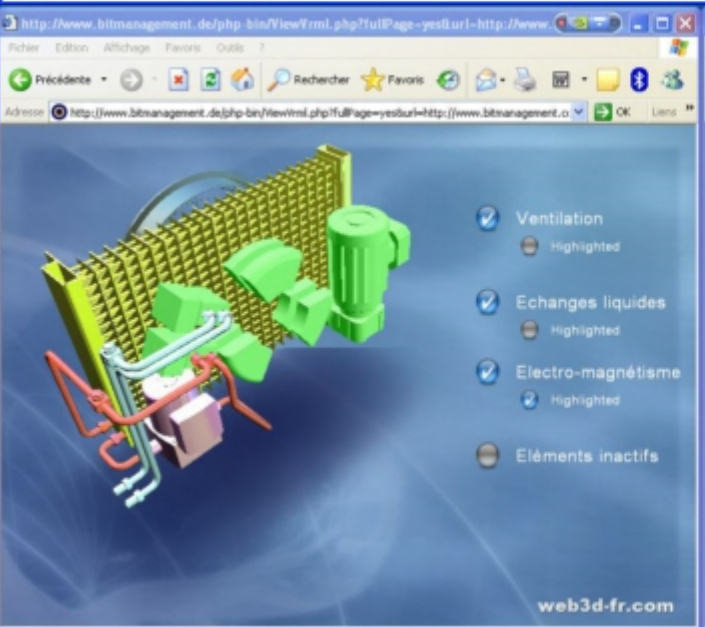
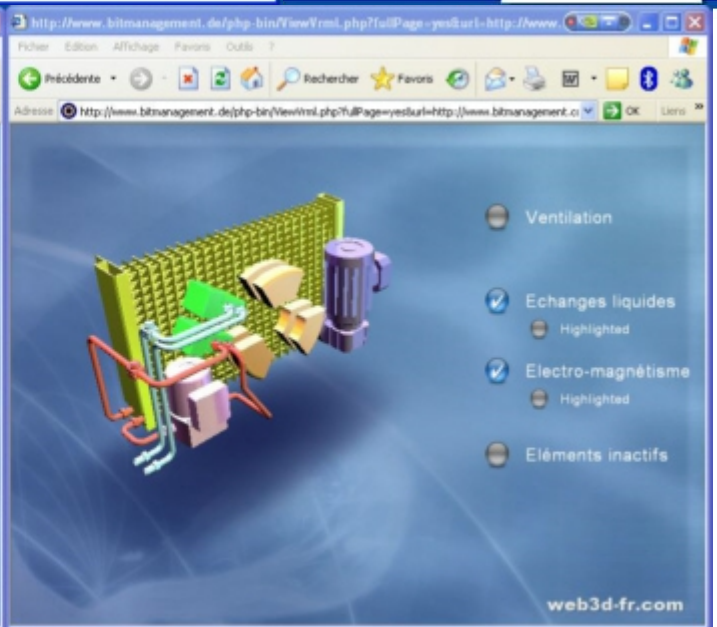

Viewpoints
102.6°
Annotation
0.526 m
This is a limited demonstration of measurement and annotation functions to be adapted for specific purposes of each customer.
Bitmanagement Software GmbH


BS Contact VRML/X3D
Vues
Affichage
Déplacement
Vitesse
Voir mon Avatar
Configuration
Fullscreen
Tools
Save Screenshot F11
Render Bitmap
Render Video


Ventilation
Highlighted
Echanges liquides
Highlighted
Electro-magnétisme
Highlighted
Eléments inactifs
web3d-fr.com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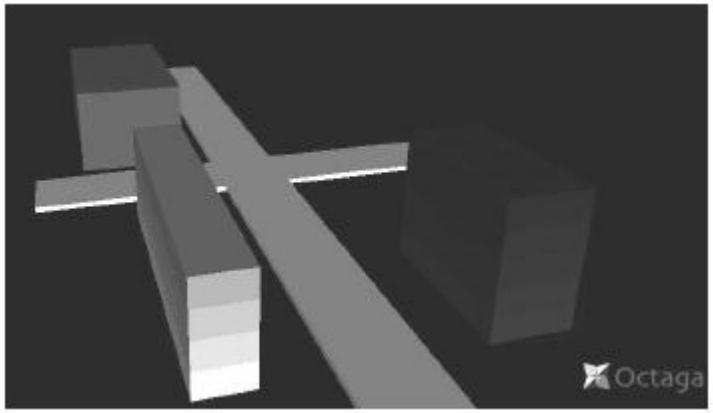
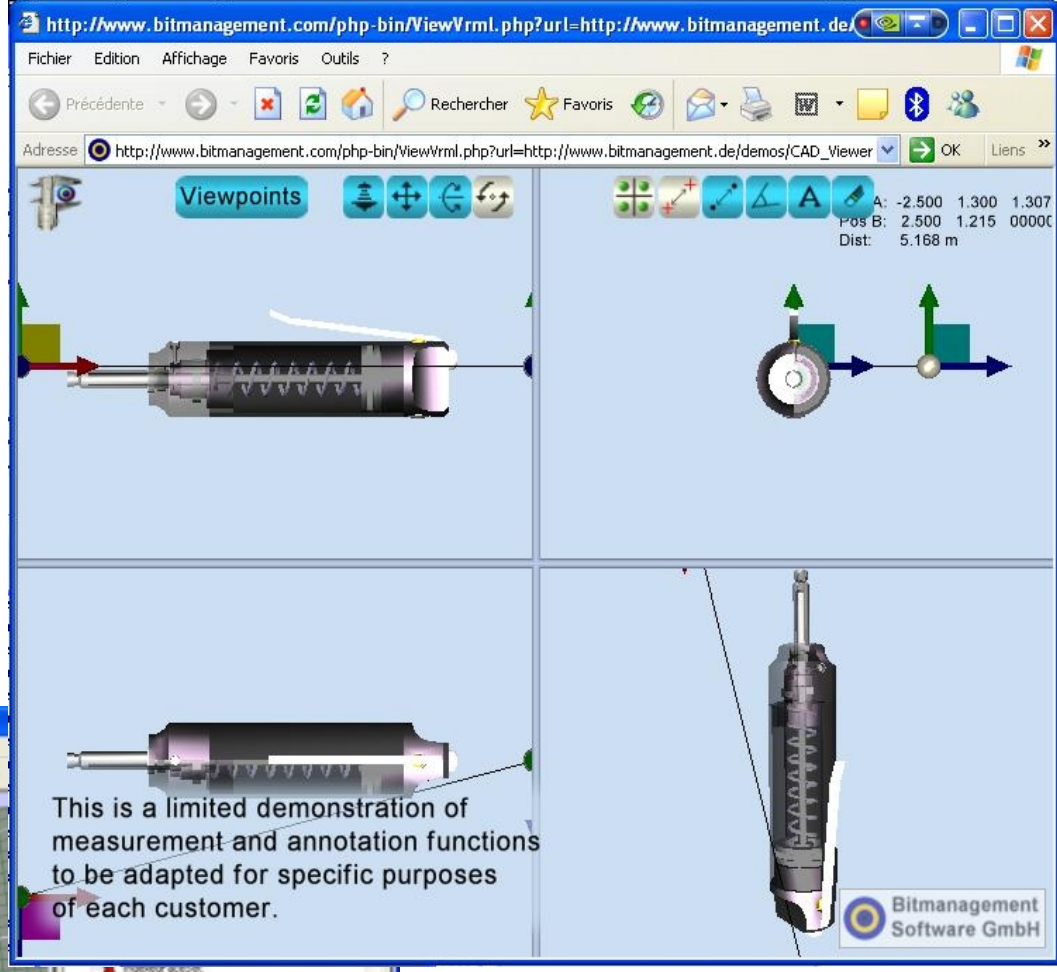
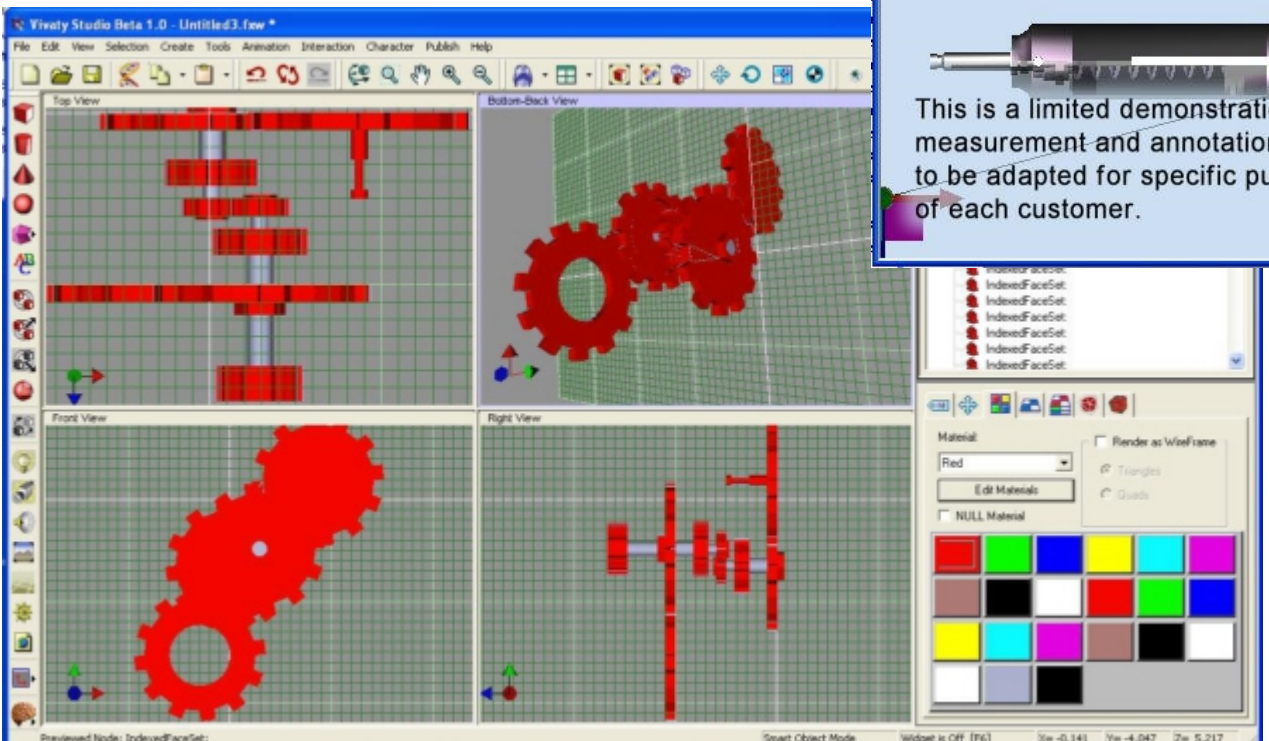

Octaga


http://www.bitmanagement.com/php-bin/ViewVrml.php?url=http://www.bitmanagement.de/
Fichier Edition Affichage Favoris Outils ?
Précédente Rechercher Favoris
Adresse http://www.bitmanagement.com/php-bin/ViewVrml.php?url=http://www.bitmanagement.de/demos/CAD_Viewer
OK Liens
Viewpoints
Pos A: -2.500 1.300 1.307
Pos B: 2.500 1.215 0000
Dist: 5.168 m
This is a limited demonstration of measurement and annotation functions to be adapted for specific purposes of each customer.
Bitmanagement Software GmbH


Vivaty Studio Beta 1.0 - Untitled3.faw *
File Edit View Selection Create Tools Animation Interaction Character Publish Help
Top View
Bottom-Back View
Front View
Right View
IndexedFaceSet:
Material
Red
Render as WireFrame
Edit Materials
NULL Material


X3D

X3D Resources: Conversions

http://www.web3d.org/x3d/content/examples/X3dResources.html#Conversions

Conversion and Translation Tools

- Okino Polytrans is the premier industry translation tool that can convert many many different file formats (including Collada) to and from X3D, VRML97 and VRML 1.0.
- Xj3D Open Source for X3D/VRML97 includes a command-line X3D translator between XML encoding (.x3d), Classic VRML encoding (.x3dv) and VRML97 encoding (.wrl). These capabilities are also embedded under *Import* and *Export* menus in X3D-Edit. Xj3D can also import Collada files.
- X3D-Edit exposes all Xj3D capabilities. It can also import, edit and validate Collada files.
- InstantReality X3D encoding converter is an online translator between ClassicVrml encoding (.x3dv) or VRML97 encoding (.wrl) to XML encoding (.x3d).
- **XSLT Stylesheets** convert .x3d scenes into alternate formats and encodings. These stylesheets (and corresponding batch files) are bundled in X3D-Edit.
  - Conversion to ClassicVRML (`.x3dv` encoding): X3dToX3dvClassicVrmlEncoding.xslt, X3dToVrml97.xslt -fileEncoding=ClassicVRML and X3dToX3dvClassicVrmlEncoding.bat
  - Backwards compatibility with VRML 97 (`.wrl` encoding): X3dToVrml97.xslt and X3dToVrml97.bat
  - Tagset pretty-printing in XHTML (`.html` encoding), includes cross linking of DEF/USE/ROUTE/etc.: X3dToXhtml.xslt and X3dToXhtml.bat (plus incremental partial-stylesheet lesson examples X3dToXhtmlStylesheetExamples.zip)
  - The X3D stylesheets are checked into version control at http://x3d.svn.sourceforge.net/viewvc/x3d/www.web3d.org/x3d/stylesheets
- BitManagement capabilities include BS Converter for 3ds max and BS Converter for Blender.
- NIST VRML to X3D Translator is written by Qiming Wang. The X3D-Edit 3.1 distribution includes an updated version of the Translator (also .zip and Javadoc) as a bundled source/jar.
- Blender Model Export To X3D using X3D-Edit
- Chisel VRML Optimisation Tool with new version autoinstaller and documentation provided by Halden Virtual Reality Centre. Originally built by Trapezium and maintained by NIST.
- The SwirlX3D Translator is an enhanced version of the Viewer that permits Collada and 3DS files to be imported into VRML or X3D.
- Vivaty has excellent utilities and converters for Google Earth KML/Sketchup, Autodesk 3DS Max, Autodesk Maya, and Unreal. Vivaty Studio also includes Collada import.
- Accutrans 3D by MicroMouse Productions provides accurate translation of 3D geometry between the file formats used by many popular modeling programs.
- Project Rawkee: Open-Source X3D Plugin for Maya by the Archaeology Technologies Laboratory (ATL) of North Dakota State University (NDSU).
- Unreal Realm of Concepts: Unreal to X3D Exporter by Dave Arendash
- VRML 1.0 to VRML97 Converter by Octaga
- Anark is able to export product data into high-precision B-rep and lightweight mesh formats including SolidWorks, Inventor, ACIS, CATIA V4/V5, Parasolid, STEP, NX (formerly Unigraphics), IGES, COLLADA, DWF, X3D, and VRML.
- MeshLab is an open source, portable, and extensible system for the processing and editing of unstructured 3D triangular meshes.
- view3dscene supports VRML/X3D, Collada, OpenInventor 1.0, 3d Studio Max 3DS, Quake 3 MD3, Wavefront OBJ and Videoscape GEO.
- CAD Exchanger is a product family aimed to help CAD professionals in a well known yet challenging problem: 3D CAD data conversion. Supported formats currently include IGES, STEP, ACIS-SAT, Parasolid-XT, STL, VRML, X3D and BRep.

Okino Polytrans converter

http://www.okino.com

Okino Computer Graphics

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BOOKMARK

Welcome Pro/Engineer® and Other CAD Users!

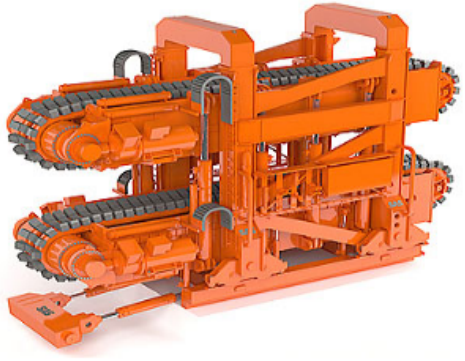
...An Overview of Using Okino Software for CAD Data Processing.

Questions? Email our CAD system software architect right now!

Built on PTC® GRANITE

Welcome Pro/E and other CAD users! For well over a decade and a half Okino Computer Graphics has provided the absolute defacto Pro/E conversion system used throughout the world by our user base of tens of thousands of 3D professionals for mission and application-critical applications. We utilize an embedded version of the actual Pro/Engineer software inside of Okino's popular PolyTrans and NuGraf software, allowing for 100% error free import of native, encrypted Pro/E assemblies, part files and instance accelerator files. There is technically no other more ideal or error free conversion pipeline available for native Pro/E data. No intermediate file formats are used nor are reverse engineered CAD toolkits used to access the Pro/E data.

Please take a moment to review the Okino Granite Importer overview, which explains how the embedded PTC Granite technology relates to this Okino CAD importer pipeline and click here to view Okino's Pro/E importer online help, feature list and option descriptions.



This CAD pipeline solution allows complete Pro/E parts and assemblies to be converted cleanly and professionally to all other major 3D file formats, animation packages and visual simulation programs. It also allows all disparate departments of large enterprise companies (such as engineering, design, marketing and support) to easily exchange product data without the need to rebuild their CAD datasets -- downstream uses include product documentation and manual creation, animation and rendering software, visual communication and review of data, and for accessing easier to manipulate versions of the original CAD datasets.

Okino's Pro/E CAD conversion pipeline is synonymous with moving complex Pro/E assemblies into 3ds Max, Maya, Lightwave, Softimage (XSI) and Cinema-4D for animation and rendering. In addition, Okino's ProE conversion system is used in conjunction with many OEM and third party vendor integrations, and for re-purposing Pro/E assembly data into all major 3D downstream 3D file formats such as Collada, DirectX, DXF/DWG, FBX, HOOPS/DWF-3D, JT Open, NGRAIN, OpenFlight, PLY, Renderman RIB, Rhino/OpenNURBS, SketchUp, Shockwave-3D, trueSpace, U3D, VRML1+2+X3D, Wavefront OBJ, XAML-3D, and XGL.

CadExchanger

http://www.cadexchanger.com

CAD Exchanger, your 3D data translator

Home | Products | Formats | Download | Forum | Contacts | About

CAD Exchanger is a product family aimed to help CAD professionals in a well known yet challenging problem – 3D CAD data conversion.

Supported formats currently include IGES, STEP, ACIS-SAT, Parasolid-XT, STL, VRML, X3D and BRep. However, this is only a beginning and more formats (including Rhino Open NURBS, JT, and others) are underway.

Latest news:

November 25, 2010. **Customer Success Story: Setred**

Setred adopts CAD Exchanger to solve design interchange problems with its partners and subcontractors. Read the full story.

November 23, 2010. **CAD Exchanger 2.0.2** is available

Version 2.0.2 is a maintenance release delivering improvements and bug fixes over v2.0. It also features Parasolid-XT importer (currently as Technology Preview) with addressed feedback from an Invitational Beta program. Please consult the CHANGES file for details and visit the download page to get the release.

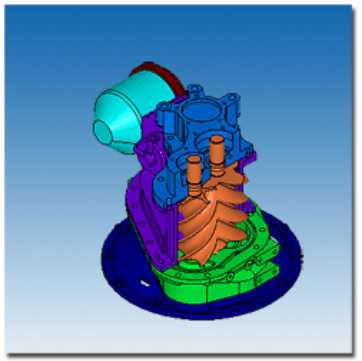
October 26, 2010. **CAD Exchanger 2.0.2 Beta** is available

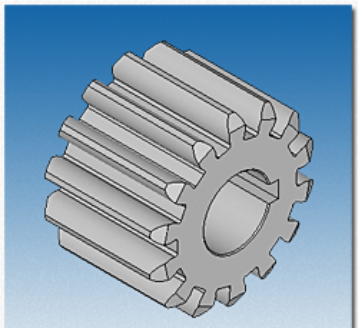
This version introduces Parasolid-XT importer. We decided to follow an effective approach used for ACIS-SAT by first proposing it to Beta customers and addressing their feedback. If you would like to join the Invitational Beta, drop us an email at info@cadexchanger.com. Public release should become available later this quarter or early 2011.

See also news archive.

CAD Exchanger is a dynamically growing project leveraging on success of its delighted customers and users. See for yourself what they have to say.

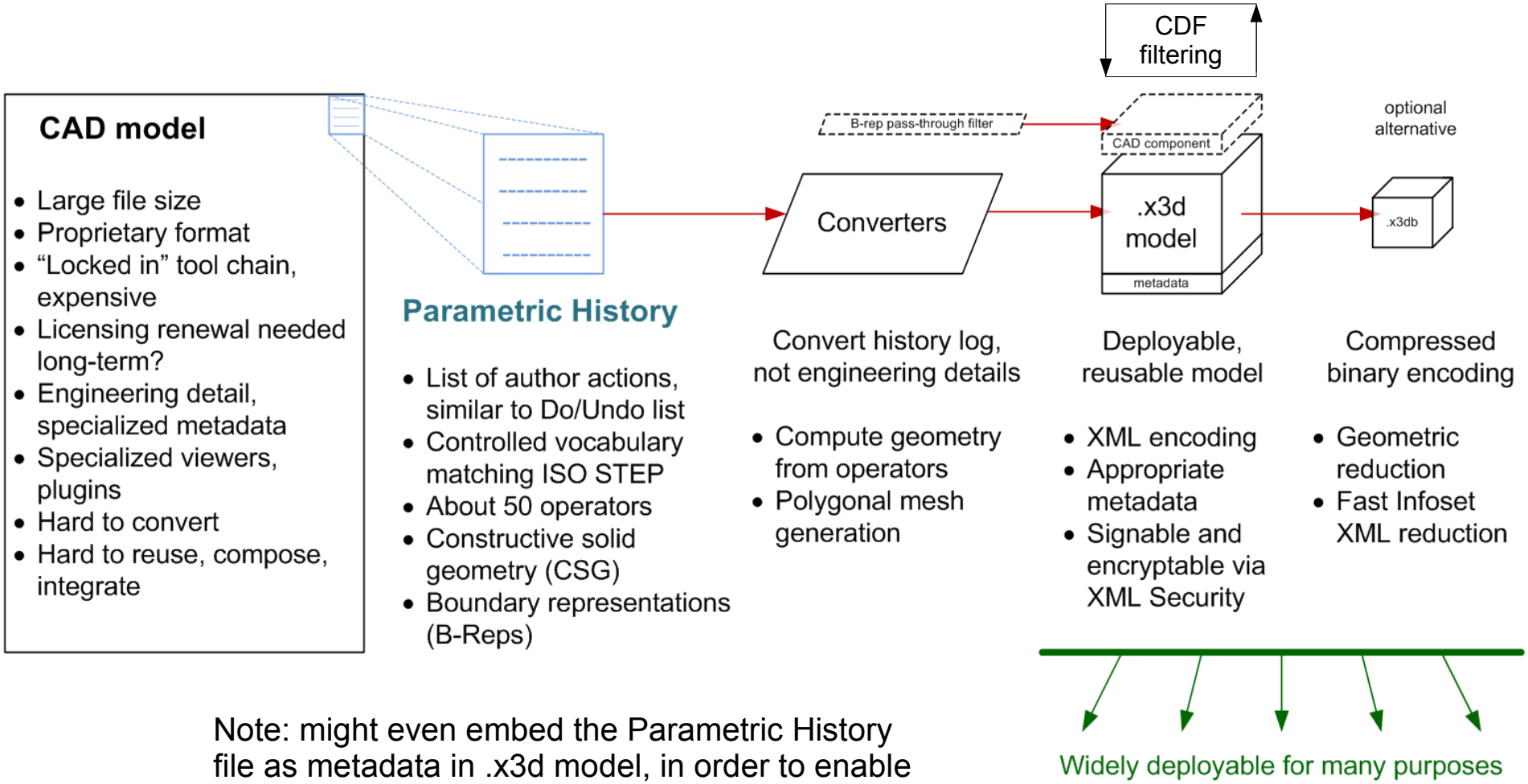
Try a fully free evaluation version now!





http://www.cadexchanger.com

X3D conversion of CAD models



Note: might even embed the Parametric History file as metadata in .x3d model, in order to enable reasonably accurate round-trip regeneration of the original CAD model despite data lossiness.

X3DOM

"X – Freedom"

www.x3dom.org

x3dom

Instant 3D the HTML way!

About

X3DOM (pronounced X-Freedom) is an experimental open-source framework and runtime to support the **ongoing discussion** in the Web3D and W3C communities how an integration of HTML5 and declarative 3D content could look like. It tries to fulfill the current HTML5 specification for **declarative 3D content** and allows including **X3D** elements as part of any HTML5 DOM tree.

SVG, canvas, WebGL and X3DOM relation

The goal here is to have a live X3D scene in your HTML DOM, which allows you to manipulate the 3D content by only adding, removing, or changing DOM elements. No specific plugin or plugin interface (like the X3D-specific **SAI**) is needed. It also supports most of the HTML events (like "onclick") on 3D objects. The whole integration model is still evolving and open for discussion.

Web graphics

	2D (Final HTML5 spec)	3D (No W3C spec yet)
Declarative Scenegraph Part of HTML-document DOM Integration CSS/ Events		
Imperative Procedural API Drawing context		

X3DOM Oil Rig

X3DOM Oil Rig
view source 1

```
<!DOCTYPE html>
<html>
        <head>
                <title>Oilrig-Demo</title>
                <meta http-equiv='X-UA-Compatible' content='chrome=1' />
                <meta http-equiv='Content-Type' content='text/html;charset=utf-8'/>
  <script type='text/javascript' src='data/js/perlinNoise.js'></script>
  <script type='text/javascript' src='data/js/jquery-1.9.1.min.js'></script>
  <script type='text/javascript' src='data/js/jquery-ui-1.10.3.min.js'></script>
  <script type="text/javascript" src="../../files/x3dom.js"></script>
  <link rel="stylesheet" type="text/css" href="../../files/x3dom.css" />
  <link rel="stylesheet" type="text/css" href="data/css/jquery-ui-1.10.3.min.css" />
  <style>
    .GUI-Box {
      position: absolute;
      z-index: 2000;
      top: 10px;
      right: 10px;
      width: 300px;
      height: 80px;
      background-color: #999;
      opacity: 0.65;
      border-radius: 8px;
      box-shadow:3px 3px 8px #000;
    }
```

X3DOM Oil Rig
view source 2

```
34          document.getElementById("Sun").setAttribute('direction', -x + ' ' + -y + ' ' + -z);
35      }
36
37    </script>
38    </head>
39    <body style='margin:0;'>
40    <div class='GUI-Box'>
41      <div class='GUI-Box-Header'>Sun Position</div>
42      <div id='GUI-Box-Slider'></div>
43    </div>
44        <X3D id='aScene' showStat='false' showLog='false' style='width:100%; height:100%; border:none;'>
45            <Scene DEF='scene' doPickPass="false">
46                <Environment frustumCulling="false" smallFeatureCulling="false"></Environment>
47                <Background id='Sky' skyAngle='1.0 1.57 3.14' skyColor='0.25 0.05 0.23 0.18 0.1 0.21 0.1 0.08 0.14 0.1 0.08 0.14'></Background>
48        <DirectionalLight id='Sun' color='0.25 0.05 0.23' direction='0.000 -0.932 -0.362' shadowIntensity='0.2' shadowCascades="7" shadowFilterSize="5"></Dir
49        <Viewpoint position="1.97252 185.76936 747.45913" orientation="-0.99978 0.01519 0.01473 0.19871" zNear='0.1' zFar='10000'></Viewpoint>
50                <Transform DEF='Plane001' translation='0.000 -136.381 -0.000' rotation='1 0 0 -1.57'>
51                    <Shape>
52                        <Appearance DEF='_08_-_Default' sortType='transparent'>
53                            <CommonSurfaceShader id='Water' diffuseFactor='1 1 1' specularFactor='0.200 0.200 0.200' shininessFactor='0.5' alphaFactor='0.900
54                                <SurfaceShaderTexture containerField='diffuseTexture' >
55                                    <ImageTexture url='data/textures/sea.png' origChannelCount='0'></ImageTexture>
56                                </SurfaceShaderTexture>
57                <SurfaceShaderTexture containerField='displacementTexture' >
58                                    <Texture hideChildren="true">
59                    <canvas id='NoiseCanvas'>
60                  </Texture>
61                                </SurfaceShaderTexture>
62                            </CommonSurfaceShader>
63                        </Appearance>
64            <Plane size='1000 1000' subdivision='50 50'></Plane>
65                    </Shape>
66                </Transform>
67        <Inline url='data/x3d/model-bg.x3d'></Inline>
68            </Scene>
69        </X3D>
70    </body>
71 </html>
```

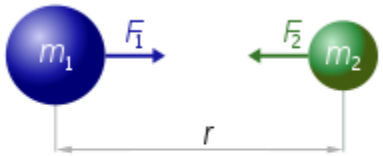
"Many body" problems

- *Physics.* For what value *n* can a closed-form mathematical solution be derived to exactly predict mutual gravitational attraction?

$$F = G\frac{m_1 m_2}{r^2},$$

where:

- F is the force between the masses,
- G is the gravitational constant,
- m_1 is the first mass,
- m_2 is the second mass, and
- r is the distance between the centers of the masses.



$$F_1 = F_2 = G\frac{m_1 \times m_2}{r^2}$$

Answer = 3

- *3DGraphics*. How many WebGl (or Flash etc.) programs, from different authors, can be mashed up together into one big 3D scene?

Answer = good luck with that

Building Mashup Momentum

- Goal: publish, view AEC models on Web

- "What's wrong with this picture??"
  - Let the Web3D community know what's missing

- We are building a homework assignment list:
  - What's missing?
  - What else do you need?
  - What else do we need to talk about?
  - What's next?

References

Book: *X3D for Web Authors*

Book is available in softcover and e-book

- Morgan Kaufman publishers
- http://x3dGraphics.com

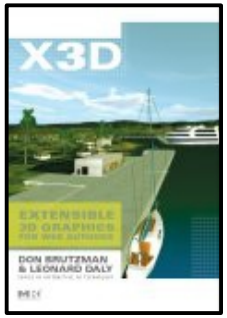
Many accompanying assets freely available

- Free authoring tool X3D-Edit
- 300 example X3D scenes
- 1200 slides, with accompanying notes
- 36 hours of video covering 2 courses

Students learn X3D without programming

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

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

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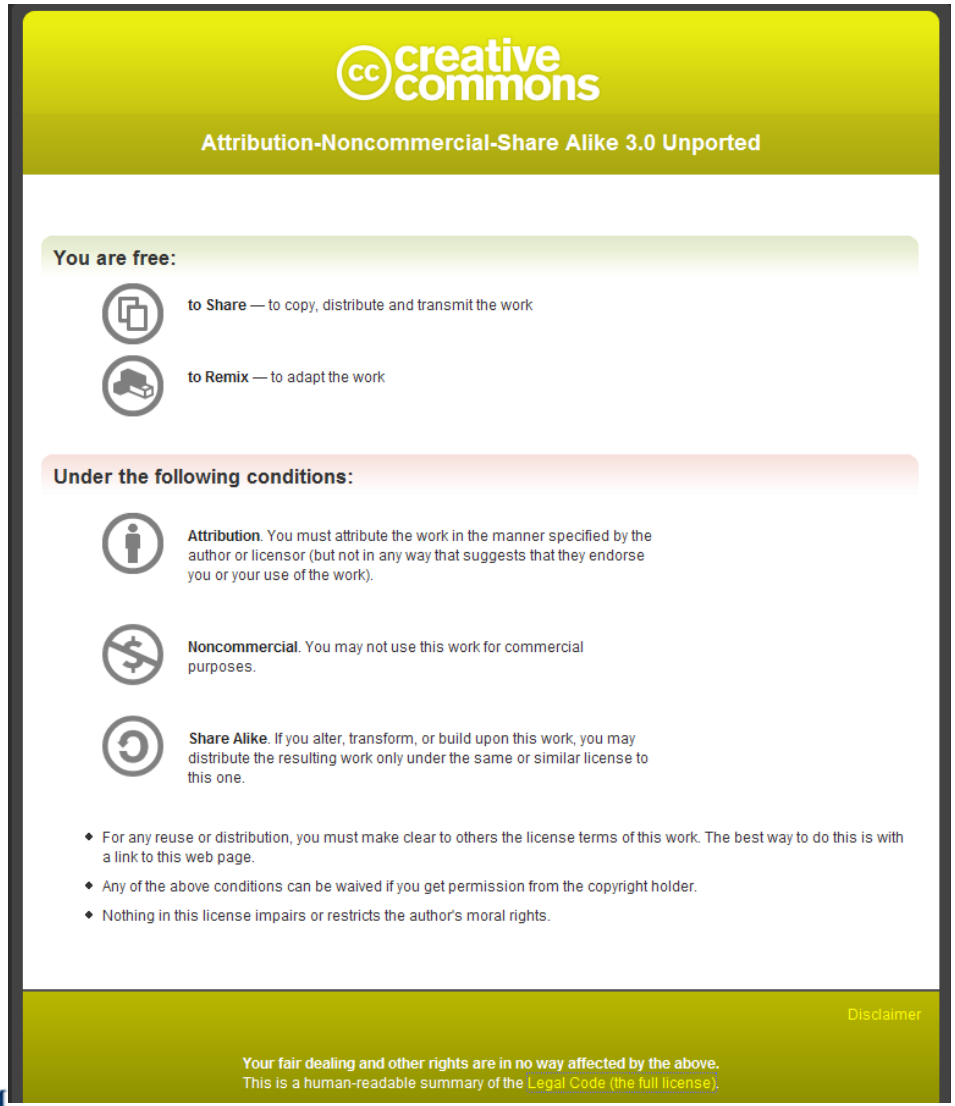

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X3D

Open-source license
for X3D-Edit software and X3D example scenes

http://www.web3d.org/x3d/content/examples/license.html