

# X3D Graphics for Web Authors

## X3D-Edit Update

Web3D Consortium Korea Chapter  
Seoul, 7-8 December 2009

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# Motivation

Teach X3D to anyone who can author HTML

Unlock all of the great work by Web3D partners

Learn by doing, help further X3D progress

# X3D Showcase DVD



## Contents

- Viewers
- Examples
- Content Creation Tools
- Case Studies
- Resources
- Join Web3D Consortium

## Features

The **Web3D Consortium** develops royalty-free open standards like Extensible 3D (X3D) Graphics. X3D is used for communicating 3D on the Web between applications, platforms and web services.

Web3D members are delighted to present our *X3D Showcase*, which is a DVD filled with introductory resources. X3D can help you accomplish your real-time 3D graphics challenges.

- **X3D Viewers** for X3D content can display scenes on every major platform, running in your web browser and on mobile devices.
- **Examples** show innovative X3D content from our member developers demonstrating the diverse use of X3D.
- **Content Creation Suite** tools help your initial ideas become interactive 3D content, ready for deployment on the Web.
- **X3D Case Studies** showcase how X3D is used by many different industries for many diverse uses (or try the **online version**).
- **X3D News and Events** provide X3D-related news stories, code samples, tutorials and X3D-based implementations for developers and the X3D user communities (or try the **online version**).
- **On-line X3D Podcasts (2008, 2007)** videos show and tell more about our innovative X3D content developers.
- **Web3D 2009 Symposium** is the 14th International Conference on 3D Web Technology. The **Call for Participation** lists topic areas of interest. It will be held 16-17 June 2009 at Fraunhofer Institute for Computer Graphics, Darmstadt, Germany.
- **X3D for Web Authors** is a textbook by Don Brutzman and Leonard Daly that provides complete detail how X3D works, helping you learn to build your own projects.

The Web3D Consortium thanks the many individuals listed in the **Showcase Credits** and **Contributor Credits**.

# X3D Showcase DVD

## Production thanks!

- *Web3D*: Anita Havele
- *University of Sao Paolo*: Mario Nagamura, Marcia Kondo, Marcio Cabral, Olavo Belloc, Marcelo Zuffo
- *Naval Postgraduate School*: Byoungyun Yoo, Jeff Weekley, Don Brutzman

Sourceforge version control  
for easy updating

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# X3D Examples Archives

*X3D for Web Authors* 246 models

- Textbook on how to design and build X3D scenes

*Basic* 645 models

- Diverse scenes illustrating various X3D capabilities

*Conformance NIST* 732 models

- Strictly defined test examples for correct operation

*VRML 2.0 Sourcebook* 269 models

- Textbook on VRML97, examples converted to X3D

*Savage* 1177 models

- Open-source military models and tools





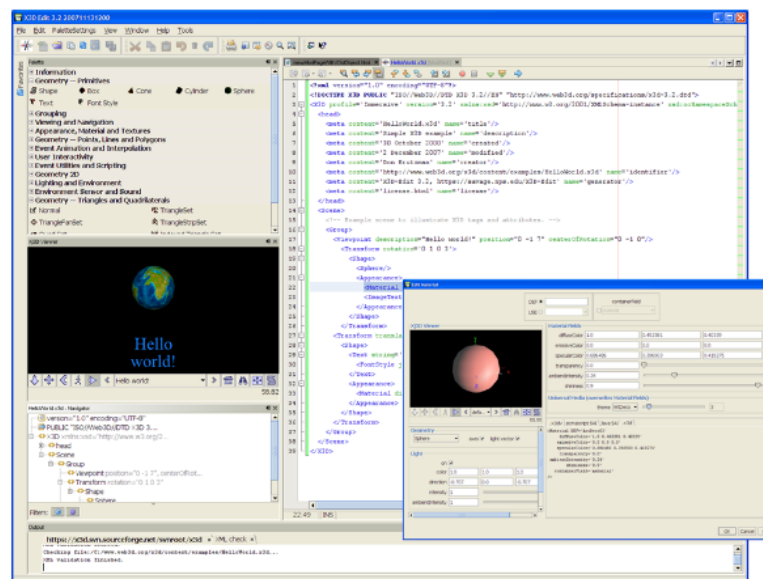
## X3D-Edit Authoring Tool for Extensible 3D (X3D) Graphics

web|3D  
CONSORTIUM  
Open Standards for  
Real-Time 3D Communication

New

[Overview](#) | [Acknowledgements](#) | [Books](#) | [Chat](#) | [Downloads](#) | [Features](#) | [Issue Tracking](#) | [Licenses](#) | [Mailing Lists](#) | [Plugins](#) | [Support](#) | [Visualization](#) | [X3D Resources](#) | [Contact](#)

X3D-Edit is an Extensible 3D (X3D) Graphics authoring tool for simple error-free editing, authoring and validation of X3D scenes.



### Overview

The X3D-Edit 3.2 Authoring Tool for [Extensible 3D \(X3D\) Graphics](#) supports the creation, checking, display and publication of X3D scenes. It is written in open-source Java and XML using the [Netbeans 6.7](#) platform, making it suitable both as a standalone application and as a plugin module for the Netbeans integrated development environment (IDE).

X3D-Edit [features](#) include direct editing of X3D scenes using the XML (.x3d) encoding, embedded visualization of scenes using the [Xj3D](#) viewer, XML validation using X3D DTD grammars, X3D Schema grammars and [X3D Schematron rules](#), drag-and-drop palette for X3D nodes, popup panels for node editing, and extensive help resources. Further features include ClassicVRML and X3D compressed binary encoding support, encryption and digital-signature authentication using XML Security standards, and additional X3D scene authoring support.

X3D-Edit 3.2 is stable and available for public use. Current capabilities are summarized in the [X3D-Edit Update](#) presentation.

Palette

- Information
- Geometry -- Primitives
  - Shape
  - Box
  - Cone
  - Cylinder
  - Sphere
- Text
  - Font Style
- Grouping
- Viewing and Navigation
- Appearance, Material and Textures
- Geometry -- Points, Lines and Polygons
- Event Animation and Interpolation
- User Interactivity
- Event Utilities and Scripting
- Geometry 2D
- Lighting and Environment
- Environment Sensor and Sound
- Geometry -- Triangles and Quadrilaterals
  - Normal
  - TriangleSet
  - TriangleFanSet
  - TriangleStripSet



HelloWorld.x3d - Navigator

- version="1.0" encoding="UTF-8"
- PUBLIC "ISO//Web3D//DTD X3D 3.2..."
- X3D xmlns:xsd="http://www.w3.org/2001/XMLSchema-instance" ...
  - head
  - Scene
    - Group
      - Viewpoint position="0 -1 7", centerOfRot...
      - Transform rotation="0 1 0 3"
      - Shape
        - Sphere

Filters: [ ]

Output

```
https://x3d.svn.sourceforge.net/svnroot/x3d x'>ML check x'
Checking file: C:/www.web3d.org/x3d/content/examples/HelloWorld.x3d...
XML validation finished.
```

```

1 <?xml version="1.0" encoding="UTF-8"?>
2 <!DOCTYPE X3D PUBLIC "ISO//Web3D//DTD X3D 3.2//EN" "http://www.web3d.org/specifications/x3d-3.2.dtd">
3 <X3D profile='Immersive' version='3.2' xmlns:xsd='http://www.w3.org/2001/XMLSchema-instance' xsd:noNamespaceSch
4 <head>
5   <meta content='HelloWorld.x3d' name='title'/>
6   <meta content='Simple X3D example' name='description'/>
7   <meta content='3D October 2000' name='created'/>
8   <meta content='2 December 2007' name='modified'/>
9   <meta content='Don Brutzman' name='creator'/>
10  <meta content='http://www.web3d.org/x3d/content/examples/HelloWorld.x3d' name='identifier'/>
11  <meta content='X3D-Edit 3.2, https://savage.nps.edu/X3D-Edit' name='generator'/>
12  <meta content='license.html' name='license'/>
13 </head>
14 <Scene>
15   <!-- Example scene to illustrate X3D tags and attributes. -->
16   <Group>
17     <Viewpoint description="Hello world!" position="0 -1 7" centerOfRotation="0 -1 0"/>
18     <Transform rotation="0 1 0 3">
19       <Shape>
20         <Sphere/>
21         <Appearance>
22           <Material>
23             <ImageTexture/>
24           </Appearance>
25         </Shape>
26       </Transform>
27     <Transform translation="0 0 0 0">
28       <Shape>
29         <Text string='
30           <FontStyle name='serif' size='24' color='blue'>
31             Hello world!
32           </Text>
33         <Appearance>
34           <Material DEF='ArtDeco03'>
35             </Material>
36           </Appearance>
37         </Shape>
38       </Transform>
39     </Group>
40   </Scene>
41 </X3D>

```

Edit Material

DEF: [ ] containerField: [ ]

USE: [ ] material: [ ]

X3D Viewer

55.55

Material Fields

diffuseColor	1.0	0.452381	0.40339
emissiveColor	0.0	0.0	0.0
specularColor	0.686486	0.396903	0.419275
transparency	0.0		
ambientIntensity	0.24		
shininess	0.9		

Universal Media (overrides Material Fields)

theme: ArtDeco [ ]

```

.x3d|ecmascript|SAJ|Java|SAJ|x3d|
<Material DEF='ArtDeco03'
  diffuseColor='1.0 0.452381 0.40339'
  emissiveColor='0.0 0.0 0.0'
  specularColor='0.686486 0.396903 0.419275'
  transparency='0.0'
  ambientIntensity='0.24'
  shininess='0.9'
  containerField='material'
/>

```

Geometry

Sphere [ ] axes [ ] light vector [ ]

Light

on [ ]

color: 1.0 1.0 1.0

direction: -0.707 0.0 -0.707

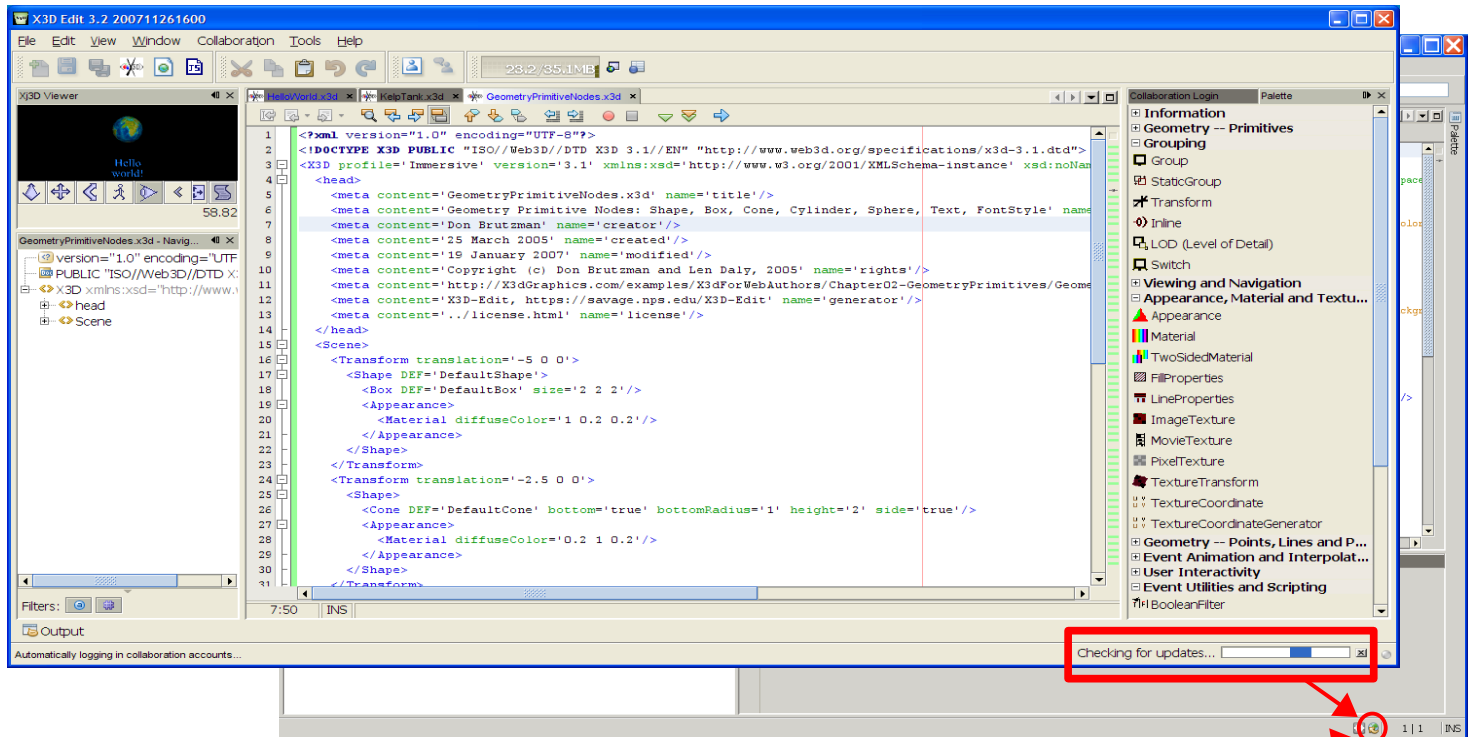
intensity: [ ]

ambientIntensity: [ ]

OK Cancel Help

# X3D-Edit updates

Icon in lower-left corner of screen indicates when updates are available for automatic installation



Plugin available: click



# X3D Examples download panel, X3D-Edit

**Download Example Archives**

X3D for Web Authors Examples  
A wide variety of basic examples are provided that show how to design and build X3D scenes. These are explained in the book X3D for Web Authors.

Basic Examples  
The Basic Examples archive provide provides numerous scenes illustrating a broad variety of X3D capabilities.

ConformanceNIST Test Suite Examples  
The ConformanceNIST Test Suite Examples were authored by National Institute of Standards and Technology (NIST) to provide a complete test set for the Virtual Reality Modeling Language (VRML97). They were automatically converted into X3D and provide approximate coverage for the X3D Immersive Profile.

VRML 2.0 Sourcebook X3D Examples  
The VRML 2.0 Sourcebook is an outstanding textbook covering the Virtual Reality Modeling Language (VRML) 97. These were the first examples converted into X3D.

Savage X3D Examples  
NPS Scenario Authoring and Visualization for Advanced Graphical Environments (SAVAGE) library is an open-source set of X3D models and prototype tools used for defense simulation.

Local download directory:



Contents Search

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  - Logging Into the Collaboration Server
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  - Starting a Conversation
  - Chat
  - Filesharing

## Using the IDE Help System

[See Also](#)

Click any entry in the Contents tab to view the topic in the right pane of the Help viewer.

## Searching the Online Help

To perform a full-text search of all IDE help topics, click the Search tab and type a keyword in the Find text box.

## Using the Index

Click any entry in the Index tab to view the topic. To search the index, enter a term in the search field and press Enter. Press Enter multiple times to cycle through all occurrences of the term in the index.

## Getting Help for IDE Dialogs and Windows

Press F1 in any part of the IDE to open a help topic that is specific to the task you are doing or where you are in the IDE.

## Tutorials and Additional Documentation

For general information about the IDE, see the Getting Started section of the online help. Tutorials and other documentation can be found in the Help menu.

## See Also

- [Help Viewer Shortcuts](#)
- [Displaying Help in a Web Browser](#)

[Legal Notices](#)

# X3D-Edit Help

# Viewing alternatives for X3D

Default built-in viewer is open-source Xj3D

- High performance, implemented using Java OpenGL

Can launch current scene into web browser

- Displays using any of your installed plugins
- “Launch all viewers” simplifies comparison testing

Can also launch into standalone applications

- Configuration panel simplifies download, install

# Player support for X3D components

Player support for X3D components - Web3D.org - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://www.web3d.org/x3d/wiki/index.php/Player\_support\_for\_X3D\_components

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Nodes & Concepts

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search

Go Search

toolbox

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- Special pages
- Printable version
- Permanent link

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## Player support for X3D components

The [Extensible 3D \(X3D\) Graphics](#) standard has many capabilities. [X3D components](#) are modular collections of nodes that make it easier for software to gradually implement the full range of X3D capabilities. Authors can also indicate what components are needed in an X3D scene in order to ensure that proper support is provided at run time.

This table records support for the official X3D components by each of the various [X3D players](#). It is maintained by the [X3D Working Group](#) and member companies in the [Web3D Consortium](#).

The [X3D Resources](#) page provides lots of additional information about X3D. Please [Contact Web3D](#) if you want to learn more or report an update.

Related page: [Tool support for X3D components](#)

**Table key**

- yes** all nodes, all fields supported for all levels of this component (though some bugs may be present)
- partial** some nodes and fields supported
- level #** which component level number (1-4) is supported (found at end of each component specification)
- no** no support provided
- ?** unknown, need status report

Players, versions, and X3D Conformance Certification	BS Contact	FreeWRL	Heilan	InstantReality	Octaga Player	OpenVRML	SwirlX3D	Vivaty	Xj3D
	v7.1	v1.21.2	v0.14	beta 5	v2.3.0.2	v0.17.9	v2.1.7	v1.0 build 900	1.0
	<b>Interchange Profile</b>	<b>Interchange Profile</b>	none	none	none	none	none	<b>Interchange Profile</b>	<b>Interchange Profile</b>
<b>File Encodings</b>									
- XML (.x3d)	yes	yes	yes	yes	yes	?	yes	yes	yes
- ClassicVRML (.x3dv)	yes	yes	no	yes	yes	yes	yes	yes	yes
- Compressed Binary Encoding (.x3db)	no	no	no	partial	no	no	no	no	yes
<b>X3D component list</b>									
CAD geometry	yes	no	no	yes	yes	partial	yes	no	yes
Core	yes	yes	partial (not Proto)	yes	yes	yes	yes	yes	yes
Cube map environmental texturing	yes	partial	no	yes	yes	no	no	partial	no
Distributed interactive simulation (DIS)	no	no	no	no	no	partial	no	no	yes

Downloads Master\_LeongTh...

Done

Now: Overcast, 55° F Fri: 60° F Sat: 51° F

# Tool support for X3D components

Tool support for X3D components - Web3D.org - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://www.web3d.org/x3d/wiki/index.php/Tool\_support\_for\_X3D\_components

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Tutorials for X3D Nodes & Concepts

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Authors can also indicate what components are needed in an X3D scene in order to ensure that proper support is provided at run time.

This table records support for the official X3D components by each of the various [X3D authoring tools](#) and [X3D conversion tools](#). It is maintained by the [X3D Working Group](#) and member companies in the [Web3D Consortium](#).

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- ?** unknown, need status report

Tools, versions, and X3D Conformance Certification	Authoring tools				Conversion tools		
	BS Editor	SwirlX3D Editor	Vivaty Studio	X3D-Edit	Okino Polytrans	SwirlX3D Translator	Xj3D Filter Chain
	v7.1	v2.1.7	v1.0 build 900	v3.2			v2.0
	none	none	Interchange Profile	Interchange Profile	none	none	Interchange Profile
<b>File Encodings</b>							
- XML (.x3d)	yes	yes	yes	yes	yes	yes	yes
- ClassicVRML (.x3dv)	yes	yes	yes	yes	yes	yes	yes
- Compressed Binary Encoding (.x3db)	no	no	no	yes	no	no	yes
<a href="#">X3D component list</a>							

Done

0:4

# Right-click to launch external players

The screenshot displays the X3D Editor 3.2 interface. The main window shows an XML file named `PixelTextureInterpolator.js` with the following content:

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE X3D PUBLIC "ISO//Web3D//DTD X3D 3.1//EN" "http://www.web3d.org/ISO/IEC15944-1/2002-12-15/X3D-3.1.dtd">
<X3D profile='Immersive' version='3.1' xmlns:xsd='http://www.w3.org/2001/XMLSchema-instance'>
  <head>
    <meta content='PixelTextureInterpolatorPrototype.x3d' name='title' />
    <meta content='Using a CoordinateInterpolator to modify a PixelTexture' name='description' />
    <meta content='Don Brutzman' name='creator' />
    <meta content='14 April 2008' name='created' />
    <meta content='5 May 2008' name='modified' />
    <meta content='under development' name='warning' />
  </head>
  <scene>
    <!-- ... -->
  </scene>
</X3D>
```

A right-click context menu is open over the XML content. The menu items are:

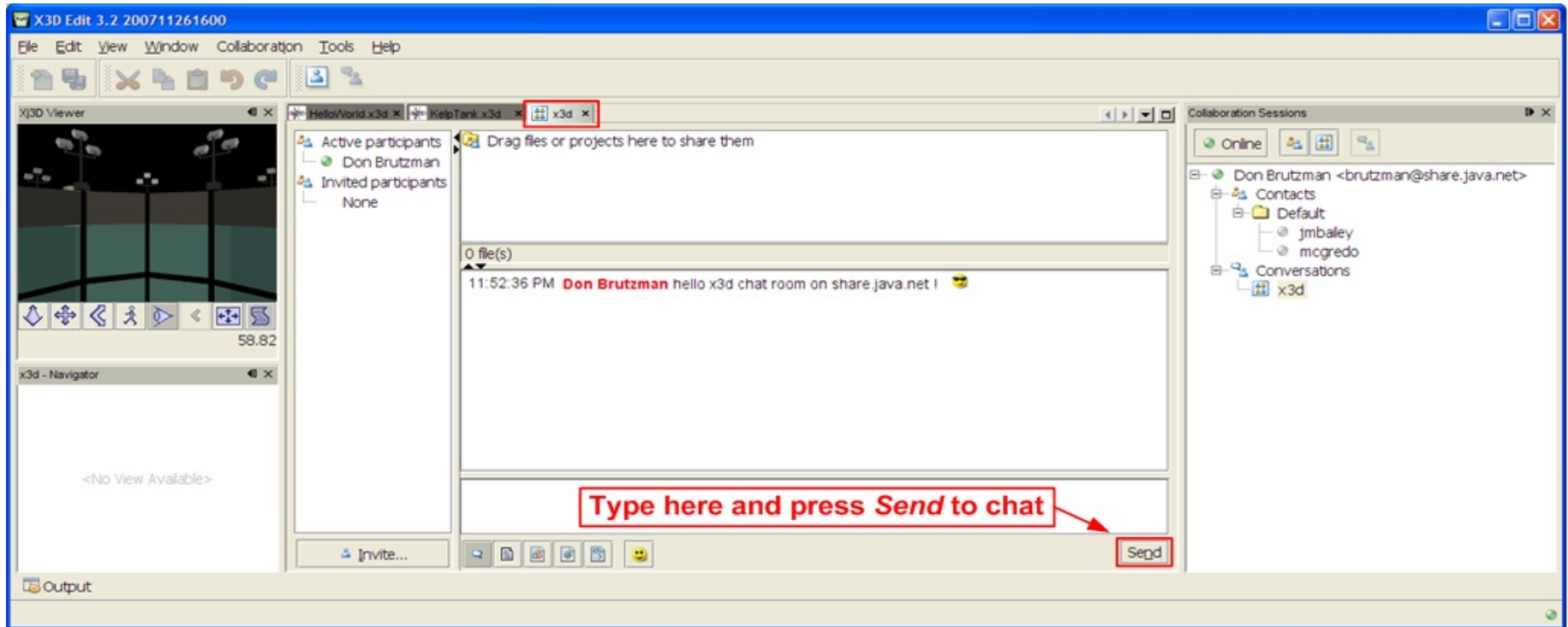
- Refresh Xj3D view
- Reload Xj3D component
- View scene externally in ..** (highlighted with a red box and arrow)
- Select element under cursor
- Edit element under cursor
- Delete element under cursor
- Rename element under cursor
- Split empty element under cursor
- Check source for ROUTE errors, etc.
- Format (Alt+Shift-F)
- View
- Check XML (Alt-F9)
- Validate XML (Alt+Shift-F9)
- XSL Transformation...
- Cut (Ctrl-X)
- Copy (Ctrl-C)
- Paste (Ctrl-V)
- Tools
- Select in

The **View scene externally in ..** option has opened a sub-menu with the following options:

- Web browser
- Contact viewer
- Flux viewer
- Instant Reality viewer
- Octaga viewer
- Xj3D viewer
- Other viewer (see Tools, Options, Miscellaneous, X3D-Edit)

The interface also shows a Favorites panel on the left with a tree view of project folders, an Xj3D Viewer window displaying a 3D scene, and a Palette panel on the right with a tree view of 3D objects.

# X3D-Edit collaboration chat



XMPP JID for the chat channel is <xmpp://x3d@muc.share.java.net>  
Subscription directions are provided on the installation page

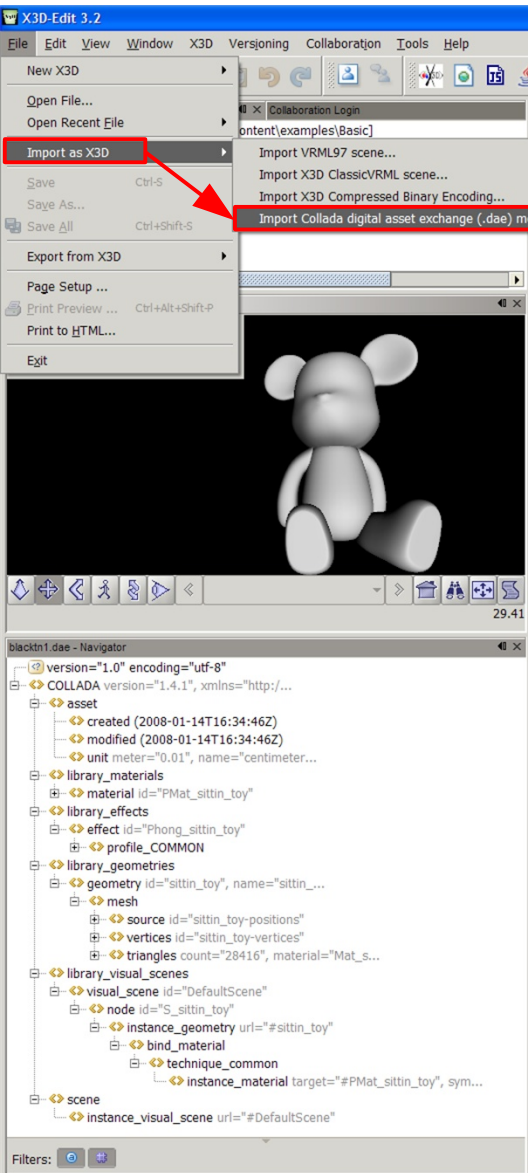
# Version control support included

The screenshot shows the X3D Editor 3.2 interface. The top menu bar includes File, Edit, View, Window, X3D, Tools, and Help. The left sidebar contains a Favorites list with chapters from Chapter 02 to Chapter 11. The main window displays the XML code for a ProtoInterface and ProtoBody. The 3D viewer shows a colorful cube. The Subversion menu is open, highlighting the Commit... option.

```
<?xml version="1.0" encoding="UTF-8" standalone="no" ?>
<!DOCTYPE X3D PUBLIC "-//Web3D//DTD X3D 3.1.dtd" "http://www.w3.org/2001/XMLSchema-instance" xsd:schemaLocation="http://www.w3.org/2001/XMLSchema-instance http://www.w3.org/2001/XMLSchema-instance" xsd:base="http://www.w3.org/2001/XMLSchema-instance" />
<X3D profile='ImmersiveInteractiveAuthoring' version='3.1' />
<head>
  <meta content='Title: PixelTextureInterpolator' name='title' />
  <meta content='a PixelTexture as an image morph' name='description' />
  <meta content='Savage' name='author' />
  <meta content='2D image PixelTexture morph' name='image' />
  <meta content='https://savage.nps.edu/Savage/Tools/TextureMorpher.html' name='url' />
  <meta content='X3D-Edit, https://savage.nps.edu/X3D-Edit/' name='url' />
  <meta content='../license.html' name='license' />
</head>
<Scene>
  <ProtoDeclare name='PixelTextureInterpolator'>
    <ProtoInterface>
      <field accessType='inputOnly' name='set' />
      <field accessType='initializeOnly' name='key' type='MFString' />
      <field accessType='initializeOnly' name='keyValue' type='MFNode' />
      <field accessType='initializeOnly' name='value_changed' type='SFImage' />
      <field accessType='initializeOnly' name='traceEnabled' type='SFBool' />
    </ProtoInterface>
    <ProtoBody>
      <!-- First node determines node type of image morph -->
      <Script DEF='ImageInterpolatorScript' USE='ImageInterpolatorScript' />
      <field accessType='inputOnly' name='set' />
      <field accessType='initializeOnly' name='key' type='MFString' />
      <field accessType='initializeOnly' name='keyValue' type='MFNode' />
      <!-- initialization nodes (if any) go here -->
    </ProtoBody>
  </ProtoDeclare>
  <PixelTextureInterpolator name='PixelTextureInterpolator' />
</Scene>
</X3D>
```



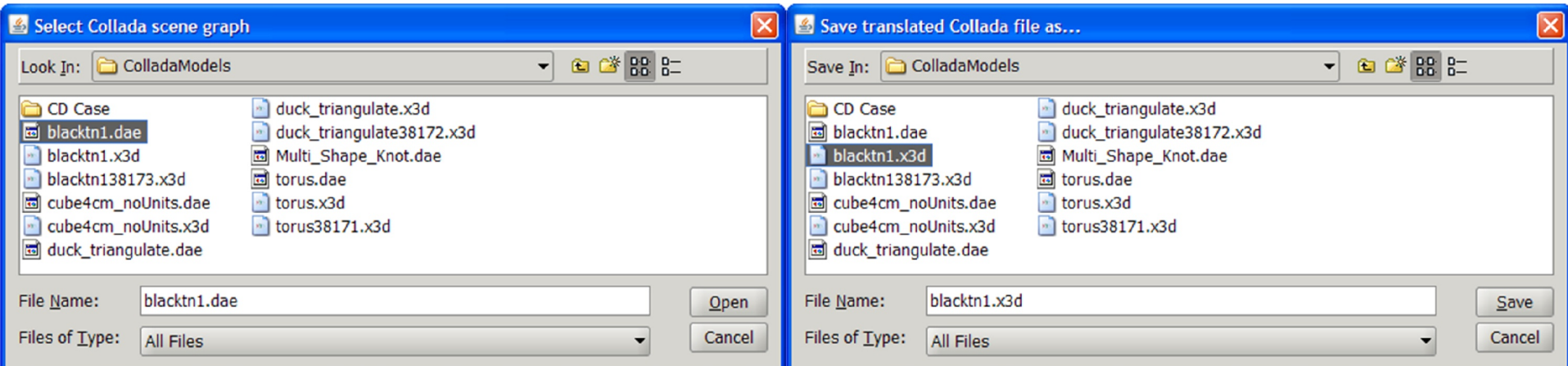
# Collada .dae editing support



The screenshot shows the X3D-Edit 3.2 interface. The 'File' menu is open, and the 'Import as X3D' option is highlighted with a red box and a red arrow. Below the menu, a 3D view displays a white teddy bear model. The 'blacktn1.dae - Navigator' panel on the left shows a tree view of the scene's structure, including assets, materials, effects, and geometries.

```
xml version="1.0" encoding="utf-8"?>
<COLLADA xmlns="http://www.collada.org/2005/11/COLLADASchema" version="1.4.1">
  <asset>
    <created>2008-01-14T16:34:46Z</created>
    <modified>2008-01-14T16:34:46Z</modified>
    <unit meter="0.01" name="centimeters" />
  </asset>
  <library_materials>
    <material id="PMat_sittin_toy">
      <instance_effect url="#Phong_sittin_toy"/>
    </material>
  </library_materials>
  <library_effects>
    <effect id="Phong_sittin_toy">
      <profile_COMMON>
        <technique sid="phong1">
          <phong>
            <emission><color>0 0 0 1.0</color></emission>
            <ambient><color>0 0 0 1.0</color></ambient>
            <diffuse><color>0.8667 0.8667 0.8667 1.0</color></diffuse>
            <specular><color>0 0 0 1.0</color></specular>
            <transparency><float>1.0</float></transparency>
          </phong>
        </technique>
      </profile_COMMON>
    </effect>
  </library_effects>
  <library_geometries>
    <geometry id="sittin_toy" name="sittin_toy">
      <mesh>
        <source id="sittin_toy-positions">
          <float_array id="sittin_toy-positions-array" count="42660">-6.183864 1.451195 17.567442 -7.186925 1.602639 18.239128 -8.380196 1.602639 18.176849 -9.307
        </float_array>
        <technique_common>
          <accessor source="sittin_toy-positions-array" count="14220" stride="3">
            <param name="X" type="float"></param>
            <param name="Y" type="float"></param>
            <param name="Z" type="float"></param>
          </accessor>
        </technique_common>
      </source>
      <vertices id="sittin_toy-vertices">
        <input semantic="POSITION" source="#sittin_toy-positions"/>
      </vertices>
      <triangles count="28416" material="Mat_sittin_toy">
        <input offset="0" semantic="VERTEX" source="#sittin_toy-vertices"/>
        <p>600 13600 13611 13611 13619 600 380 600 13619 13619 13624 380 382 106 13600 13600 600 382 45 382 600 600 380 45 197 601 13623 13623 13622 19
      </triangles>
    </mesh>
  </geometry>
</library_geometries>
<library_visual_scenes>
  <visual_scene id="DefaultScene">
    <node id="S_sittin_toy">
      <instance_geometry url="#sittin_toy">
        <bind_material>
          <instance_material target="#PMat_sittin_toy", sym...
        </bind_material>
      </instance_geometry>
    </node>
  </visual_scene>
</library_visual_scenes>
<scene>
  <instance_visual_scene url="#DefaultScene">
  </instance_visual_scene>
</scene>
</COLLADA>
```

# Collada .dae import to X3D



The image shows the "blacktn1.x3d - Editor" window. The title bar indicates the file name "blacktn1.x3d". The editor displays the XML code for the scene graph. The code is as follows:

```
1 <?xml version='1.0' encoding='UTF-8'?>
2 <!DOCTYPE X3D PUBLIC "ISO//Web3D//DTD X3D 3.2//EN" "http://www.web3d.org/specifications/x3d-3.2.dtd">
3 <X3D profile='Interchange' version='3.2'>
4 <head>
5 </head>
6 <Scene>
7     <Transform DEF='COLLADA_UNITS' scale='0.01 0.01 0.01'>
8         <Transform DEF='S_sittin_toy'>
9             <Shape>
10                <Appearance>
11                    <Material DEF='Phong_sittin_toy' diffuseColor='0.8667 0.8667 0.8667'></Material>
12                </Appearance>
13                <IndexedTriangleSet index='600 13600 13611 13611 13619 600 380 600 13619 13619 13624 380 382 106 13600 13600 600
14                    <Coordinate DEF='sittin_toy-positions' point='-6.183864 1.451195 17.567442 ,-7.186925 1.602639 18.239128 ,-8.
15                </IndexedTriangleSet>
16            </Shape>
17        </Transform>
18    </Transform>
19 </Scene>
20 </X3D>
21
```

# Distributed Interactive Simulation (DIS) Protocol

Long-running IEEE protocol used in military modeling + simulation applications

OpenDIS: open source implementations

- Java, C++, C#, Objective C
- Also DIS-XML that runs under XMPP jabber chat
- Available at Sourceforge  
<http://sourceforge.net/projects/open-dis>

Integrate network test environment into X3D-Edit

- Multiple panels completed for record/playback/test
- Goal: aid development, testing of new protocols

# DIS Networking Test Panel

The screenshot displays the X3D-Edit 3.2 interface. On the left, a 3D viewer shows a yellow box in a coordinate system with red (X), green (Z), and blue (Y) axes. The center pane contains XML code for an X3D scene, including metadata and an `EspduTransform` element. On the right, the 'DIS ESPDU Test Panel' is visible, featuring sliders for translation (x, y, z) and rotation (phi, theta, psi), along with 'DIS Settings' for address, port, and site/application/entity IDs. A 'Palette' at the bottom right lists various simulation components.

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE X3D PUBLIC "ISO//Web3D//DTD X3D 3.2//EN" "http://www.web3d.org/specifications/x3d-3.2.dtd">
<X3D profile='Immersive' version='3.2' xmlns:xsd='http://www.w3.org/2001/XMLSchema-instance' xsd:noNamespaceSchemaLocation='http://www.w3.org/2001/XMLSchema-instance'>
  <head>
    <component level='1' name='DIS'/>
    <meta content='BoxTestEspduTransform.x3d' name='title'/>
    <meta content='Don Brutzman, Don McGregor' name='creator'/>
    <meta content='1 January 2007' name='created'/>
    <meta content='13 November 2008' name='modified'/>
    <meta content='Leonard Daly and Don Brutzman' name='creator'/>
    <meta content='A simple EspduTransform test to move a Box.' name='description'/>
    <meta content='http://www.web3d.org/x3d/content/examples/Basic/DistributedInteractiveSimulation/BoxTestEspduTransform.x3d' name='generator'/>
    <meta content='../..//license.html' name='license'/>
  </head>
  <Scene>
    <Viewpoint description='EspduTransform moves Box' position='0 0 25'/>
    <Background skyColor='0.5 0.6 0.8'/>
    <EspduTransform address='239.1.2.3' applicationID='1' entityID='2' marking='TestBox' networkMode='networkReader' port='62040' siteID='0'>
      <Shape>
        <Box size='2 4 6'/>
        <Appearance>
          <Material diffuseColor='0.748014 0.62085 0' shininess='0.93' specularColor='0.860606 0.860606 0.860599'/>
        </Appearance>
      </Shape>
    </EspduTransform>
    <Transform scale='5 5 5'>
      <Inline url='../..//course/CoordinateAxes.x3d'>
        "http://www.web3d.org/x3d/content/examples/Basic/course/CoordinateAxes.x3d"
      </Inline>
    </Transform>
  </Scene>
</X3D>
```

**Distributed Interactive Simulation (DIS)  
Entity State Protocol Data Unit (ESPDU)  
Test Panel**

Translation along x-axis by -20m, to left  
Rotation about y-axis by +20° counter-clockwise

# DIS Networking Player-Recorder Panel

X3D-Edit 3.2

File Edit View Window X3D Versioning Tools Help

X3D Viewer

DIS Player-Recorder Window

```
79 ENTITY_STATE 14.211912687
80 ENTITY_STATE 14.237453643
81 ENTITY_STATE 14.254803613
82 ENTITY_STATE 14.286980328
83 ENTITY_STATE 14.325127914
84 ENTITY_STATE 14.88727003
85 ENTITY_STATE 14.90586988
86 ENTITY_STATE 14.91336357
87 ENTITY_STATE 14.931027826
88 ENTITY_STATE 14.949399714
89 ENTITY_STATE 14.966543792
90 ENTITY_STATE 15.225262428
91 ENTITY_STATE 15.250172019
92 ENTITY_STATE 15.267734586
93 ENTITY_STATE 15.2851449
94 ENTITY_STATE 15.293875059
95 ENTITY_STATE 15.311404941
96 ENTITY_STATE 15.329561997
97 ENTITY_STATE 15.37510773
98 ENTITY_STATE 15.412108522
99 ENTITY_STATE 15.436978163
100 ENTITY_STATE 15.463135957
101 ENTITY_STATE 15.52497119
102 ENTITY_STATE 15.564852795
103 ENTITY_STATE 15.590005992
104 ENTITY_STATE 15.60751129
105 ENTITY_STATE 15.632799979
106 ENTITY_STATE 15.640490342
107 ENTITY_STATE 15.675847349
108 ENTITY_STATE 15.693986526
109 ENTITY_STATE 15.824318174
110 ENTITY_STATE 15.856962826
111 ENTITY_STATE 15.881707032
112 ENTITY_STATE 15.950148133
113 ENTITY_STATE 16.000276571
114 ENTITY_STATE 16.775290155
115 ENTITY_STATE 16.793808151
116 ENTITY_STATE 16.802593067
117 ENTITY_STATE 16.822360663
118 ENTITY_STATE 16.840936767
119 ENTITY_STATE 16.859243563
120 ENTITY_STATE 16.876472568
121 ENTITY_STATE 16.893585637
122 ENTITY_STATE 16.911356611
123 ENTITY_STATE 16.929247991
```

TestSchematronDiagnostics.x3d

BoxTestEspduTransform.x3d

DIS ESPDU Test Panel

Translation

scale

x 1.00

y 1.00

z 1.00

Rotation

phi 0 180° 360°

theta 0 180° 360°

psi 0 180° 360°

DIS Settings

address 239.1.2.3 site ID 0

port 62040 application ID 1

entity ID 2

PDU Header

prot version 6 exercise ID 0 PDU type 1 prot family 1

time stamp 547

pdu length 144 padding 0

Entity ID

ent id 2 sim site id 0 sim app id 1

Articulation Parameters

number 0

Entity Type

kind	domain	country	category	subcategory	specific	extra
0	0	0	0	0	0	0

Alternative Entity Type

kind	domain	country	category	subcategory	specific	extra
0	0	0	0	0	0	0

Entity Linear Velocity

0.0 0.0 0.0

Entity Location

0.0 0.0 -0.0

Entity Orientation

psi	theta	phi
-2.631084	3.5735617	2.7488935

Dead Reckoning Parameters

algorithm 0 other 0 0 0 0 0 0 0 0 0 0 0 0 0 0

ang vel 0.0 0.0 0.0 lin acc 0.0 0.0 0.0

Entity Marking

char set 0 string(hex) 00 00 00 00 00 00 00 00 00 00

capabilities 0

entity appearance 0

force id 0

marshalled size 144

address 239.1.2.3 port 62040

31.24

Beginning Reverse Record Pause Stop Play FF End Load Save

# X3D Earth, Geospatial Component

## Editing and authoring support provided

The screenshot displays the X3D-Edit 3.2 application interface. The main window shows an XML editor with the following content:

```
1 <?xml version="1.0" encoding="UTF-8"?>
2 <!DOCTYPE X3D PUBLIC "-//Web3D//DTD X3D 3.1//EN" "http://www.web3d.org/specifications/x3d-3.1.dtd">
3 <X3D profile='Immersive' version='3.1' xmlns:xsd='http://www.w3.org/2001/XMLSchema-instance' xsd:noNamespaceSchemaLocation='http://www.w
4
5 <head>
6 <meta content='HelloEarthOpenStreetMap.x3d' name='title'/>
7 <meta content='Simplest example to load X3D Earth into an X3D scene.' name='description'/>
8 <meta content='Byoungghyun Yoo, Don Brutzman' name='creator'/>
9 <meta content='24 November 2008' name='created'/>
10 <meta content='25 November 2008' name='modified'/>
11 <meta content='http://OpenStreetMap.org' name='reference'/>
12 <meta content='http://www.web3d.org/x3d-earth' name='reference'/>
13 <meta content='http://x3d-earth.nps.edu' name='reference'/>
14 <meta content='OpenStreetMapToX3D.php' name='reference'/>
15 <meta content='OpenStreetMapExample0.x3d' name='reference'/>
16 <meta content='OpenStreetMapExample00.x3d' name='reference'/>
17 <meta content='OpenStreetMapExample01.x3d' name='reference'/>
18 <meta content='OpenStreetMapExample02.x3d' name='reference'/>
19 <meta content='OpenStreetMapExample03.x3d' name='reference'/>
20 <meta content='http://www.web3d.org/x3d/content/examples/Basic/GeoSpatial/HelloEarthOpenStreetMap.x3d' name='identifier'/>
21 <meta content='X3D-Edit, https://savage.nps.edu/X3D-Edit' name='generator'/>
22 </head>
23 <Scene>
24 <!-- a simple Inline node is all that is needed for any scene to use X3D Earth assets -->
25 <Inline url='http://x3d-earth.nps.edu/osmdemo.x3d'/>
26 <!-- TODO: consider exchanging further configuration information with server via IMPORT/EXPORT -->
27 <!-- TODO: also consider passed parameters to server in the url, similar to HTML forms -->
28 </Scene>
29 </X3D>
```

A green box highlights the following text:

```
<!-- a simple Inline node is all that is needed for any scene
to use X3D Earth assets, for example: -->
<Inline url='http://x3d-earth.nps.edu/osmdemo.x3d'/>
```

The interface also includes a 'Favorites' list on the left, a 'Navigator' pane showing the scene structure (version, PUBLIC, X3D, head, Scene, Inline), a 'GeoViewer' window displaying a 3D Earth globe, and a 'DilbertViewer Window' at the bottom showing a comic strip.

# Humanoid Animation (H-Anim)

ISO standard for human skeletons, skin

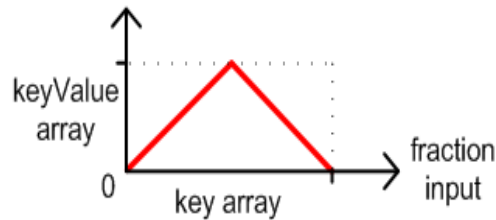
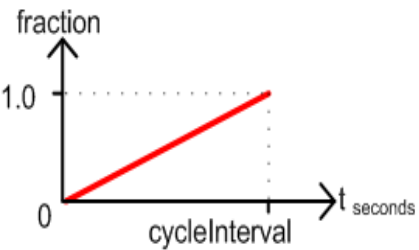
- Supported in X3D-Edit, other tools

Examining support for non-humanoid skeletons

NPS working on composable, reusable behaviors

- From motion capture (Vicon Peak system)?
- From different motion formats?
- More work needed, H-Anim group seems stalled...

# Tool and example support



**Time Sensor**

---

enabled true

---

loop true

---

cycleInterval 4.0

fraction\_  
changed

set\_  
fraction

**Scalar Interpolator**

value\_  
changed

set\_  
fraction

**Coordinate Interpolator**

value\_  
changed

Indexed FaceSet

Edit CoordinateInterpolator
✖

containerField

children

DEF  MorphInterpolator

USE

---

Coordinate lists

508 coordinate(s) (column triples) Add coordinate columns Remove coordinate columns

key		0			1		2			3			4			5			
<b>0</b>	0.406	1.049	7.905	0.595	2.957	-10.3...	0.592	2.263	-10.7...	1.246	2.823	5.21	1.352	0.918	5.384	1.336	3.003	-1.028	1.311
<b>0.5</b>	0.406	0.431	7.729	0.595	1.561	-10.4...	0.592	0.769	-10.4...	1.246	2.58	5.322	1.352	0.67	5.216	1.336	3.003	-1.028	1.311
<b>1</b>	0.406	-0.354	7.585	0.595	0.257	-10.3...	0.592	-0.511	-10.1...	1.246	2.012	5.391	1.352	0.121	5.105	1.336	3.003	-1.028	1.311

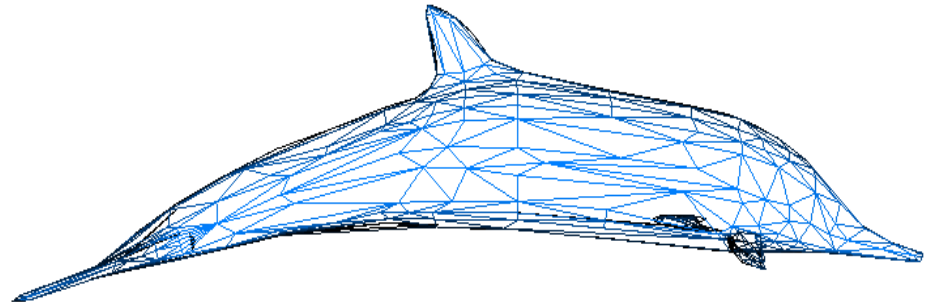
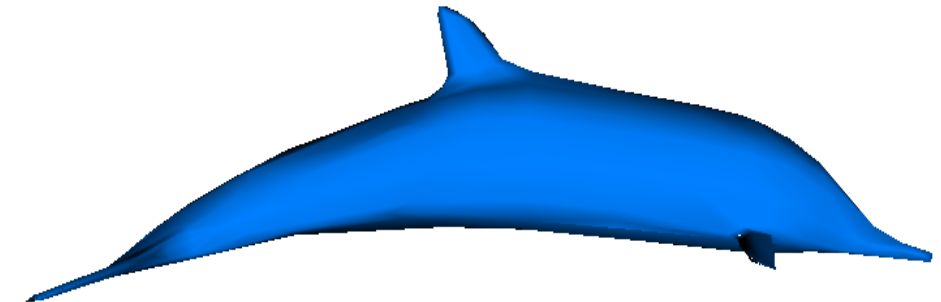
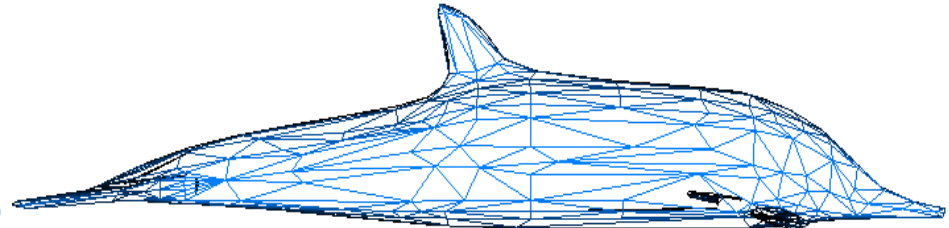
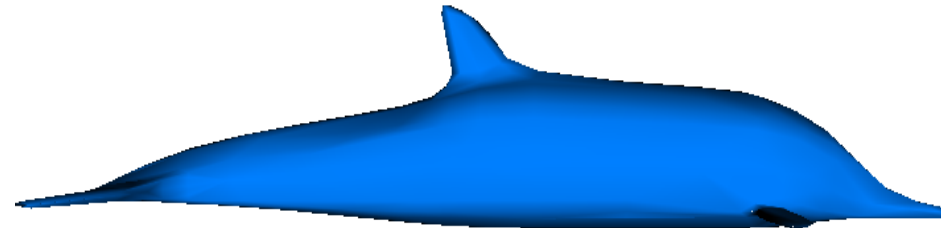
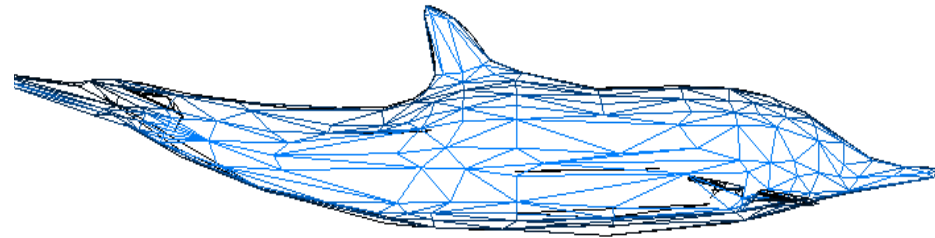
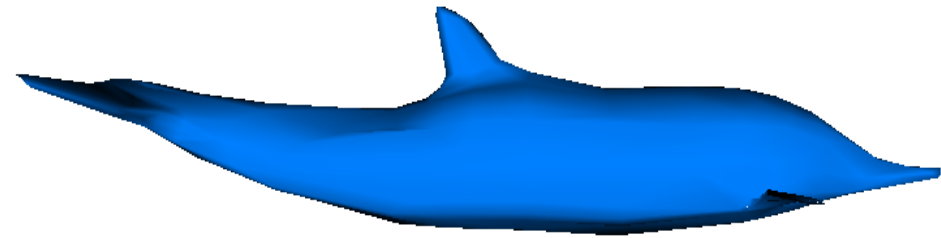
3 keyed coordinate list(s) (rows) Add keyed coordinate list Remove keyed coordinate list

OK Cancel Help



# Creating a morphable dolphin

Chris Lang, Monterey High School



# X3D for Web Authors

Textbook, slidesets, examples, videos

<http://x3dGraphics.com>

# Availability of book resources

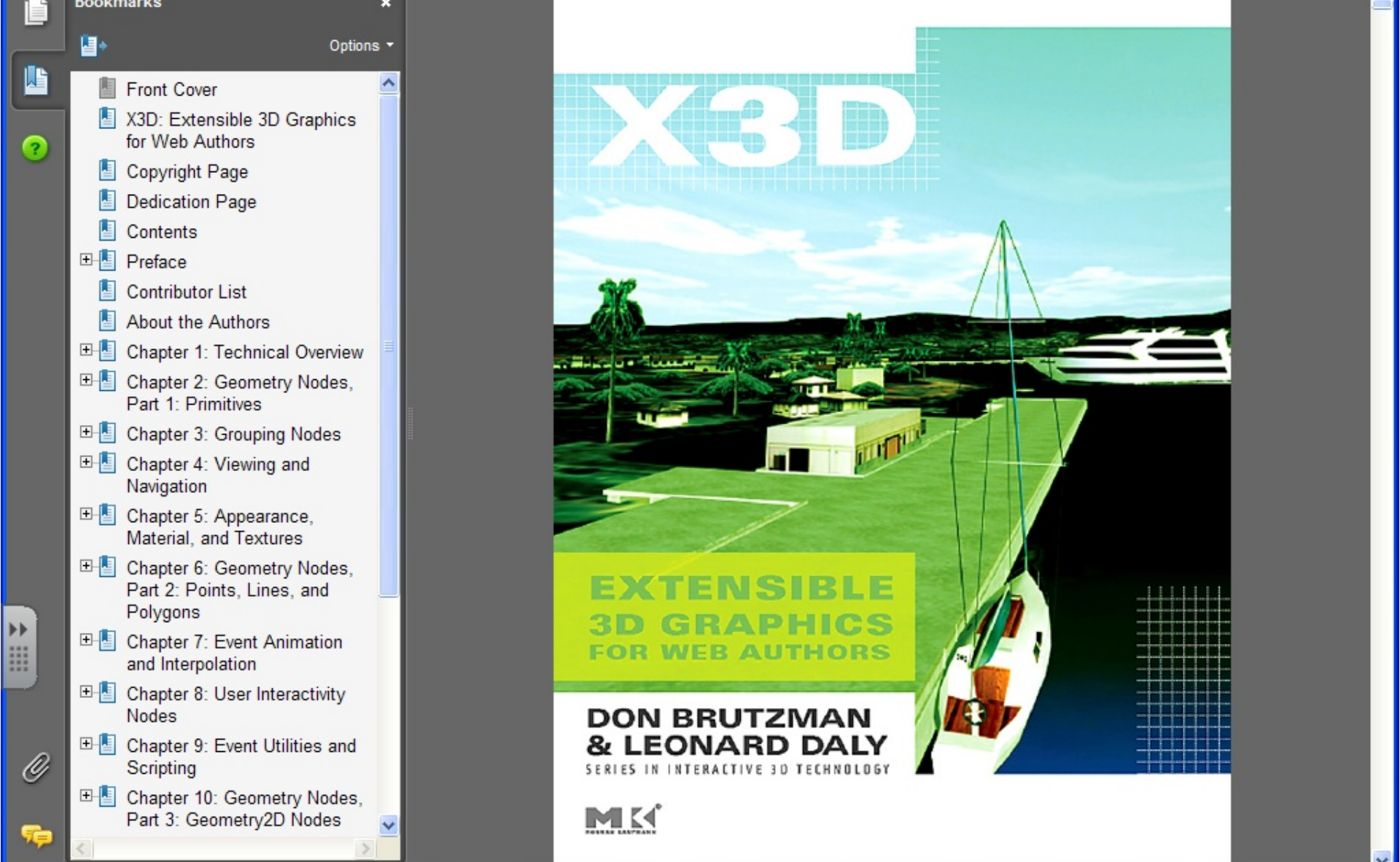
Book available in hard copy or electronic copy

X3D-Edit authoring tool is free for any use

X3D Examples are free for any use

X3D for Web Authors slides and course videos  
are free for any use

All free assets included on X3D Showcase DVD



# X3D

**EXTENSIBLE  
3D GRAPHICS  
FOR WEB AUTHORS**

**DON BRUTZMAN  
& LEONARD DALY**

SERIES IN INTERACTIVE 3D TECHNOLOGY



Bookmarks

- Front Cover
- X3D: Extensible 3D Graphics for Web Authors
- Copyright Page
- Dedication Page
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- Chapter 2: Geometry Nodes, Part 1: Primitives
- Chapter 3: Grouping Nodes
- Chapter 4: Viewing and Navigation
- Chapter 5: Appearance, Material, and Textures
- Chapter 6: Geometry Nodes, Part 2: Points, Lines, and Polygons
- Chapter 7: Event Animation and Interpolation
- Chapter 8: User Interactivity Nodes
- Chapter 9: Event Utilities and Scripting
- Chapter 10: Geometry Nodes, Part 3: Geometry2D Nodes

# Teaching Goals

This work presents Extensible 3D (X3D) Graphics, the open, royalty-free, international standard for 3D graphics on the Web

Book and slideset goals include

- Show Web authors experienced with HTML and XML how to build and connect X3D models
- Teach students principles of Web-capable 3D graphics
- Serve as a ready-reference book for X3D experts

Explain broad principles and specific details of X3D for anyone learning how to build 3D models

# CGEMS

## Computer Graphics Educational Material Source

- SIGGRAPH Education Committee
- Archives for teaching and learning 3D
- <http://cgems.inesc.pt>



## Jury award, best submission 2008

- Book, course notes, X3D-Edit tool, examples

New learning resource: course video podcasts!



# Course Videos: X3D for Web Authors



These video lessons support the textbook [X3D: Extensible 3D Graphics for Web Authors](#), which shows how to build and animate models using X3D.

Primary supporting materials for the book and these video lessons include the [X3D-Edit authoring tool](#), [example scenes](#), and [chapter slidesets](#). Supplementary learning materials include [X3D Resources](#), [X3D Tooltips](#), and [X3D Scene Authoring Hints](#).

These videos were produced as part of two [Naval Postgraduate School \(NPS\) MOVES Institute](#) courses: *Introduction to X3D Graphics* (MV3204) and *Advanced X3D Graphics* (MV4205). The course presenter is book coauthor [Don Brutzman](#).

Chapter	Session	Description	.pdf
<a href="#">Examples</a>			
0	<a href="#">Getting Started</a>	Goals and motivation, installing <a href="#">X3D-Edit authoring tool</a> and <a href="#">example scenes</a> , course introduction	<a href="#">slides</a>
1	<a href="#">Technical Overview 1A</a>	Introduction, historical background, <a href="#">Web3D Consortium</a> , importance of standardization, <a href="#">X3D Specifications</a> and <a href="#">International Organization of Standards (ISO)</a> , intellectual property rights (IPR) and open-source software, interoperability considerations	<a href="#">slides</a>
	<a href="#">Technical Overview 1B</a>	Browsers and players, models versus programming, scene graphs, behaviors and events, profiles and components, document metadata, fields	
	<a href="#">Technical Overview 1C</a>	Importance of consistency, strong data typing, accessType, XML design patterns for X3D, compressed binary encoding, standards liaison organizations	
	<a href="#">Technical Overview 1D</a>	<a href="#">X3D-Edit authoring tool</a> development, functional testing, bug tracking, version control, <a href="#">Netbeans</a> , help system	
2	<a href="#">Geometry Primitives 2A</a>	Shape and geometry nodes, common geometry fields	<a href="#">slides</a>
	<a href="#">Geometry Primitives 2B</a>	Box and Cylinder nodes, <a href="#">X3D Tooltips</a>	
	<a href="#">Geometry Primitives 2C</a>	<a href="#">HelloWorld</a> example, Cone Cylinder and Sphere nodes	
	<a href="#">Geometry Primitives 2D</a>	Text node for flat 2D strings, launching an X3D scene into one or more external players, multiple-field MFString arrays, handling special characters using <a href="#">XML character entities</a>	
	<a href="#">Geometry Primitives 2E</a>	FontStyle node, open-source licenses	
3	<a href="#">Grouping 3A</a>	Grouping node concepts, XML encoding	<a href="#">slides</a>
	<a href="#">Grouping 3B</a>	Inline node, url field	
	<a href="#">Grouping 3C</a>	X3D resources and additional references, Inline node, url fields, level of detail (LOD) node	
	<a href="#">Grouping 3D</a>	Switch node, review grouping node concepts, 3D grid resources	
4	<a href="#">Viewing Navigation 4A</a>	Viewing, navigation, bindable nodes and binding operations example	<a href="#">slides</a>
	<a href="#">Viewing Navigation 4B</a>	Viewpoint node, viewing and navigation	
	<a href="#">Viewing Navigation 4C</a>	NavigationInfo and Anchor nodes, uniform resource locator (url)	
5	<a href="#">Appearance 5A</a>	Material and TwoSidedMaterial nodes, <a href="#">Universal Media materials library</a>	<a href="#">slides</a>
	<a href="#">Appearance 5B</a>	Textures and ImageTexture node, texture coordinates, image copying and flipping to produce a continuously repeating texture, file formats	
	<a href="#">Appearance 5C</a>	MovieTexture and PixelTexture nodes, LineProperties and FillProperties nodes	
	<a href="#">Appearance 5D</a>	PixelTexture node, SFImage data type, PixelTexture image-import tool	
	<a href="#">Appearance 5E</a>	More on PixelTexture node. MovieTexture node	

# Summary

X3D-Edit provides many great resources for learning, authoring and using X3D

These community capabilities are good for business, educators, individuals

We welcome your active participation in Web3D Consortium



# Contact

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

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