



# X3D Assets and X3D-Edit Authoring Tool

**Web3D 2024 Conference** [web3d.siggraph.org](https://web3d.siggraph.org)

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# Learning goals

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

Book and tutorial goals include

- Show Web authors experienced with HTML and XML how to build and connect X3D models, demonstrated using the X3D-Edit tool
- Teach principles of Web-capable 3D graphics
- Serve as a ready-reference for X3D novices and experts
- Explain broad principles and specific details of X3D for anyone learning how to build 3D models

# X3D-Edit Motivation

- Provide a simple, excellent authoring tool for X3D
- Teach X3D to anyone who can author HTML
- Unlock all of the great work by many Web3D partners
- Learn by doing, and help further X3D progress

# Presentation organization

## X3D Assets

- Book and License
- X3D International Standards
- X3D Resources, Hints, Tooltips
- X3D Example Archives
- X3D File Encodings
- X3D Programming Languages

## X3D-Edit Authoring Tool

- Apache NetBeans Installation
- SourceForge Early Releases
- Example model HelloPortugal.x3d
- Editing panels
- X3D Model Documentation
- X3D assets, conversions, tools

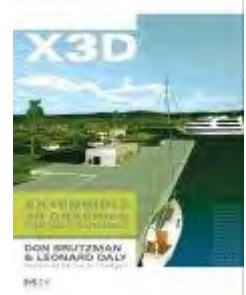
Have fun with X3D! ☺



# X3D Assets

An immense number of assets and resources are available for X3D authors.

# Book: X3D for Web Authors



- Building and interacting with 3D graphics is a "hands on" experience. Throughout this book there are lots of examples to study and modify. Practice helps you learn how X3D works.
- Corresponding online course includes examples, slidesets, and videos.
- The book presents the essential ideas needed to understand how an X3D world is constructed. Book chapters build upon each other, progressing from simple ideas to sophisticated concepts.
- *X3D: Extensible 3D Graphics for Web Authors* assumes that you are interested in learning more about 3D graphics. Some experience with other Web technologies (such as HTML or XML) is helpful. No prior programming experience is needed.

# X3D for Web Authors

## course videos

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Course videos, examples, resources and slidesets for "X3D: Extensible 3D Graphics for ...more

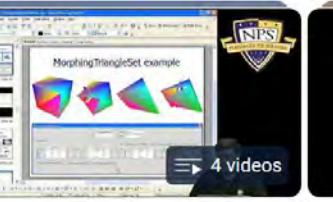
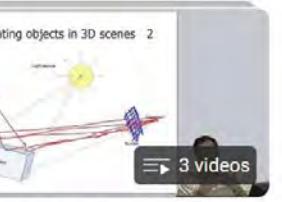
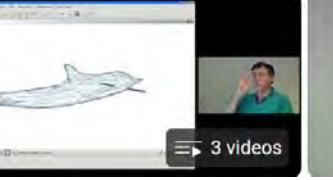
x3dgraphics.com

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 X3D-Edit 4.0 open-source X3D Graphics authoring tool View full playlist	 Chapter 14, Creating Prototype Nodes View full playlist	 Chapter 13, Geometry Part 4: Triangles and Quadrilaterals View full playlist	 Chapter 12, Environmental Sensor and Sound Nodes View full playlist	 Chapter 11, Lighting and Environment Nodes View full playlist
 Example: dominoes ready to fall 2 videos	 Right-hand rule for polygon normals 6 videos	 Morphing TriangleSet example 3 videos	 The X in X3D stands for Extensibility 4 videos	 Illuminating objects in 3D scenes 3 videos

# X3D Recommended International Standards

Extensible 3D (X3D) Graphics and Humanoid Animation (H-Anim) Standards provide a coordinated set of steadily evolving ISO standards, Royalty Free (RF) and publicly available for any use.

- <https://www.web3d.org/standards>

Primary architecture standards for X3D/HAnim models are functional and can be adapted across many devices, major operating systems, multiple file formats, and multiple programming languages.

- <https://www.web3d.org/x3d4>
- <https://www.web3d.org/specifications/X3Dv4/ISO-IEC19775-1v4-IS>
- <https://www.web3d.org/documents/specifications/19774/V2.0>



The [X3D Standards Working Group](#) addresses all X3D specification issues and coordinates the technical development of future improvements.

# X3D 4.0 Architecture



Extensible 3D (X3D)  
Part 1: Architecture and base components

ISO/IEC 19775-1:2023



This document is Edition 4 of ISO/IEC 19775-1, Extensible 3D (X3D). The full title of this document is: *Computer graphics, image processing, and environmental data representation — Extensible 3D (X3D) — Part 1: Architecture and base components*.

Background	Clauses	Annexes
1 Foreword	1 Scope	A Core profile
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3 Definitions, acronyms, and abbreviated terms	22 Environmental sensor component	C Interactive profile
4 Concepts	23 Navigation component	D MPEG-4 interactive profile
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10 Grouping component	29 Scripting component	J Microsoft high level shading language (HLSL) binding
11 Rendering component	30 Event utilities component	K nVidia Cg shading language binding
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21 Key device sensor component	40 Particle systems component	
	41 Volume rendering component	
	42 Texture projection component	

# HAnim 2.0 Architecture



**ISO/IEC 19774-1**

## Part 1: Humanoid animation (HAnim) architecture



This document is ISO/IEC 19774-1:2019, Humanoid animation (HAnim) architecture. The full title of this document is: *Information technology — Computer graphics, image processing and environmental data representation — Part 1: Humanoid animation (HAnim) architecture*.

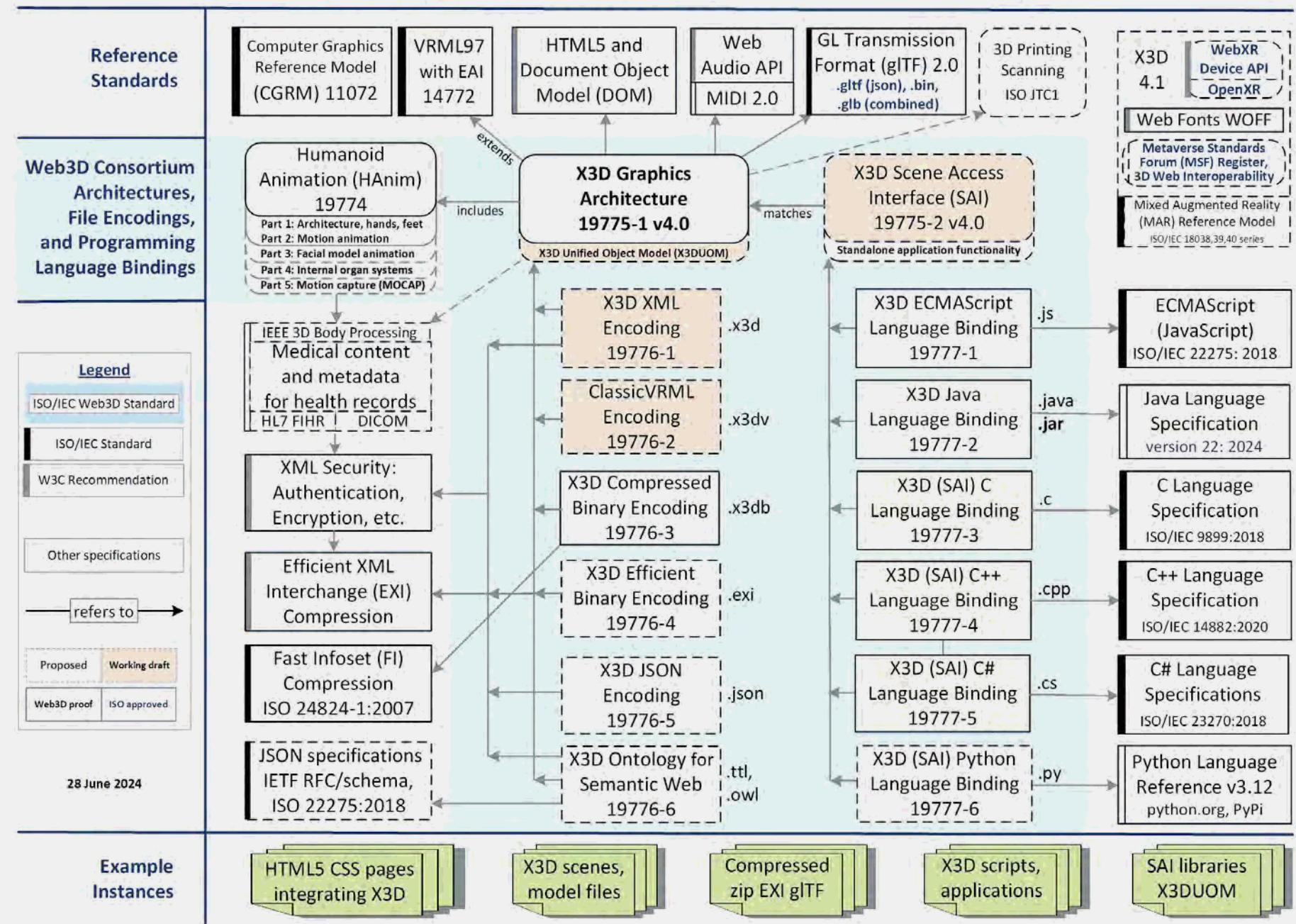
Background	Clauses	Annexes
Foreword	1 <a href="#">Scope</a>	A ( <i>informative</i> ) Nominal human body dimensions and levels of articulation (LOAs)
Introduction	2 <a href="#">Normative references</a>	B ( <i>informative</i> ) Feature points for the human body
	3 <a href="#">Terms and definitions</a>	C ( <i>informative</i> ) VRML binding
	4 <a href="#">Concepts</a>	D ( <i>informative</i> ) X3D binding
	5 <a href="#">Abstract data types</a>	E ( <i>informative</i> ) Guidelines for HAnim in VRML and X3D worlds
	6 <a href="#">Object interfaces</a>	F ( <i>informative</i> ) Guidelines for HAnim character design
	7 <a href="#">Conformance</a>	<a href="#">Bibliography</a>

# X3D Graphics Standards Relationships

X3D and HAnim  
Architecture  
standards define  
core functionality  
used by all other  
file encodings  
and programming  
language bindings

(online)

## X3D Graphics Standards Relationships



# Web3D Consortium Open-Source License

- Grants royalty-free (RF) rights suitable for any purpose
- Background on BSD-style license details found at  
<https://www.web3d.org/x3d/content/examples/X3dSceneAuthoringHints.html#license>
- X3D authors can place meta statements in a scene to document what license being applied. For example, one of the following is typically included in the X3D scenes found in the Web3D Consortium and NPS open-source example archives:  
`<meta name="license" content="../../license.html"> or`  
`<meta name="license"  
content="https://www.web3d.org/x3d/content/examples/license.html">`
- Also <https://www.web3d.org/x3d/content/examples/license.txt>



This slideset is offered under the Web3D Consortium Open-Source License

# X3D Resources

- Extensible 3D (X3D) Graphics is royalty-free open standard for publishing, viewing, printing and archiving interactive 3D models.
- Numerous resources are available to support X3D Graphics and its direct predecessor, Virtual Reality Modeling Language (VRML).
- Additional resources are welcome!
- <https://www.web3d.org/x3d/content/examples/X3dResources.html>



## X3D Resources



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

[Applications](#) | [Authoring Tools](#) | [Authoring Support](#) | [Books](#) | [Conformance](#) | [Conversions](#) | [Examples](#) | [Export and Import](#) | [Feedback](#) | [License](#) | [Mobile](#) | [Model Search](#) | [PowerPoint Programming Languages](#) | [Quality Assurance \(QA\)](#) | [References](#) | [Security](#) | [Showcase](#) | [Training and Tutorials](#) | [Videos](#) | [VRML and Open Inventor](#) | [Wish List](#) | [Savage Developers Guide](#) | [X3D-Edit](#) | [X3D Scene Authoring Hints](#) | [X3D Tooltips](#) | [X3D Validator](#) | [Contact](#)

# X3D Scene Authoring Hints

- These hints provide a collection of style guidelines, authoring tips and best practices to improve the quality, consistency and maintainability of Extensible 3D (X3D) Graphics models.
- Authoring challenges and best practices are welcome!
- <https://www.web3d.org/x3d/content/examples/X3dSceneAuthoringHints.html>



## X3D Scene Authoring Hints



These hints provide a collection of style guidelines, authoring tips and best practices to improve the quality, consistency and maintainability of Extensible 3D (X3D) Graphics models.

# X3D Tooltips

X3D Tooltips provide authoring hints for each node and field found in X3D Architecture [version 4 International Specification \(IS\)](#).

<https://www.web3d.org/x3d/tooltips/X3dTooltips.html>

X3D Tooltips provide context-sensitive support for authors and are usable within tools (such as [X3D-Edit](#)).

These tooltips are primarily phrased for X3D XML encoding, but other X3D file encodings and programming-language bindings are similar.

Each node's table entry also provides appropriate links to the [X3D Abstract Specification](#), [X3D Schema Documentation](#), [X3D DOCTYPE Documentation](#), [X3D JSON Documentation \(draft\)](#), [X3D Regular Expressions \(regexes\)](#), and [X3D Java SAI Library \(X3DJSAIL\)](#).



Tooltips are also embedded in [X3D Python SAI Library \(X3DPSAIL\) x3d.py](#)

# X3D Tooltips: WorldInfo

<https://www.web3d.org/x3d/tooltips/X3dTooltips.html#WorldInfo>



## WorldInfo

[inherits [X3DInfoNode](#)]

**WorldInfo includes a browsesr-displayable title and persistent string information about an X3D scene. For X3D4 models, WorldInfo can also contain a single MetadataSet node with further metadata information about the scene.**

**Hint:** comments are not readable when a model file is loaded for viewing, but WorldInfo and Metadata\* nodes are persistent and inspectable at run time.

**Hint:** WorldInfo is part of Core component and Core profile. <https://www.web3d.org/specifications/X3Dv4/ISO-IEC19775-1v4-IS/Part01/components/core.html#CoreSupportLevels>

**Hint:** X3D for Web Authors, Chapter 15, Metadata Information <https://www.web3d.org/x3d/content/examples/X3dForWebAuthors/Chapter15-Metadata/Chapter15-MetadataInformation.html>

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X3D validation:  
[XML Schema](#),  
[DOCTYPE](#),  
[JSON Schema](#),  
[Java SAI](#),  
[X3DJSAIL](#)

## metadata

[metadata [accessType inputOutput](#), [type SFNode](#) singleton, [NULL node](#)] [[X3DMetadataObject](#)]

Information about this node can be contained in a MetadataBoolean, MetadataDouble, MetadataFloat, MetadataInteger, MetadataString or MetadataSet node.

**Hint:** X3D Architecture 7.2.4 Metadata <https://www.web3d.org/specifications/X3Dv4/ISO-IEC19775-1v4-IS/Part01/components/core.html#Metadata>

## DEF

[DEF [type](#) [ID](#) #IMPLIED]

DEF defines a unique ID name for this node, referenceable by other nodes.

**Hint:** descriptive DEF names improve clarity and help document a model.

**Hint:** well-defined names can simplify design and debugging through improved author understanding.

**Hint:** X3D Scene Authoring Hints, Naming Conventions <https://www.web3d.org/x3d/content/examples/X3dSceneAuthoringHints.html#NamingConventions>



# X3D Examples Archives

The X3D Examples Archives demonstrate how X3D nodes and scenes work. Thousands of scenes are provided in all X3D encodings as learning resources.

You can browse them individually online or download fully complete, separately installable .zip archives. Open-source contributions are welcome!

# X3D Examples Archives overview

[X3D Examples Archives](#) show how X3D nodes and scenes work.

- Over four thousand scenes are provided for all X3D encodings.  
You can browse them individually online or download zip archives.

Quick Links	X3D for Web Authors	X3D for Advanced Modeling	Basic	Conformance Nist	Humanoid Animation (HAnim)	VRML 2 Sourcebook	Savage
Overview, references:	<a href="#">README</a>						
Archive examples:	<a href="#">Online</a>						
Local links (if present):	<a href="#">Local</a>						
Java conversions:	<a href="#">Javadoc</a>						
<b>4083 total X3D scenes:</b>	271	135	745	761	91	416	1253
Catalog metadata XML:	<a href="#">Content catalog</a> <a href="#">XMLSpy project</a>						
<a href="#">Ant</a> build scripts:	<a href="#">build.xml</a>						
Quality Assurance (QA) regression testing:	<a href="#">build.log.txt</a> ( <a href="#">history</a> )						
Full download:	<a href="#">zip</a> ( <a href="#">MD5 checksum</a> )						
Additional details:	see below						

# X3D for Web Authors Examples Archive

- *X3D for Web Authors* is an introductory reference textbook for learning Extensible 3D (X3D) Graphics.
- Author support includes the X3D-Edit authoring tool, X3D Tooltips, X3D Validator, complete course slidesets, YouTube course videos for learning X3D, plus this open-source scene archive.
- Supporting textbook in listed ACM Digital Library.
- This archive is a great place to start!
- 16 Directories, 271 X3D Models
- <https://www.web3d.org/x3d/content/examples/X3dForWebAuthors>

# X3D for Advanced Modeling (X3D4AM) Examples Archive

- X3D4AM is a work in progress for learning advanced Extensible 3D (X3D) Graphics modeling techniques
- <https://www.web3d.org/x3d/content/examples/X3dForAdvancedModeling>



17 Directories, ~~135~~<sup>136</sup> X3D Models



[Additive Manufacturing](#)  
[Buildings](#)  
[Gltf Sample Models](#)  
[Matlab](#)  
[Security](#)  
[User Experience UX](#)

[Animation](#)  
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[Hello World Scenes](#)  
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[Shay D Pixel](#)  
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[Audio Spatial Sound](#)  
[Geometric Shapes](#)  
[Inspiration](#)  
[Scanning](#)  
[Texture Mapping](#)



*HelloPortugal.x3d added for Web3D 2024 tutorial*



# Extensible 3D (X3D) Graphics: Basic Examples Archive



This archive provides a wide variety of basic open-source examples that show how to design and build X3D models. Many of these scenes have been used for confirmation, development and testing of essential node capabilities in X3D.



26 Directories, 744 X3D Models



[CAD development](#)  
[External Authoring Interface](#)  
[Lattice Xvl](#)  
[NURBS](#)  
[Script Conformance](#)  
[Student Projects](#)  
[Universal Media Panoramas](#)  
[Web 3D Outreach](#)

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[Experimental Binary Compression](#)  
[Geospatial](#)  
[Networking](#)  
[Rigid Body Physics](#)  
[Shaders](#)  
[Universal Media Materials](#)  
[VRML 97 Specification](#)



## ConformanceNist X3D Examples Archive



The ConformanceNist X3D Examples Archive was converted from the original [VRML Test Suite \(VTS\)](#) providing full coverage of the [Virtual Reality Modeling Language \(VRML97\) Specification](#). It was produced by a [team of experts](#) at the U.S. National Institute of Science and Technology ([NIST](#)) in 1999. The VRML97 standard is the direct predecessor of X3D and is maintained as the [X3D ClassicVRML Encoding](#), maintaining full and equivalent expressive power for any X3D or VRML model.

This open-source archive was designed using an [interactive conformance testing methodology](#) that continues to work well today. It provides a huge number of rendering and behavior examples to help verify X3D model and player conformance matching the [Immersive Profile](#) of the [X3D Architecture ISO Specification](#).



13 Sections, 66 Directories, 761 Models





## HumanoidAnimation (HAnim) X3D Examples Archive



# Humanoid Animation (HAnim) X3D Examples

The HumanoidAnimation (HAnim) X3D Examples Archive includes a growing number of humanoid models using joints, segments, skin, and animation behaviors.

Current work is upgrading all models to support [ISO/IEC 19774 Humanoid animation \(HAnim\) International Specification, version 2.0](#).

Quality Assurance (QA) efforts are documented with [diagnostics, warnings and error messages](#).

Also available: [HAnim2 name / HAnim1 alias tables](#) and [HAnim2 default values](#) for Joint, Segment and Site (feature point) nodes.



10 Directories, 118 X3D Models



[Characters](#)

[Motion Animation](#)

[Skin](#)

[Winter And Spring](#)

[Facial Animation](#)

[Polygonal](#)

[Specifications](#)

[Legacy](#)

[Prototypes](#)

[Templates](#)

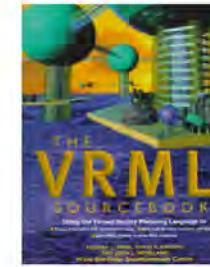


## VRML 2 Sourcebook, X3D Examples Archive



The [VRML 2 Sourcebook](#) was written by Andrea L. Ames, David R. Nadeau, and John L. Moreland, published by John Wiley & Sons, 1996. This open-source archive has translated the [original examples](#) to create corresponding example scenes using X3D. The original [SIGGRAPH 98 course notes](#) with corresponding translated [Siggraph 98 Course](#) scenes are also available.

Virtual Reality Modeling Language (VRML97) is the second-generation ISO International Standard that is fully compatible with the third-generation ISO standard, Extensible 3D (X3D) Graphics. VRML97 provides a close match to the X3D Immersive Profile.



31 Directories, 416 X3D Models



[Chapter 02 Introduction](#)

[Chapter 05 Positioning Shapes](#)

[Chapter 08 Animating Position Orientation Scale](#)

[Chapter 11 Grouping](#)

[Chapter 14 Elevation Grid](#)

[Chapter 17 Textures](#)

[Chapter 20 Lighting](#)

[Chapter 23 Fog](#)

[Chapter 26 Viewpoint](#)

[Chapter 29 World Info](#)

[Siggraph 98 Course](#)

[Chapter 03 Shapes](#)

[Chapter 06 Rotating Shapes](#)

[Chapter 09 Sensing Viewer](#)

[Chapter 12 Inline](#)

[Chapter 15 Extrusion](#)

[Chapter 18 Texture Mapping](#)

[Chapter 21 Shiny Materials](#)

[Chapter 24 Sound](#)

[Chapter 27 Sensing Visibility Proximity Collision](#)

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[Chapter 13 Points Lines Faces](#)

[Chapter 16 Color](#)

[Chapter 19 Normals Shading](#)

[Chapter 22 Background](#)

[Chapter 25 Level Of Detail](#)

[Chapter 28 Anchor](#)

[Chapter 31 Prototypes](#)

# Savage X3D Examples Archive



- NPS archive for many Navy-related models, currently 1253 total.
  - <https://savage.nps.edu/Savage>
- SAVAGE stands for Scenario Authoring and Visualization for Advanced Graphics Environments.
- Our mascot is a **LION** because **Like It Or Not**, using the Web, open source and open standards always win!
- [Savage Developers Guide](#) describes numerous system configuration details supporting various software projects.
  - <https://savage.nps.edu/Savage/developers.html>

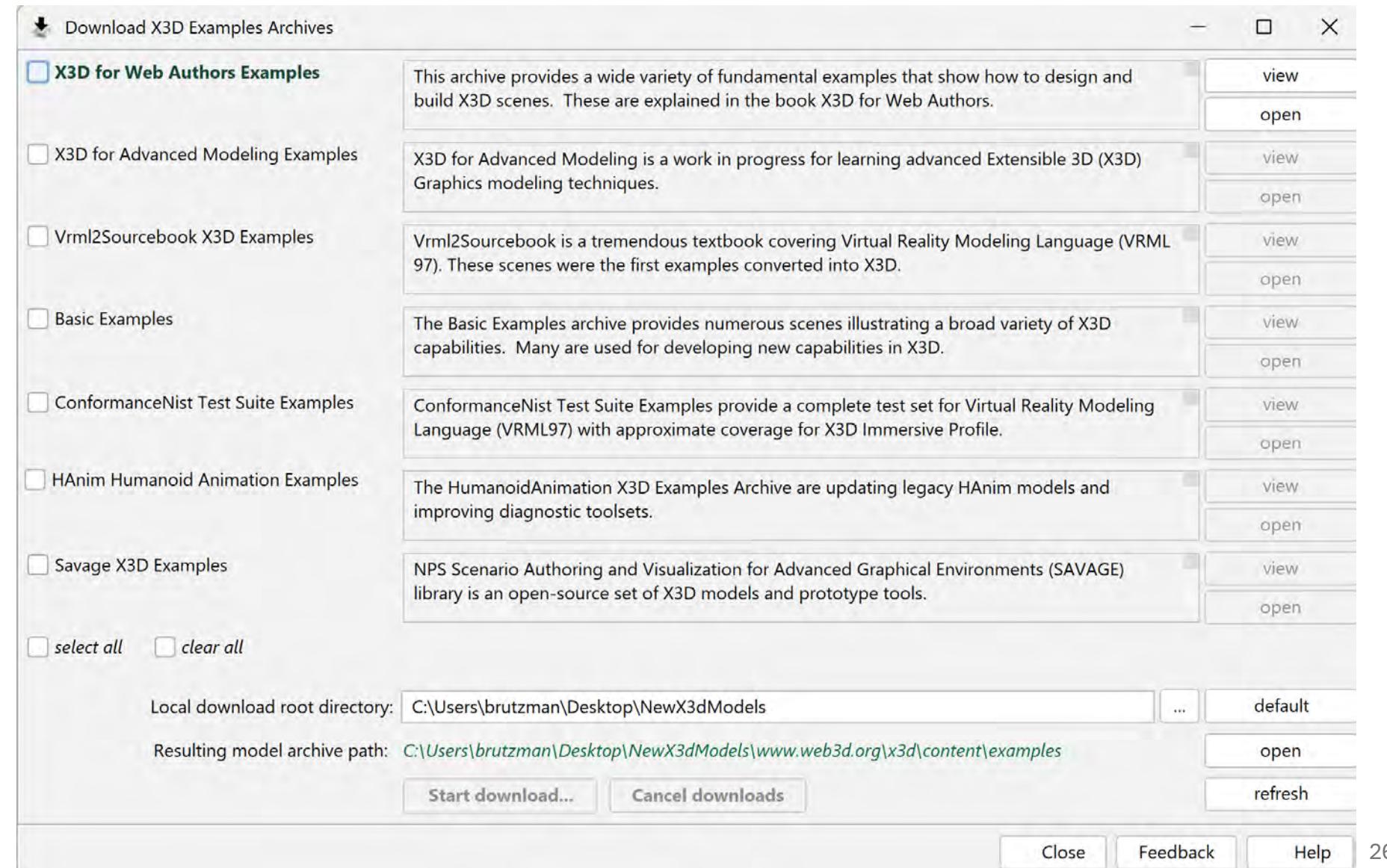
# Download X3D Example Archives

X3D-Edit can select and download any archives you like

Many X3D Examples are available for you!

X\_ITE model pages need CORS when viewing on localhost

X3DOM model pages are directly viewable, locally or online



- Web3D Consortium Examples:  
<https://www.web3d.org/examples>
- <https://webx3d.org>

## Discover X3D

# 3D For The Web

Unleash the power of 3D web content with X3D, the ISO-certified, open-source solution. Create and share with ease—all for free.

[Learn More](#)[Join Our Community](#)



# X3D File Formats

Multiple ways to capture an interactive X3D model, all functionally equivalent thanks to all requirements for rendering and interaction being commonly defined in the X3D Architecture Standard.

# XML file encoding .x3d

The Extensible Markup Language (XML) is a plain-text format used by many Web languages, e.g. Hypertext Markup Language (HTML)

- XML is used to define other data-oriented languages
- Therefore XML is not a language by itself, rather it is a language for defining other languages, i.e. a metalanguage

XML has many benefits and is well-suited for X3D Graphics

- Perhaps the strongest is validation capabilities for model definition.
- Prevent Garbage In Garbage Out (GIGO) !
- Rephrase: developers detect problems when modeling, rather than end users grappling with unforeseen/unknown problems at run time.

# XML and X3D correspondence

Opening element  
Singleton element, attribute="value"  
Opening element  
Singleton element, attribute='value'  
Closing element  
Closing element

```
<Shape>
  <Sphere radius="10.0" solid="true"/>
  <Appearance>
    <ImageTexture url='earth-topo.png'/>
  </Appearance>
</Shape>
```

- Elements correspond to X3D nodes
- Attributes correspond to X3D simple-type fields
- Parent-child relationships define containerField
- Validatable XML using X3D DTD, schema, schematron

# VRML97 file encoding .wrl (or gzipped .wrz)

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

- Numerous candidates considered by an open community of interested practitioners
- SGI's *OpenInventor* file format won the initial competition
- VRML 1.0 developed over next year, with multiple lessons learned
- VRML 2.0 restructured some nodes, added features, became VRML97

VRML 97 advanced to International Standard 14772 by ISO in 1997

Accomplished by individuals and companies cooperating together

# ClassicVRML file encoding .x3dv

ClassicVRML has maintained forward, backward compatibility

- No changes in syntax rules
- Some additional new nodes and slight naming differences to match specification improvements
- VRML97 content still works and is easily supported
- Validation well supported by [castle-model-viewer](#)
- XML, ClassicVRML and Compressed Binary encodings are functionally equivalent
- Once again, governed by same X3D Architecture specification

# X3D Binary

- Compressed Binary Encoding with both geometric and information compression
- Supported by Xj3D
- Uses Fast InfoSet (FI) for information compression
- Uses Deering geometric-compression algorithms for geometry

glTF compression is more efficient for really large meshes

# Efficient Extensible Interchange (EXI)

- EXI is a very compact representation for the Extensible Markup Language (XML) Information Set that is intended to simultaneously optimize performance and the utilization of computational resources.
- In other words: achieved smallest size and fastest decompression.
- Using a relatively simple algorithm, amenable to fast and compact implementation, and a small set of datatype representations, it reliably produces efficient encodings of either XML or JSON event streams.
- W3C Recommendation and associated reports, implementations
- Can coexist with XML Security: digital signature and encryption

# X3D JSON .json

## JavaScript Object Notation (JSON)

- Data structures matching X3D scene graph
- Not yet formally specified but regular, simple and well defined
- X3D JSON syntax is beginning to be well supported, implemented
- Files are generated, tested for all X3D Example Archive models
- X3D to JSON Stylesheet Converter  
<https://www.web3d.org/x3d/stylesheets/X3dToJson.html>
- X3D JSON Design Goals  
[https://www.web3d.org/wiki/index.php/X3D\\_JSON\\_Encoding](https://www.web3d.org/wiki/index.php/X3D_JSON_Encoding)



TODO: use X3DUOM to autogenerate an authoritative X3D JSON Schema



# X3D Programming Language APIs

Multiple ways to capture an interactive X3D model, all functionally equivalent thanks to all requirements for rendering and interaction being commonly defined in the X3D Architecture Standard.

# X3D Regular Expressions (regexes)

X3D Regular Expressions (regexes) are used to validate the correctness of string and numeric array values in an X3D scene.

- Regular expressions (regexes) define string grammars that efficiently and rigorously define allowable character patterns making up a value.
- Regexes themselves are carefully defined sequences of characters that form a search pattern, mainly used for string pattern matching. This technique allows detection of well-formed (or incorrect) MFVec3f arrays of three-tuple floats in X3D scene, with commas between tuples.
- Used for regression testing in XML schema, Java, Python validation
- <https://www.web3d.org/specifications/X3dRegularExpressions.html>

# X3D Unified Object Model (X3DUOM)

X3D is strongly typed, avoiding Garbage In Garbage Out (GIGO) errors.

The X3D Unified Object Model (X3DUOM) provides a complete set of object-oriented interfaces for all nodes, fields, and statements in the X3D Architecture Specification.

- Generated from annotated X3D XML Schema for exact correctness
- Expressed in an XML file, [X3dUnifiedObjectModel-4.0.xml](#)
- Used to autogenerate Java, Python, Turtle language bindings
- Also used to autogenerate some annexes in X3D Specifications
- <https://www.web3d.org/specifications/X3DUOM.html>

# JavaScript for X3D



Primary programming language used in X3D Script node

- Also known as ECMAScript in ISO standards parlance
- Many implementations use JavaScript provided by Web browser
- <https://262.ecma-international.org/14.0>

X3DJSONLD is a library by John Carlson with many capabilities



TODO: autogenerate JavaScript library using X3DUOM

# X3D Java, X3DJSAIL



X3D Java Scene Access Interface Library (X3DJSAIL) supports Java programmers with standards-based X3D Java interfaces and objects, all strongly typed and autogenerated as open source.

- X3DJSAIL is a set of strongly typed Java application programming interfaces (APIs) providing programmer access to an X3D scene graph.
- *Goal outcomes:* make it easy to create a fully valid X3D model using Java, while also making it hard to create an incorrect or invalid X3D model. X3DJSAIL has accomplished these goals.
- Programs are generated and tested for all X3D Example Archive models
- <https://www.web3d.org/specifications/java/X3DJSAIL.html>

# X3D Python, x3d.py package



- X3D Python Scene Access Interface Library (X3DPSAIL)
- The x3d.py Python X3D Package supports programmers with Python interfaces and objects for standards-based X3D programming, all as open source. Autogenerated from X3DUOM.
- <https://www.web3d.org/x3d/stylesheets/python/python.html>
- <https://pypi.org/project/x3d>
- Not yet formally specified but regular, simple and well defined
- Programs are generated and tested for all X3D Example Archive models

"Pythonic is a word because Python programming is... different, in many excellent ways."

# X3D Ontology for Semantic Web



- The X3D Ontology for Semantic Web provides terms of reference for semantic query of X3D graphics models, including interactive 3D geometry, multimedia, and metadata.
- The X3D Ontology is autogenerated from X3DUOM.
- X3D semantic models expressed as Turtle (rdf and owl) files are created from any .x3d (XML-based) model using a stylesheet.
- Programs are generated, tested for all X3D Example Archive models
- <https://www.web3d.org/x3d/content/semantics/semantics.html>

# Work in progress: creating C++ and C# Scene Access Interface (SAI)



- Draft ISO specifications are being written that define C++ and C# programming-language bindings for X3D scene graphs
- Suwon University has also written up the simple examples found in each specification annex.
- Using such examples as design patterns, we will write conversion stylesheets (resembling X3dToJava.xslt, X3dToPython.xslt) creating program results, each including a self-validation test.
- Applying these stylesheets to all 4000+ X3D Examples, automating production and testing, provides a large suite of regression tests that can be used to confirm correctness of each API.

# Deep breath... wow!

X3D has many capabilities and many equivalent variations to use.

3D models that include geometry, advanced rendering, interaction and navigation can all be consistently converted, reused, and adapted.

Strengths include long-term archiving, conversions, 3D printing, etc.

If you have a use case, then X3D likely has an approach you can use.



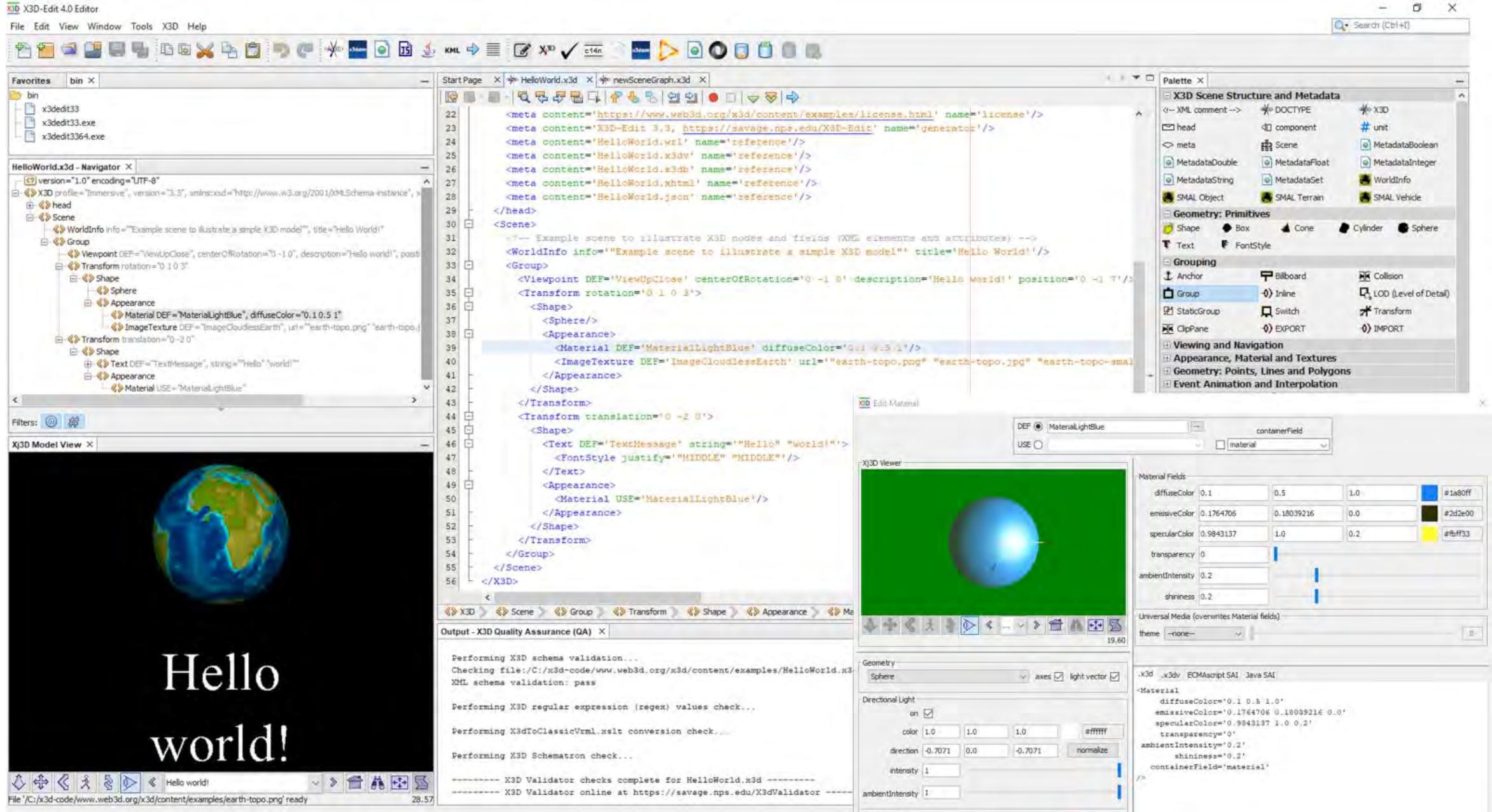
# X3D-Edit Authoring Tool

Free, open-source Extensible 3D (X3D) Graphics authoring tool for simple high-quality authoring, editing, import/export, validation and viewing of X3D scenes.



# X3D-Edit Overview

- The X3D-Edit 4.0 Authoring Tool for Extensible 3D (X3D) Graphics supports creation, checking, display, publication of X3D scenes.
- X3D-Edit 4.0 is stable and available for public use. It is written in open-source Java and XML using NetBeans as a plugin module.
- Motivation for X3D-Edit design has always been centered around authors making great X3D content for Web users, precise implementation of the X3D specifications, and quality assurance (QA) for producing reliable, repeatable results.
- X3D-Edit features are numerous and steadily growing supporting many long-term efforts by Web3D Consortium and X3D community.



# X3D-Edit Interface within NetBeans IDE

# Download and installation

- Home page: <https://savage.nps.edu/X3D-Edit>
- Downloads: <https://savage.nps.edu/X3D-Edit/#Downloads>
- Requires prior installation of JavaJDK and NetBeans
- Preferred installation of X3D-Edit within NetBeans is via plugin panel
  - NetBeans > Tools > Plugins > Available Plugins.
- We are now using [Java OpenJDK 23](#) and [Apache NetBeans 23](#).
- The trusted NetBeans Plugin Update Center (image) includes a direct download link for the latest X3D-Edit plugin module.
- Plugin portal download statistics show **nearly 22,000 downloads** since May 2023.

# Apache NetBeans

- <https://netbeans.apache.org>
- Top-level project at world's largest open-source effort, Apache Software Foundation
- Supports multiple datatypes and programming languages
- Update releases quarterly
- X3D-Edit releases also performed quarterly to match



Screenshot of the Apache NetBeans website (<https://netbeans.apache.org>)

The screenshot shows the Apache NetBeans homepage. At the top, there is a navigation bar with links for Community, Participate, Blog, Get Help, Plugins, and Download. Below the navigation bar, a banner for "Apache NetBeans 23" is displayed, featuring a "Download" button. The main content area includes the Apache NetBeans logo (a 3D cube composed of colored facets), the tagline "Fits the Pieces Together", and a description of it as a Development Environment, Tooling Platform and Application Framework. The page is divided into several colored sections: blue, green, red, light green, dark red, and light blue. These sections contain text about Fast & Smart Editing, Java support, Cross Platform compatibility, Join us, Participate, and Learn. Social media icons for Facebook, Twitter, YouTube, Slack, GitHub, and LinkedIn are located at the bottom right.

# Apache NetBeans Plugin Portal

Directly integrates  
into NetBeans,  
leverages immense  
platform capabilities.

Runs on any  
operating system,  
uses latest Java JDK.

Apache NetBeans Plugin Portal    Plugin Catalog    Help    Login

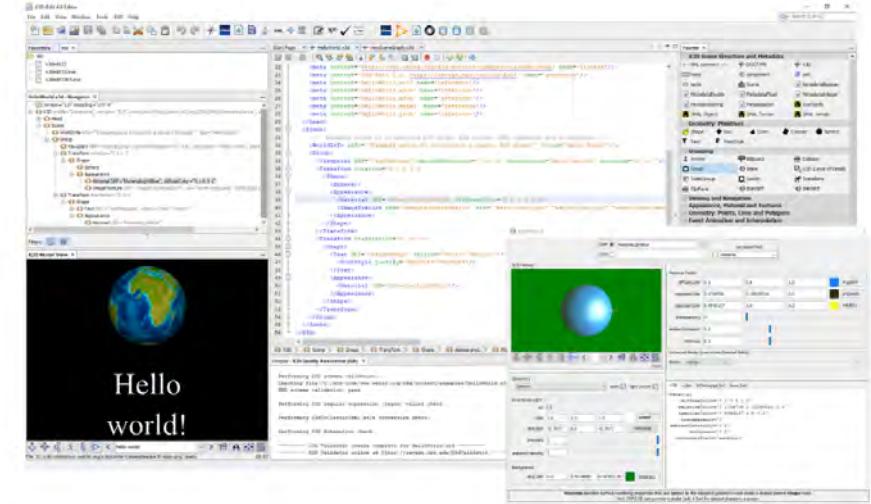
## X3D-Edit

GroupId: org.web3d.x3d.tools  
ArtifactId: x3dedit  
Author: Don Brutzman, Terry Norbraten  
License: license.txt  
Homepage: <https://savage.nps.edu/X3D-Edit>  
\* 2023-05-06    2024-06-14    21,873

Editing    Modeling

Download matrix

Plugin version	NetBeans compatible
4.0.27	<a href="#">NB 17</a> <a href="#">NB 16</a>
4.0.28	<a href="#">NB 17</a>
4.0.29	<a href="#">NB 18 - Verified</a> <a href="#">NB 17 - Verified</a>
4.0.30	<a href="#">NB 19 - Verified</a> <a href="#">NB 18</a> <a href="#">NB 17</a>
4.0.31	<a href="#">NB 19</a> <a href="#">NB 18</a> <a href="#">NB 17</a>
4.0.32	<a href="#">NB 20 - Verified</a> <a href="#">NB 19</a> <a href="#">NB 18</a> <a href="#">NB 17</a>
4.0.33	<a href="#">NB 21 - Verified</a> <a href="#">NB 20</a>
4.0.34	<a href="#">NB 20</a> <a href="#">NB 22 - Verified</a> <a href="#">NB 21</a>



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# SourceForge for advance releases

https://sourceforge.net/projects/x3d/files/

## X3D-Edit 4.0 Distribution, 7 July 2024

Primary software deployment is found in [NetBeans X3D-Edit plugin](#) autoupdate support.

Backup software deployment is found in [Maven Central Repository](#) distribution support.

These SourceForge pages are used for distributing X3D-Edit application installers.



X3D-Edit Install File	Description	Status	File size	Date
<a href="#">x3deditmodulesuite.zip</a>	Complete zip archive for <a href="#">Java JDK</a> execution	Recommended, tested satisfactorily, any operating system	207.2 MB	7 July 2024
<a href="#">org-web3d-x3d-palette.nbm</a>	<a href="#">NetBeans</a> plugin module	Netbeans 22. tested satisfactorily, any operating system	74.3 MB	7 July 2024

SourceForge [download statistics](#) are interesting.

### How To Do It

Please see our [Installation video \(22:56\)](#)



**Windows users:** there is an issue in both the zip and [X3D-Edit Windows installer](#). Please note that you will manually need to edit the configuration files to point to your local JDK installation. For example:

- Using `localadmin` permissions, set `jdkhome` permissions in configuration file:
- `C:\\Program Files\\x3deditmodulesuite\\etc\\x3deditmodulesuite.conf`
- `jdkhome="C:\\Program Files\\Java\\openjdk\\jdk-22.0.1"`

### Source Code has Moved

X3D-Edit software development has moved to [GitHub](#)

# X3D-Edit User Preferences

## Author Information

Local copy of  
X3D Example  
Archives

X3D-Edit User Preferences

Xj3D CAD Filters X3D Security Multimedia, Web, and Networking Tools X3D Modeling Tools

Author X3D Players Image and Volume Tools X3D-Edit Visualization Settings

**Author name** Don Brutzman

**Author email** brutzman@nps.edu

**New X3D Models**  
default local directory path for authoring

location C:\Users\brutzman\Desktop\NewX3dModels   default

**X3D Examples Model Archives**  
default local directory path for downloading

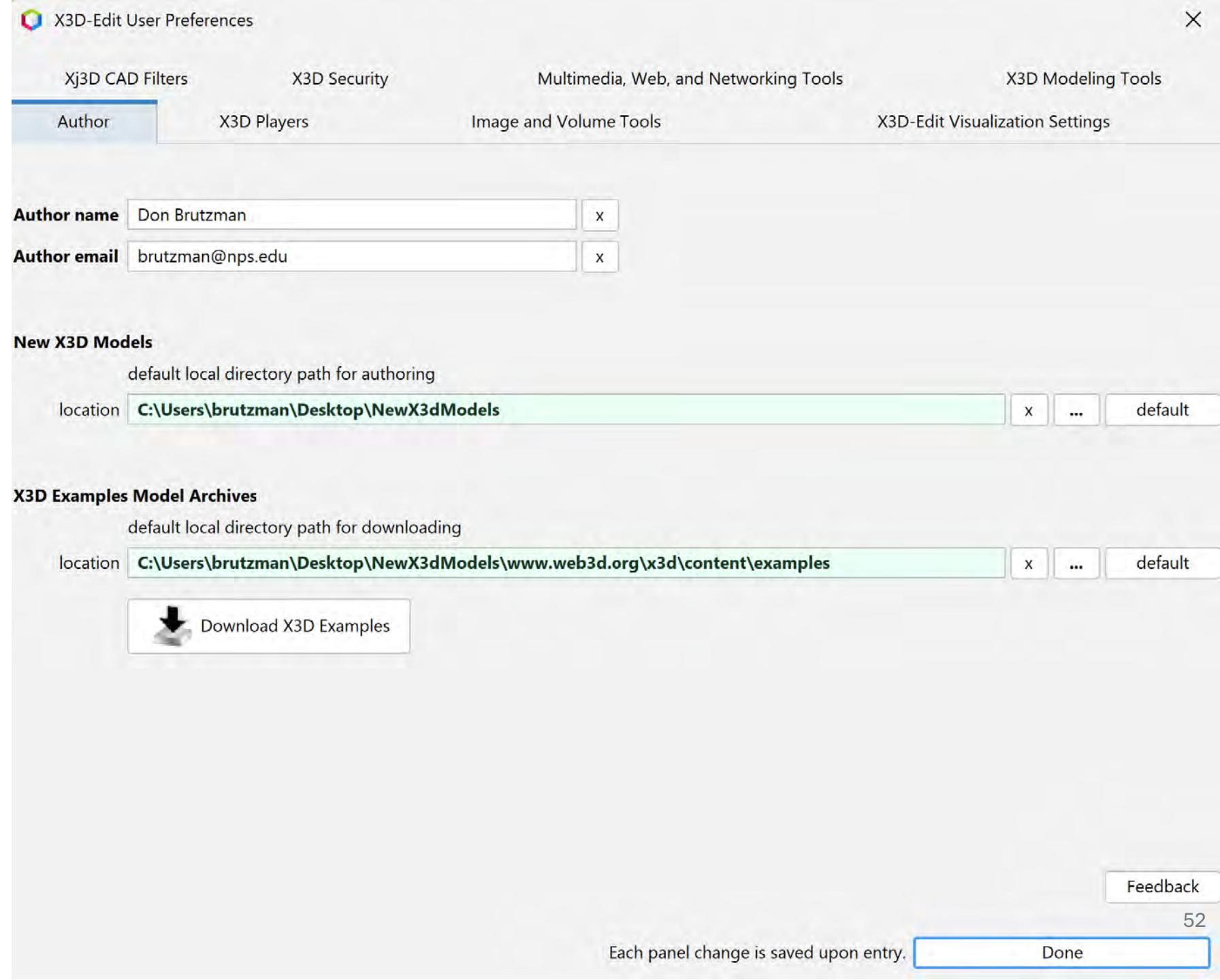
location C:\Users\brutzman\Desktop\NewX3dModels\www.web3d.org\x3d\content\examples   default

 Download X3D Examples

Feedback

52

Each panel change is saved upon entry.



# Learn-by-example scene: HelloPortugal.x3d !

Created a new X3D model for this tutorial

- ... which is pretty easy using X3D-Edit

Positive side effect: add to set of around-the-world exemplars

- <https://www.web3d.org/x3d/content/examples/X3dForAdvancedModeling/HelloWorldScenes>

TODO, when ready: add Hello X3D model for your nation! ☺



# Translating text, then copy and paste

Hello World!

- Olá mundo!

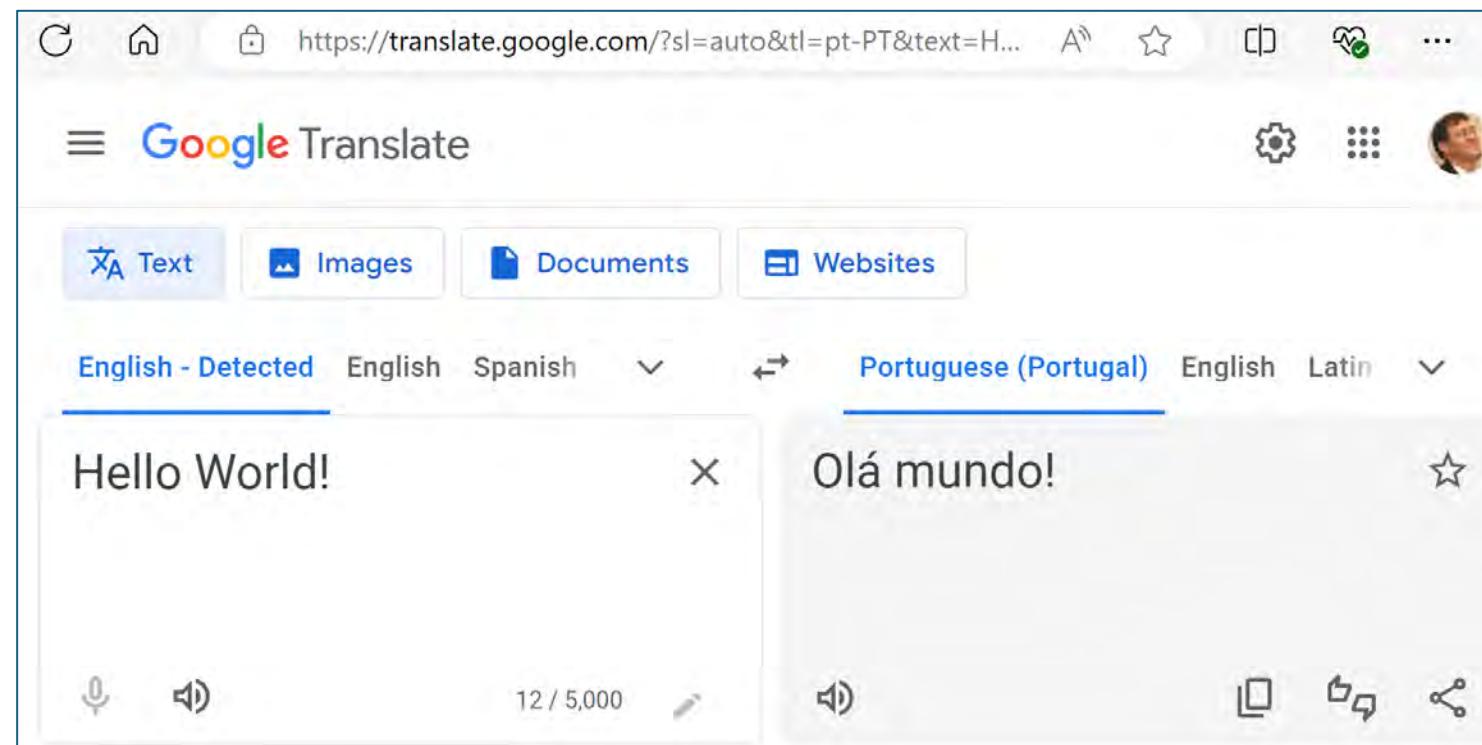
Hello Portugal!

- Olá Portugal!

Have fun with X3D!

- Divirta-se com o X3D!

[translate.google.com “Hello World!”](https://translate.google.com/?sl=auto&tl=pt-PT&text=Hello%20World!)



# X3D header and model metadata

```
1  <?xml version="1.0" encoding="UTF-8"?>
2  <!DOCTYPE X3D PUBLIC "ISO//Web3D//DTD X3D 4.0//EN" "https://www.web3d.org/specifications/x3d-4.0.dtd">
3  <X3D profile='Immersive' version='4.0' xmlns:xsd='https://www.w3.org/2001/XMLSchema-instance' xsd:
4    noNamespaceSchemaLocation='https://www.web3d.org/specifications/x3d-4.0.xsd'>
5      <head>
6        <meta content='HelloPortugal.x3d' name='title' />
7        <meta content='HelloPortugal example scene to show Portuguese special characters, built for Web3D 2024 Conference
8          Tutorial.' name='description' />
9        <meta content='Don Brutzman' name='creator' />
10       <meta content='24 September 2024' name='created' />
11       <meta content='24 September 2024' name='modified' />
12       <meta content='Hello World, Portugal' name='subject' />
13       <meta content='https://en.wikipedia.org/wiki/Portugal' name='reference' />
14       <meta content='https://en.wikipedia.org/wiki/Portugal#/media/File:Flag\_of\_Portugal.svg' name='Image' />
15       <meta content='https://upload.wikimedia.org/wikipedia/commons/thumb/5/5c/Flag\_of\_Portugal.svg/600px-Flag\_of\_Portugal.svg.png' name='Image' />
16       <meta content='images/HelloPortugalCastleModelViewer.png' name='Image' />
17       <meta content='images/HelloPortugalFreeWRL.png' name='Image' />
18       <meta content='images/HelloPortugalH3DViewer.png' name='Image' />
19       <meta content='images/HelloPortugalInstantReality.png' name='Image' />
20       <meta content='images/HelloPortugalOctaga.png' name='Image' />
21       <meta content='Completed https://github.com/castle-engine/view3dscene/issues/30#issuecomment-630715046' name='reference' />
```

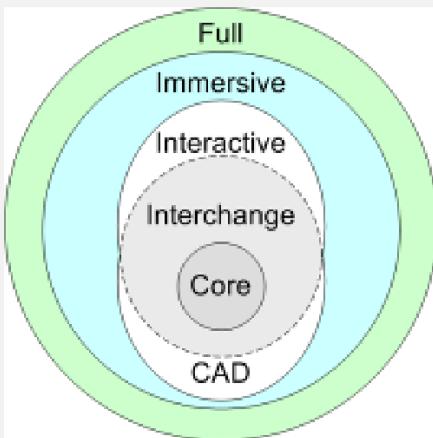
X3D version 4.0 ISO Draft Standard 2023

profile Immersive

**X3D** is the root XML element for an X3D scene graph, containing **head** and **Scene** elements.version value is required, and version **4.0** is recommended

profile value tells an X3D application how large the node vocabulary might be for this scene.

- profile **Core**: Empty profile containing only Metadata nodes
- profile **Interchange**: Minimum set of nodes to author lightweight compelling content
- profile **Interactive**: Interchange geometry plus simple user interaction
- profile **Immersive**: is common and approximately matches VRML97 with Script and Prototypes
- profile **CADInterchange**: Basic models plus computer-aided design (CAD) model distillation
- profile **MedicalInterchange**: Interchange support plus VolumeRendering for medical records
- profile **Full**: contains all nodes defined in X3D specification.

Add **head** with **component** elements to support additional nodes above a given profile.Add **head** with **unit** elements to provide unit conversions for numeric data.Add **head** with **meta** elements to provide metadata about this document.Add **Scene** element to contain X3D shapes, animation and interaction.

Validation checkmark button confirms X3D version, profile, components for a scene.

Accept

Discard

Feedback

Help

**meta** contains a name-value pair of metadata attributes: *name* and *content*.  
Additional attributes provide direct compatibility matching HTML meta tags.

# ent editors

name

description

content

HelloPortugal example scene to show Portuguese special characters,  
built for Web3D 2024 Conference Tutorial.

name help

--

today's date

prepend https://

prepend http://

choose file

load in X3D-Edit

open in browser

external editor

QA

domain

ping

```
HelloSceneGraphStructure.x3d - Navigator x
version="1.0" encoding="UTF-8"
X3D profile="Immersive", version="4.0"
  head
    component level="4", name="Rendering"
    unit category="length", conversionFactor="0.3048", name="FeetToMeters"
    meta content="HelloSceneGraphStructure.x3d", name="title"
    meta content="Show basic scene graph structure", name="description"
  Scene
    WorldInfo title="HelloSceneGraphStructure.x3d"
    Transform
```

generator: select an authoring tool...

TODO: select an issue tracker...

dir (none) direction

dir help

http-equiv

http-equiv lookup

http-equiv help

lang

language lookup

lang help

scheme

scheme help

Accept

Discard

Feedback

Help

# Scene, WorldInfo, Background, Anchor, Transform, Shape, Text, FontStyle, Appearance, Material

```
31      <meta content='https://www.web3d.org/x3d/content/examples/X3dForAdvancedModeling>HelloWorldScenes>HelloPortugal.x3d' name='identifier'/>
32      <meta content='X3D-Edit 4.0, https://savage.nps.edu/X3D-Edit' name='generator'/>
33      <meta content='../license.html' name='license'/>
34  </head>
35  <Scene>
36      <WorldInfo title='HelloPortugal.x3d'/>
37      <Background skyColor='1 0.835294 0.258824'/>
38      <Viewpoint DEF='ViewpointEntry' description='Olá Portugal! Divirta-se com o X3D!' />
39      <Viewpoint DEF='ViewpointRotation' description='rotate the flag' />
40      <Anchor description='Wikipedia: Tourism in Portugal' url='"https://en.wikipedia.org/wiki/Tourism\_in\_Portugal"'>
41          <Transform translation='0 -2 0'>
42              <Transform translation='0 4.8 0'>
43                  <Shape>
44                      <Text string='Olá Portugal!'>
45                          <!-- https://translate.google.com/?sl=auto&tl=pt-PT&text=Hello%20World!&op=translate -->
46                          <FontStyle justify='MIDDLE' MIDDLE />
47                  </Text>
48                  <Appearance DEF='BlackAppearance'>
49                      <Material diffuseColor='0.01 0.4 0.01' />
50                  </Appearance>
51              </Shape>
52          </Transform>
```

Note NetBeans handling of special characters

# Anchor, Viewpoint node editors

**Edit Anchor**

X3D DEF USE containerField    HTML5 id, CSS class style

DEF  ViewpointEntry    USE  ViewpointRotation

containerField    children

description: Wikipedia: Tourism in Portugal

url: [https://en.wikipedia.org/wiki/Tourism\\_in\\_Portugal](https://en.wikipedia.org/wiki/Tourism_in_Portugal)

Buttons: < Edit url value Append Remove Add url Sort >  
Load... Open External editor QA domain ping

parameter: # Target parameters for web browser

Row edit: All Copy Append Remove Flip Rows --

bboxCenter: 0 0 0

bboxSize: -1 -1 -1

**Anchor** is a Grouping node that can contain most nodes.  
User selection of shapes contained by Anchor loads content specified in the url field.  
Loaded content completely replaces current content, if parameter is same window.  
Hint: set parameter as target=\_blank to load the target url into a new browser frame.

Visualize    Accept    Discard    Feedback    Help

**Edit Viewpoint**

X3D DEF USE containerField    HTML5 id, CSS class style

DEF  ViewpointEntry    USE  ViewpointRotation

containerField    children

description: Olá Portugal! Divirta-se com o X3D!

x y z angle adjustments

position: 0 0 10

orientation: 0 1 0 0 calculator

fieldOfView: 0.7854 normalize orientation values and fieldOfView angle

centerOfRotation: 0 0 0

jump  retainUserOffsets

**Viewpoint Rotation Calculator**

goal look-at point: 0 0 0 level height reset

recompute orientation for look-at point heads-up rotation

slant range: 10 m twist angle: 0 direct-path rotation

horizontal range: 10 m horizontal angle: 0 include lookat point as comment

vertical range: 0 m vertical angle: 0

**Viewpoint** provides a specific location and direction where the user may view the scene. Viewpoints are the primary way for a user to navigate within a scene, and for an author to show critical aspects of a model.

- Hint: a list of good **Viewpoint** nodes with clear descriptions can provide a guided tour of the model.
- Hint: currently bound **NavigationInfo** node determines how users navigate after reaching this **Viewpoint**.

Trace    Visualize    Accept    Discard    Feedback    Help

# Shape, Appearance, ImageTexture, url arrays

```
53 <Shape>
54   <Text string=' "Divirta-se com o X3D! " "Have fun with X3D!" '>
55     <FontStyle justify='MIDDLE'>
56   </Text>
57   <Appearance USE='BlackAppearance' />
58 </Shape>
59 <Transform DEF='PortugueseFlagTransform' scale='0.8 0.8 0.8' translation='0 2.6 0'>
60   <Shape>
61     <!-- image is 600px x 400px -->
62     <Box size='6 4 0.01' />
63     <Appearance>
64       <Material />
65       <!-- https://upload.wikimedia.org/wikipedia/commons/thumb/5/5c/Flag_of_Portugal.svg/600px-Flag_of_Portugal.
svg.png -->
66       <ImageTexture DEF='FlagOfPortugalImage' description='Flag of Portugal' url='Flag_of_Portugal.svg.png'
"https://www.web3d.org/x3d/content/examples/X3dForAdvancedModeling>HelloWorldScenes/Flag_of_Portugal.svg.png' />
67     </Appearance>
68   </Shape>
69 </Transform>
70 </Transform>
71 </Anchor>
```

# Shape node editor

Shape  
is the most  
fundamental  
data structure  
for geometry,  
appearance

Edit Shape X3D DEF USE containerField HTML5 id, CSS class style

DEF  OlaShape  containerField  
USE    children

child content	properties	3D geometry	2D geometry		
<input type="radio"/> new nodes <input checked="" type="radio"/> prior nodes <input type="radio"/> no Content	# points <input type="text" value="64"/> height <input type="text" value="1.0"/> radius <input type="text" value="1.0"/> depth <input type="text" value="1"/> level <input style="width: 20px;" type="text" value="0"/> <input type="button" value="▼"/> type <input type="radio"/> primitive <input checked="" type="radio"/> polygons <input type="radio"/> lines <input type="radio"/> points	<input type="radio"/> Box <input type="radio"/> Cone <input type="radio"/> Cylinder <input type="radio"/> Sphere <input type="radio"/> Text <input type="radio"/> Selectable Text <input type="radio"/> Axis Lines	<input type="radio"/> ElevationGrid <input type="radio"/> Extrusion <input type="radio"/> IndexedFaceSet <input type="radio"/> IndexedLineSet <input checked="" type="radio"/> LineSet <input type="radio"/> PointSet	<input type="radio"/> Capsule <input type="radio"/> Conical n-point Polygon <input type="radio"/> Cylindrical n-point Polygon <input type="radio"/> Dodecahedron <input type="radio"/> Hemisphere <input type="radio"/> Icosahedron <input type="radio"/> Rounded Rectangle <input type="radio"/> Tetrahedron	<input type="radio"/> Arc2D <input type="radio"/> ArcClose2D <input type="radio"/> Circle2D <input type="radio"/> Disk2D <input type="radio"/> Polyline2D <input type="radio"/> Polypoint2D <input type="radio"/> Rectangle2D <input type="radio"/> RoundedRectangle2D <input type="radio"/> TriangleSet2D

bboxCenter     
bboxSize

**Shape** contains a single geometry node and a single **Appearance** node.  
Animation hint: replacement child nodes can be **ROUTE**d to *new\_geometry* and *new\_appearance*.

Visualize

# Text and FontStyle node editors

**Edit Text**

X3D DEF USE containerField      HTML5 id, CSS class style

DEF   + containerField  
USE   ?  geometry  ?

solid  Google translate  
length  Wikipedia  
maxExtent  Wiktionary

string array  
#  
0

string values appear on separate lines  
Olá Portugal!

Row edit: All Copy Append Remove Flip Rows --

Insert:  commas,  line breaks after 1  tuples,  append comment

append:  commas,  line feeds

**Text** is a geometry primitive node that must be contained by a **Shape** node.  
String array values (including empty strings) get displayed on separate lines.  
**Text** can contain a **FontStyle** node to control string layout, language and style.

Accept Discard Feedback Help

**Edit FontStyle**

X3D DEF USE containerField      HTML5 id, CSS class style

DEF   + containerField  
USE   ?  fontStyle  ?

	preferred	default	example
horizontal justify	MIDDLE	MIDDLE	BEGIN
vertical justify	MIDDLE	MIDDLE	FIRST
family	SERIF	SERIF	"Times" "SERIF"
style	PLAIN	PLAIN	BOLDITALIC
size	1		
spacing	1		

**Internationalization (i18n)**

language  country codes fr-ca  
horizontal  true  
leftToRight  true  
topToBottom  true

**FontStyle** affects the layout, language and style of its parent **Text** node.  
Full internationalization (i18n) features are available for any written language.  
Hint: **FontStyle** DEF/USE can help achieve consistent text styles in a scene.

Accept Discard Feedback Help

# ImageTexture node editor

url lists can offer relative paths and online addresses for a given asset, providing great reliability that the file can be found at run time for any user

The screenshot shows the 'Edit ImageTexture' dialog box. At the top, there are fields for 'X3D DEF USE containerField' and 'HTML5 id, CSS class style'. Under 'DEF', the value 'FlagOfPortugalImage' is selected. Under 'USE', there is a dropdown menu and a checkbox for 'texture'. Below these are checkboxes for 'repeatS' (checked) and 'repeatT' (checked). To the right, there are buttons for 'append: commas' and 'line feeds'. The 'description' field contains 'Flag of Portugal'. The 'url' section contains two entries: 'Flag\_of\_Portugal.svg.png' and 'Flag\_of\_Portugal.svg'. A note below says 'Ordered list of equivalent url addresses (green=found, red=not found, orange=case mismatch, black=searching..)'. At the bottom, there are buttons for 'Edit url value', 'Append', 'Remove', 'Add url', 'Sort', 'Load, edit', 'Open', 'External editor', 'QA', 'domain', and 'ping'. A note at the very bottom states: 'ImageTexture is contained by Appearance to map an image onto peer geometry'. At the bottom right are buttons for 'Accept', 'Discard', 'Feedback', and 'Help'.

**Viewpoint  
isBound**

# Animation chain **events**: OrientationInterpolator, TimeSensor, ROUTEs, destination Transform

**Transform  
rotation**

```

72   <OrientationInterpolator DEF='SpinInterpolator' key='0 0.3333 0.6667 1'
73   |           keyValue='0 1 0 0 0 1 0 2.094395 0 1 0 4.18879 0 1 0 0' />
74   |   <TimeSensor DEF='SpinClock' cycleInterval='4' enabled='false' loop='true' />
75   |       <ROUTE fromField='isBound' fromNode='ViewpointRotation' toField='enabled' toNode='SpinClock' />
76   |       <ROUTE fromField='fraction_changed' fromNode='SpinClock'
77   |           toField='set_fraction' toNode='SpinInterpolator' />
78   |       <ROUTE fromField='value_changed' fromNode='SpinInterpolator'
79   |           toField='set_rotation' toNode='PortugueseFlagTransform' />
80   </Scene>
81 </X3D>

```

**ROUTES define  
event connections**

Event Graph ROUTE Table entries with 3 ROUTE connections total, showing X3D event-model relationships for this scene.

Each row shows an event cascade that may occur during a single timestamp interval between frame renderings, as part of the X3D execution model.

ViewpointRotation	→	SpinClock	then	SpinClock	→	SpinInterpolator	then	SpinInterpolator	→	PortugueseFlagTransform
Viewpoint <u>isBound</u> SFBool	ROUTE	TimeSensor <u>enabled</u> SFBool		TimeSensor <u>fraction_changed</u> SFFloat	ROUTE	OrientationInterpolator <u>set_fraction</u> SFFloat		OrientationInterpolator <u>value_changed</u> SFRotation	ROUTE	Transform <u>set_rotation</u> SFRotation

Anchor	description='Wikipedia: Tourism in Portugal' User-interaction hint for this node.
--------	--

Additional guidance on X3D animation can be found in the 10-Step Animation Design Process and Event Tracing hint sheets. Have fun with X3D! 😊

# X3D Model Documentation

HTML generated directly from the X3D model

- DEF names are bookmarks, USE names are links, table of contents
- Line numbers are also linked
- Color coding for nodes (XML elements) and fields (XML attributes)
- Links for url values and relative files, for images models audio etc.
- Incoming/outgoing ROUTE information, Event graph ROUTE table

For model documentation generated in X3D Example Archives, also includes links to online distribution and version control



These improved features will be in next X3D-Edit plugin release

```

1  <?xml version="1.0" encoding="UTF-8"?>
2  <!DOCTYPE X3D PUBLIC "ISO//Web3D//DTD X3D 4.0//EN" "https://www.web3d.org/specifications/x3d-4.0.dtd">
3  <X3D profile='Immersive' version='4.0' xmlns:xsd='http://www.w3.org/2001/XMLSchema-instance' xsd:noNamespaceSchemaLocation='"https://www.web3d.org/specifications/x3d-4.0.xsd">
4  <head>
5    <meta name='title' content='HelloPortugal.x3d'/>
6    <meta name='description' content='HelloPortugal example scene to show Portuguese special characters, built for Web3D 2024 Conference Tutorial.'/>
7    <meta name='creator' content='Don Brutzman' />
8    <meta name='created' content='24 September 2024' />
9    <meta name='modified' content='30 September 2024' />
10   <meta name='subject' content='Hello World, Portugal' />
11   <meta name='reference' content='"https://en.wikipedia.org/wiki/Portugal"' />
12   <meta name='Image' content='"https://en.wikipedia.org/wiki/Portugal#/media/File:Flag\_of\_Portugal.svg"' />
13   <meta name='Image' content='"https://upload.wikimedia.org/wikipedia/commons/thumb/5/5c/Flag\_of\_Portugal.svg/600px-Flag\_of\_Portugal.svg.png"' />
14   <meta name='Image' content='"images>HelloPortugalCastleModelViewer.png"' />
15   <meta name='Image' content='"images>HelloPortugalFreeWRL.png"' />
16   <meta name='Image' content='"images>HelloPortugalH3DViewer.png"' />
17   <meta name='Image' content='"images>HelloPortugalInstantReality.png"' />
18   <meta name='Image' content='"images>HelloPortugalOctaga.png"' />
19   <meta name='reference' content='Completed https://github.com/castle-engine/view3dscene/issues/30#issuecomment-630715046' />
20   <meta name='TODO' content='Xj3D bugfix images/HelloPortugalXj3d.png' />
21   <meta name='Image' content='"images>HelloPortugalX\_ITE.png"' />
22   <meta name='Image' content='"images>HelloPortugalX\_ITEPlayground.png"' />
23   <meta name='Image' content='"images>HelloPortugalX3DOM.png"' />
24   <meta name='Image' content='"images>HelloPortugalX3DOMEdition.png"' />
25   <meta name='reference' content='"https://www.w3.org/International"' />
26   <meta name='reference' content='"https://de.wikipedia.org/wiki/Liste\_von\_Hallo-Welt-Programmen/H%C3%B6here\_Programmiersprachen"' />
27   <meta name='reference' content='"https://en.wikipedia.org/wiki/Percent-encoding"' />
28   <meta name='reference' content='"https://helloworldcollection.de/#VRML"' />
29   <meta name='reference' content='"https://en.wiktionary.org/wiki/Hello\_World"' />
30   <meta name='reference' content='"https://en.wikipedia.org/wiki/%22Hello,%20World!%22\_program"' />
31   <meta name='reference' content='"https://en.wikibooks.org/w/index.php?title=Computer\_Programming/Hello\_world"' />
32   <meta name='reference' content='"https://www.youtube.com/channel/UCSOnGlgAFxkWg8ilg-JEbAQ"' />
33   <meta name='identifier' content='"https://www.web3d.org/x3d/content/examples/X3dForAdvancedModeling>HelloWorldScenes>HelloPortugal.x3d"' />
34   <meta name='generator' content='X3D-Edit 4.0, https://savage.nps.edu/X3D-Edit' />
35   <meta name='license' content='"./license.html"' />
36 </head>

```

# X3D Model Documentation in HTML, 1

(online)

**Index for DEF nodes:** [BlackAppearance](#), [FlagOfPortugalImage](#), [PortugueseFlagTransform](#), [SpinClock](#), [SpinInterpolator](#), [ViewpointEntry](#), [ViewpointRotation](#)



**Index for Viewpoint nodes:** [ViewpointEntry](#), [ViewpointRotation](#)

```
35 <Scene>
36   <WorldInfo title='HelloPortugal.x3d'/>
37   <Background skyColor='1 0.835294 0.258824' />
38   <Viewpoint DEF='ViewpointEntry' description='Olá Portugal! Divirta-se com o X3D!' />
39     <!-- ROUTE information for ViewpointRotation node: [from isBound to SpinClock.enabled] -->
40   <Viewpoint DEF='ViewpointRotation' description='rotate the flag' />
41   <Anchor description='Wikipedia: Tourism in Portugal' url=' "https://en.wikipedia.org/wiki/Tourism_in_Portugal" ' />
42     <Transform translation='0 -2 0' />
43       <Transform translation='0 4.8 0' />
44         <Shape>
45           <Text string='Olá Portugal!'>
46             <!-- https://translate.google.com/?sl=auto&tl=pt-PT&text=Hello%20World!&op=translate -->
47             <FontStyle justify='MIDDLE' style='MIDDLE' />
48           </Text>
49             <!-- Appearance BlackAppearance is a DEF node that has 1 USE node: USE_1 -->
50             <Appearance DEF='BlackAppearance'>
51               <Material diffuseColor='0.01 0.4 0.01' />
52             </Appearance>
53           </Shape>
54         </Transform>
55         <Shape>
56           <Text string='Divirta-se com o X3D!' "Have fun with X3D!">
57             <FontStyle justify='MIDDLE' style='MIDDLE' />
58           </Text>
59           <Appearance USE='BlackAppearance' />
60         </Shape>
```

# X3D Model Documentation in HTML, 2

(online)

# X3D Model Documentation in HTML, 3 (online)

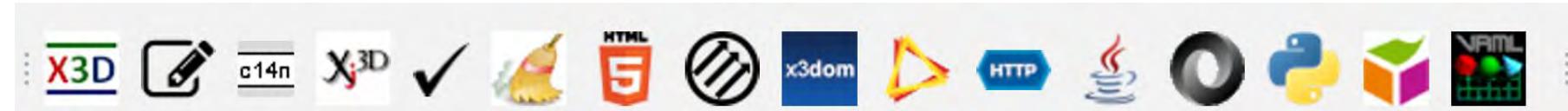
```
59    <!-- ROUTE information for PortugueseFlagTransform node: [from SpinInterpolator.value_changed to set_rotation] -->
60    <Transform DEF='PortugueseFlagTransform' scale='0.8 0.8 0.8' translation='0 2.6 0'>
61        <Shape>
62            <!-- image is 600px x 400px -->
63            <Box size='6 4 0.01' />
64            <Appearance>
65                <Material/>
66                <!-- https://upload.wikimedia.org/wikipedia/commons/thumb/5/5c/Flag_of_Portugal.svg/600px-Flag_of_Portugal.svg.png -->
67                <ImageTexture DEF='FlagOfPortugalImage' description='Flag of Portugal' url=' "Flag_of_Portugal.svg.png" "https://www.web3d.org/x3d/content/
examples/X3dForAdvancedModeling>HelloWorldScenes/Flag_of_Portugal.svg.png' '/>
68            </Appearance>
69        </Shape>
70    </Transform>
71</Anchor>
72    <!-- ROUTE information for SpinInterpolator node: [from SpinClock.fraction_changed to set_fraction]
73    [from value_changed to PortugueseFlagTransform.set_rotation] -->
74    <OrientationInterpolator DEF='SpinInterpolator' key='0 0.3333 0.6667 1' keyValue='0 1 0 0 0 1 0 2.094395 0 1 0 4.18879 0 1 0 0' />
75    <!-- ROUTE information for SpinClock node: [from ViewpointRotation.isBound to enabled] [from fraction_changed to SpinInterpolator.set_fraction] -->
76    <TimeSensor DEF='SpinClock' cycleInterval='4' enabled='false' loop='true' />
77    <ROUTE fromNode='ViewpointRotation' fromField='isBound' toNode='SpinClock' toField='enabled' />
78    <ROUTE fromNode='SpinClock' fromField='fraction_changed' toNode='SpinInterpolator' toField='set_fraction' />
79    <ROUTE fromNode='SpinInterpolator' fromField='value_changed' toNode='PortugueseFlagTransform' toField='set_rotation' />
80</Scene>
81</X3D>
```

# Xj3D



- Xj3D is an open-source browser and application programming interface written in Java for X3D and VRML97 graphics scenes.
- Original developers Yumetech, Alan Hudson and Justin Couch
- Codebase transferred to Web3D Consortium, maintained by NPS
- Embedded, launchable viewer integrated in X3D-Edit
- Current releases use the open-source [Jogamp](#) high performance Java libraries for 3D Graphics, Multimedia and Processing. These include modern [Java OpenGL \(JOGL\)](#) rendering and [JOAL](#) spatialized audio.
- <https://savage.nps.edu/Savage/developers.html#Xj3D>
- Generates X3D Binary Encoding .x3db models in X3D Example Archives
- Issue tracker: <https://gitlab.nps.edu/Savage/xj3d/-/issues>

# Workflow



- X3D-Edit User Preferences
- Edit Element (Node, Statement)
- Canonicalization (C14N)
- Xj3D View Refresh
- Validation suite
- X3dTidy cleanup
- X3D Model Documentation
- Launch all browsers
- X3DOM embed in HTML page
- X\_ITE embed in HTML page
- HTTP CORS server, localhost
- Convert to Java
- Convert to JSON
- Convert to Python
- Convert to Semantic Web Turtle
- Convert to ClassicVRML

# Templates

New templates  
ready for editing  
to support new  
X3D applications



- New Hello World model
- New empty scene, metadata
- New
- New X3DOM page
- New HTML5 page
- New ECMAScript source code
- New Java source code
- New XSLT stylesheet
- New Text file

# Explanation: X3D stylesheets using XSLT



- The XML Stylesheet Language for Translations (XSLT) is a programming language, itself expressed in XML, that is great for converting a valid XML document into any other kind of document.
- Multiple stylesheets are provided for checking and converting .x3d (XML encoded) X3D models into equivalent models in VRML97, ClassicVRML, Java source code, Python source code, Turtle, etc.
- Of special note is creation of X3D Model Documentation pages that take full advantage of HTML5 capabilities.
- All of these stylesheets are provided as part of regression testing for the entire X3D Examples Archives.

# X3D Tidy for Scene Cleanup, Corrections, Modifications



- X3D Tidy is an XSLT stylesheet that checks for simple authoring difficulties in X3D scenes and fixes them.
- Authors can use X3D Tidy to fix minor errors and apply best practices for authoring. X3D Tidy provides additional Quality Assurance (QA) that helps achieve intended results in X3D scenes and metadata.
- X3D Tidy takes an .x3d scene (written in X3D XML encoding) as input, then returns a modified .x3d scene as output. Any corrections are applied in place without changing the overall formatting or layout of the original X3D scene.
- X3D Tidy warns but does not attempt to make scene corrections which might change intended scene content or require an authoring decision.
- <https://www.web3d.org/x3d/stylesheets/X3dTidy.html>

# X3D Canonicalizer for XML Canonicalization (C14N)

c14n

- X3D Canonicalizer reformats .x3d files to match normalization requirements for [XML Canonicalization \(C14N\)](#), for example
  - Two blank characters for whitespace indent, single vice double quotes, include X3D Schema and DOCTYPE, omit default and empty attribute values, singleton elements, comments preserved (optionally)
  - Exact rules found in X3D Compressed Binary Encoding, [X3D Canonical Form](#)
- This helps with difference comparisons (diff) in version control and as a prerequisite to XML Digital Signature or XML Encryption
- The acronym “c14n” stands for 14 letters between “c” and “n” in the word “[canonicalization](#)” – note that [localization](#) (l10n) is also possible.
- <https://svn.code.sf.net/p/x3d/code/www.web3d.org/x3d/tools/canonical/doc/x3dTools.htm>

# X3D to HTML5, creating Model Documentation

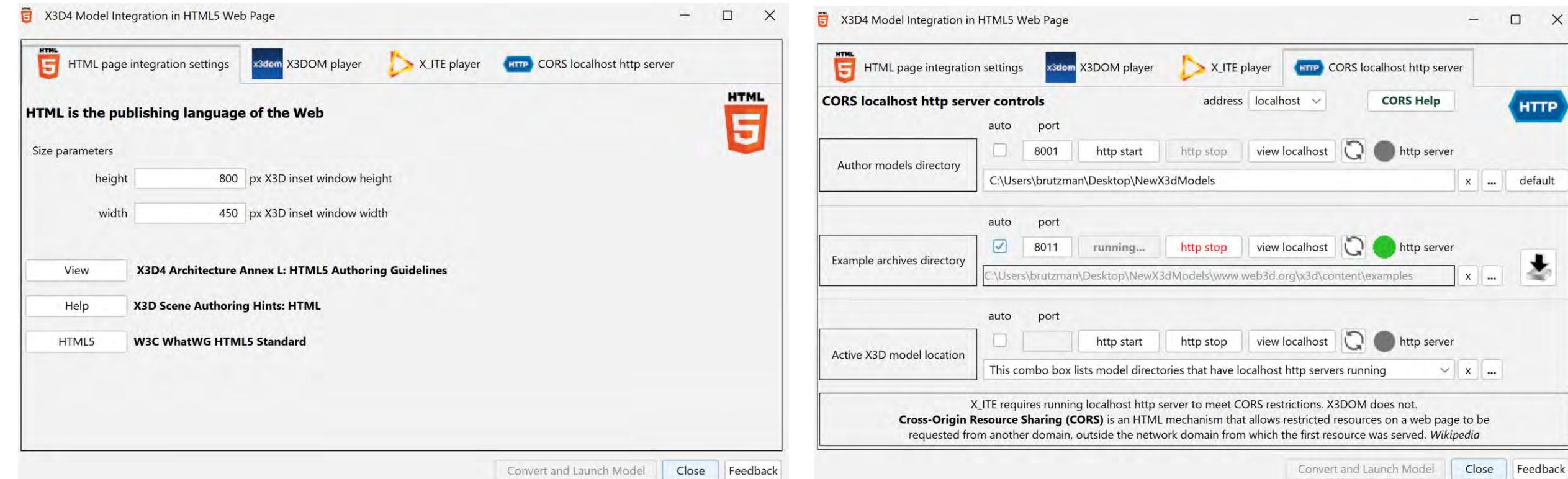


- Formerly called “X3D pretty print,” this capability has steadily increased in functionality to point where it can now be considered full-fledged X3D Model Documentation
- Features include links, color coding, tooltips, HAnim diagnostics, etc.
- Available in X3D-Edit, other application uses are welcome
- Provided as part of production of entire X3D Examples Archives.
- Example:  
<https://www.web3d.org/x3d/content/examples/X3dForAdvancedModeling>HelloWorldScenes>HelloPortugal.html>

Color legend: X3D terminology <X3dNode DEF='idName' field='value'> matches XML terminology <XmlElement DEF='idName' attribute='value'>

(Light-blue background: event-based behavior node or statement) (Grey background inside box: inserted documentation) (Magenta background: X3D Extensibility)

# X3D-Edit publishing X3D model to HTML page



- Size of X3D inset within HTML page for local publication testing
- Local http server to safely meet CORS security constraints

# X3D Model Documentation

## Hello Portugal.html

1

```

1 <?xml version="1.0" encoding="UTF-8"?>
2 <!DOCTYPE X3D PUBLIC "ISO//Web3D//DTD X3D 4.0//EN" "https://www.web3d.org/specifications/x3d-4.0.dtd">
3 <X3D profile='Immersive' version='4.0' xmlns:xsd='http://www.w3.org/2001/XMLSchema-instance' xsd:noNamespaceSchemaLocation="https://www.web3d.org/specifications/x3d-4.0.xsd">
4   <head>
5     <meta name='title' content='HelloPortugal.x3d'/>
6     <meta name='description' content='HelloPortugal example scene to show Portuguese special characters, built for Web3D 2024 Conference Tutorial.'/>
7     <meta name='creator' content='Don Brutzman' />
8     <meta name='created' content='24 September 2024' />
9     <meta name='modified' content='30 September 2024' />
10    <meta name='subject' content='Hello World, Portugal' />
11    <meta name='reference' content='https://en.wikipedia.org/wiki/Portugal' />
12    <meta name='Image' content='https://en.wikipedia.org/wiki/Portugal#/media/File:Flag_of_Portugal.svg' />
13    <meta name='Image' content='https://upload.wikimedia.org/wikipedia/commons/thumb/5/5c/Flag_of_Portugal.svg/600px-Flag_of_Portugal.svg.png' />
14    <meta name='Image' content='images/HelloPortugalCastleModelViewer.png' />
15    <meta name='Image' content='images/HelloPortugalFreeWRL.png' />
16    <meta name='Image' content='images/HelloPortugalH3DViewer.png' />
17    <meta name='Image' content='images/HelloPortugalInstantReality.png' />
18    <meta name='Image' content='images/HelloPortugalOctaga.png' />
19    <meta name='reference' content='Completed https://github.com/castle-engine/view3dscape/issues/30#issuecomment-630715046' />
20    <meta name='TODO' content='Xj3D bugfix images/HelloPortugalXj3d.png' />
21    <meta name='Image' content='images>HelloPortugalX_ITE.png' />
22    <meta name='Image' content='images>HelloPortugalX_ITEPlayground.png' />
23    <meta name='Image' content='images>HelloPortugalX3DOM.png' />
24    <meta name='Image' content='images>HelloPortugalX3DOMEditor.png' />
25    <meta name='reference' content='https://www.w3.org/International' />
26    <meta name='reference' content='https://de.wikipedia.org/wiki/Liste_von_Hallo-Welt-Programmen/H%C3%B6here_Programmiersprachen' />
27    <meta name='reference' content='https://en.wikipedia.org/wiki/Percent-encoding' />
28    <meta name='reference' content='https://helloworldcollection.de/#VRML' />
29    <meta name='reference' content='https://en.wiktionary.org/wiki/Hello_World' />
30    <meta name='reference' content='https://en.wikipedia.org/wiki/%22Hello,%20World!%22_program' />
31    <meta name='reference' content='https://en.wikibooks.org/w/index.php?title=Computer_Programming/Hello_world' />
32    <meta name='reference' content='https://www.youtube.com/channel/UCSONgAFxkWg8ilg-JEbAQ' />
33    <meta name='identifier' content='https://www.web3d.org/x3d/content/examples/X3dForAdvancedModeling>HelloWorldScenes>HelloPortugal.x3d' />
34    <meta name='generator' content='X3D-Edit 4.0, https://savage.nps.edu/X3D-Edit' />
35    <meta name='license' content='..//license.html' />
36  </head>

```

[Event Graph ROUTE Table](#) shows event connections.

*Index for DEF nodes:* [BlackAppearance](#), [FlagOfPortugalImage](#), [OlaShape](#), [PortugueseFlagTransform](#), [SpinClock](#), [SpinInterpolator](#), [ViewpointEntry](#), [ViewpointRotation](#)

*Index for Viewpoint nodes:* [ViewpointEntry](#), [ViewpointRotation](#)



# X3D Model Documentation

## Hello Portugal.html

2

```
35 <Scene>
36   <WorldInfo title='HelloPortugal.x3d' />
37   <Background skyColor='1 0.835294 0.258824' />
38   <Viewpoint DEF='ViewpointEntry' description='Olá Portugal! Divirta-se com o X3D!' />
39   <!-- ROUTE information for ViewpointRotation node: [from isBound to SpinClock.enabled] -->
40   <Viewpoint DEF='ViewpointRotation' description='rotate the flag' />
41   <Anchor description='Wikipedia: Tourism in Portugal' url=' "https://en.wikipedia.org/wiki/Tourism_in_Portugal" '>
42     <Transform translation='0 -2 0' />
43     <Transform translation='0 4.8 0' />
44     <Shape>
45       <Text string='Olá Portugal!'>
46         <!-- https://translate.google.com/?sl=auto&tl=pt-PT&text=Hello%20World!&op=translate -->
47         <FontStyle justify='MIDDLE' MIDDLE />
48       </Text>
49       <!-- Appearance BlackAppearance is a DEF node that has 1 USE node: USE_1 -->
50       <Appearance DEF='BlackAppearance'>
51         <Material diffuseColor='0.01 0.4 0.01' />
52       </Appearance>
53     </Shape>
54     <Transform>
55       <Text string='Divirta-se com o X3D! Have fun with X3D!'>
56         <FontStyle justify='MIDDLE' MIDDLE />
57       </Text>
58       <Appearance USE='BlackAppearance' />
59     </Transform>
60     <!-- ROUTE information for PortugueseFlagTransform node: [from SpinInterpolator.value_changed to set_rotation] -->
61     <Transform DEF='PortugueseFlagTransform' scale='0.8 0.8 0.8' translation='0 2.6 0'>
62       <Shape>
63         <!-- image is 600px x 400px -->
64         <Box size='6 4 0.01' />
65         <Appearance>
66           <Material />
67           <!-- https://upload.wikimedia.org/wikipedia/commons/thumb/5/5c/Flag_of_Portugal.svg/600px-Flag_of_Portugal.svg.png -->
68           <ImageTexture DEF='FlagOfPortugalImage' description='Flag of Portugal' url=' "Flag_of_Portugal.svg.png" '
69             "https://www.web3d.org/x3d/content/examples/X3dForAdvancedModeling>HelloWorldScenes/Flag_of_Portugal.svg.png" '>
70         </Appearance>
71       </Shape>
72     </Transform>
73   </Anchor>
74   <!-- ROUTE information for SpinInterpolator node: [from SpinClock.fraction_changed to set_fraction] [from value_changed to PortugueseFlagTransform.set_rotation] -->
75   <OrientationInterpolator DEF='SpinInterpolator' key='0 0.3333 0.6667 1' keyValue='0 1 0 0 1 0 2.094395 0 1 0 4.18879 0 1 0 0' />
76   <!-- ROUTE information for SpinClock node: [from ViewpointRotation.isBound to enabled] [from fraction_changed to SpinInterpolator.set_fraction] -->
77   <TimeSensor DEF='SpinClock' cycleInterval='4' enabled='false' loop='true' />
78   <ROUTE fromNode='ViewpointRotation' fromField='isBound' toNode='SpinClock' toField='enabled' />
79   <ROUTE fromNode='SpinClock' fromField='fraction_changed' toNode='SpinInterpolator' toField='set_fraction' />
80   <ROUTE fromNode='SpinInterpolator' fromField='value_changed' toNode='PortugueseFlagTransform' toField='set_rotation' />
81 </Scene>
82 </X3D>
```

# X3D Model Documentation

## Hello Portugal.html

3

[Event Graph ROUTE Table](#) shows event connections.

*Index for DEF nodes:* [BlackAppearance](#), [FlagOfPortugalImage](#), [PortugueseFlagTransform](#), [SpinClock](#), [SpinInterpolator](#), [ViewpointEntry](#), [ViewpointRotation](#)

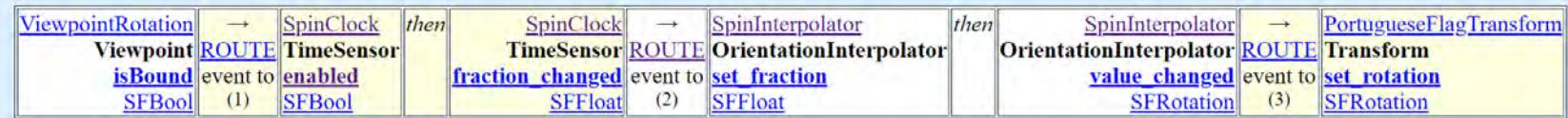


*Index for Viewpoint nodes:* [ViewpointEntry](#), [ViewpointRotation](#)

*X3D Tooltips element index:* [Anchor](#), [Appearance](#), [Background](#), [Box](#), [FontStyle](#), [head](#), [ImageTexture](#), [Material](#), [meta](#), [OrientationInterpolator](#), [ROUTE](#), [Scene](#), [Shape](#), [Text](#), [TimeSensor](#), [Transform](#), [Viewpoint](#), [WorldInfo](#), [X3D](#), [accessType](#) and [type](#), [XML data types](#), [field types](#)

[Event Graph ROUTE Table](#) entries with 3 [ROUTE](#) connections total, showing [X3D event-model relationships](#) for this scene.

Each row shows an [event cascade](#) that may occur during a single [timestamp](#) interval between frame renderings, as part of the [X3D execution model](#).



description='Wikipedia: Tourism in Portugal'  
Anchor User-interaction hint for this node.

Additional guidance on X3D animation can be found in the [10-Step Animation Design Process](#) and [Event Tracing](#) hint sheets. Have fun with X3D! 😊

Online at

<https://www.web3d.org/x3d/content/examples/X3dForAdvancedModeling>HelloWorldScenes>HelloPortugalIndex.html>

Version control at

<https://sourceforge.net/p/x3d/code/HEAD/tree/www.web3d.org/x3d/content/examples/X3dForAdvancedModeling>HelloWorldScenes>HelloPortugal.x3d>

Color legend: X3D terminology <X3dNode DEF='idName' field='value'> matches XML terminology <XmlElement DEF='idName' attribute='value'>  
(Light-blue background: event-based behavior node or statement) (Grey background inside box: inserted documentation) (Magenta background: X3D Extensibility)

# X3D Player Playground Editor

XITE

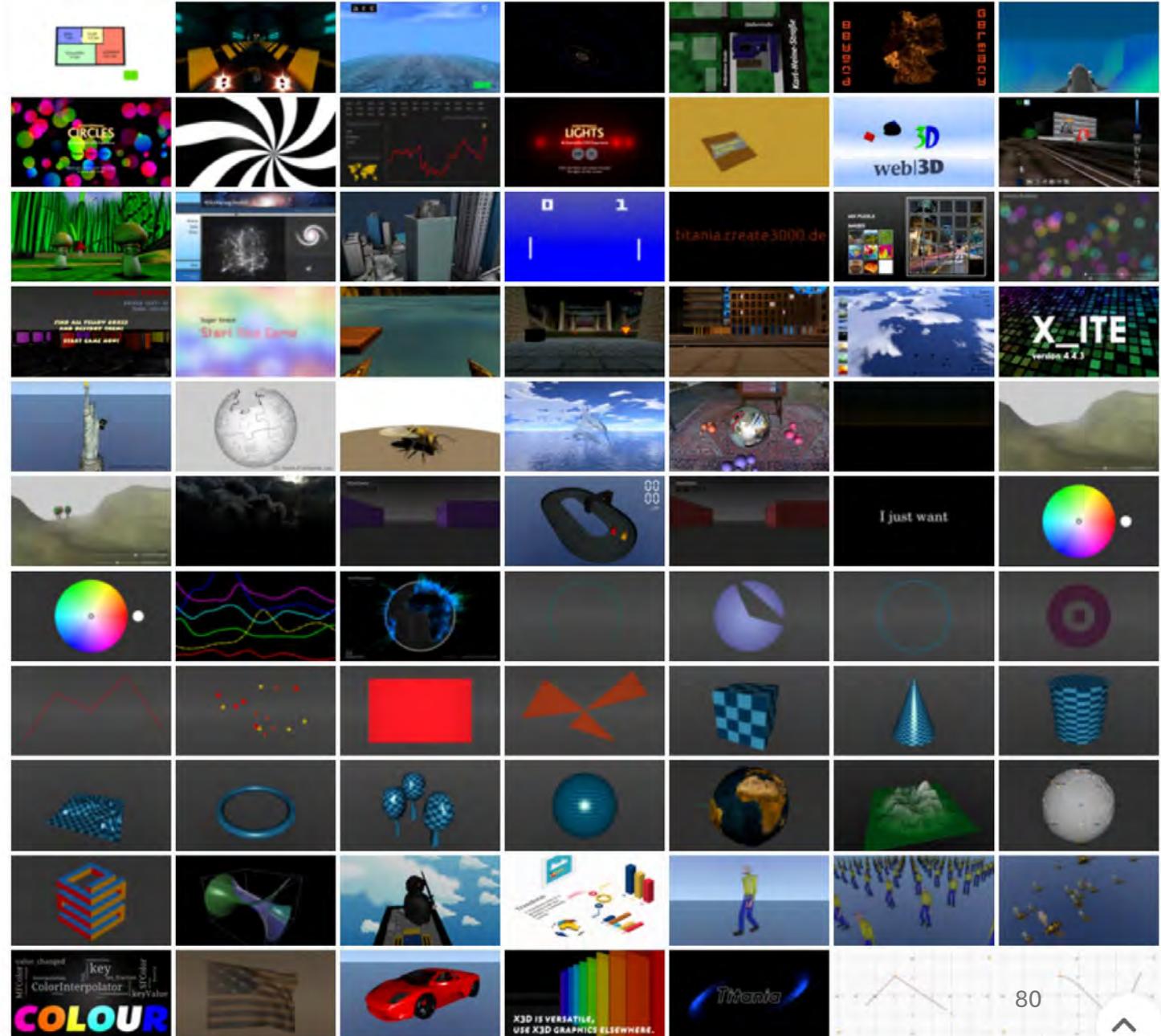


## X ITE X3D Browser

Ready for X3Dv4!

- [HOME](#)
- [COMPONENTS](#)
- [SCRIPTING  
REFERENCE](#)
- [TUTORIALS](#)
- [PLAYGROUND](#)
- [LABORATORY](#)
- [EDITOR](#)
- [TAGS](#)

## X3D Examples



# X3D browser rendering in HTML5 with X\_ITE



X3D4 Model Integration in HTML5 Web Page

HTML 5 X3DOM player X\_ITE player HTTP CORS localhost http server

**X\_ITE renderer in HTML page for X3D model**

cache  Whether to cache remote files on local computer

url  
C:/x3d-code/www.web3d.org/x3d/content/examples/X3dForAdvancedModeling>HelloWorldScenes/HelloPortugal.x3d

< Edit url value Append Remove Add urls Sort >

Load, edit Open External editor QA domain ping

**X\_ITE X3D Browser** "Step Into The Future" X\_ITE is an open-source 3D JavaScript library using WebGL for 3D rendering. Authors can publish X3D and VRML source online within an HTML5 page by using X\_ITE, without prior plugin installation.

Convert and Launch Model Close Feedback

Export X3D Model as HTML5 via XSLT, rendered with X3DOM or X\_ITE

Save In: HelloWorldScenes

Recent Items

- HelloPortugal.ttl
- HelloPortugal.wrl
- HelloPortugal.x3d
- HelloPortugal.x3db
- HelloPortugal.x3dv
- HelloPortugalCanonical.xml
- HelloPortugalIndex.html
- HelloPortugalX\_ITE.html
- HelloPortugalX3dom.xhtml

Desktop

Documents

This PC

Network

File Name: HelloPortugalX\_ITE.html

Files of Type: All Files

Save Cancel

Open result in browser

Open result in editor

<https://www.web3d.org/x3d/content/examples/X3dForAdvancedModeling>HelloWorldScenes>HelloPortugalX ITE.html>

X ITE X3D Player HelloPortugal example scene to show Portuguese special characters, built for Web3D 2024 Conference Tutorial.

Wikipedia: Tourism in Portugal

# Olá Portugal!



Divirta-se com o X3D!  
Have fun with X3D!

Original X3D scene: HelloPortugal.x3d

# Live editing with X\_ITE Playground

## XML encoding

The screenshot shows the X\_ITE X3D Browser interface. On the left, there's a sidebar with the title "Live editing with X\_ITE Playground". The main area displays a 3D scene with a purple background. The scene features a 3D Portuguese flag and text in Portuguese and English: "Olá Portugal!", "Divirta-se com o X3D!", and "Have fun with X3D!". Below the scene, a "Welcome to X\_ITE X3D Browser v10.5.3:" message provides system information, including the graphics renderer (Google Inc. (Intel) ANGLE), WebGL version (2.0), shading language (WebGL GLSL ES 3.00), and rendering properties like antialiasing and depth size. On the right, the XML code for the scene is shown, with line numbers from 3 to 56. A green arrow points from the search bar at the top right to the XML tab, which is highlighted.

```
3   <X3D profile='Immersive' version='4.0' xmlns:xsd='http://www.
4     <head>
5       <meta name='generator' content='X3D-Edit 4.0, https://
6         savage.nps.edu/X3D-Edit'/>
7       <meta name='license' content='../license.html'/>
8     </head>
9     <Scene>
10    <WorldInfo
11      title='HelloPortugal.x3d'/>
12    <Background
13      skyColor='.7 .7 1'>
14    <Viewpoint DEF='ViewpointEntry'
15      description='Olá Portugal! Divirta-se com o X3D!'/>
16    <Viewpoint DEF='ViewpointRotation'
17      description='rotate the flag'/>
18    <Anchor
19      description='Wikipedia: Tourism in Portugal'
20      url='https://en.wikipedia.org/wiki/Tourism_in_Portugal'>
21    <Transform
22      translation='0 -2 0'>
23    <Transform
24      translation='0 4.8 0'>
25    <Shape>
26      <Appearance DEF='BlackAppearance'>
27        <Material
28          diffuseColor='0.01 0.4 0.01'/>
29      </Appearance>
30      <Text
31        text='Olá Portugal!
32        Divirta-se com o X3D!
33        Have fun with X3D!
34      </Text>
35    </Shape>
36  </Background>
37 </WorldInfo>
38 </Scene>
39 </X3D>
```

# Live editing with X\_ITE Playground

# Classic VRML encoding



```
32 META "generator" "X3D-Edit 4.0, https://savage.nps.edu/X3D-Edit"  
33 META "license" "../license.html"  
34  
35 WorldInfo {  
36   title "HelloPortugal.x3d"  
37 }  
38  
39 Background {  
40   skyColor 0.7 0.7 1  
41 }  
42  
43 DEF ViewpointEntry Viewpoint {  
44   description "Olá Portugal! Divirta-se com o X3D!"  
45 }  
46  
47 DEF ViewpointRotation Viewpoint {  
48   description "rotate the flag"  
49 }  
50  
51 Anchor {  
52   description "Wikipedia: Tourism in Portugal"  
53   url "https://en.wikipedia.org/wiki/Tourism\_in\_Portugal"  
54   children Transform {  
55     translation 0 -2 0  
56     children [  
57       Transform {  
58         translation 0 4.8 0  
59         children Shape {
```

# Live editing with X\_ITE Playground

## JSON encoding

Home > Playground

Auto Update

Olá Portugal!



Divirta-se com o X3D!  
Have fun with X3D!

Welcome to X\_ITE X3D Browser v10.5.3:

Current Graphics Renderer

- Name: Google Inc. (Intel) ANGLE (Intel, Intel(R) UHD Graphics (0x00009A6))
- WebGL version: WebGL 2.0 (OpenGL ES 3.0 Chromium)
- Shading language: WebGL GLSL ES 3.00 (OpenGL ES GLSL ES 3.0 Chromium)
- WebXR: true

Rendering Properties

- Antialiased: true
- Max samples: 16
- Depth size: 24 bits
- Color depth: 128 bits
- Max clip planes per shape: 6
- Max lights per shape: 8
- Max textures per shape: 4

XML · VRML · JSON

```
1 { "X3D": {
  7   "head": {
  8     "meta": [
120       ],
121       {
122         "@name": "license",
123         "@content": "../license.html"
124       }
125     ],
126   },
127   "Scene": {
128     "-children": [
129       {
130         "WorldInfo": {
131           "@title": "HelloPortugal.x3d"
132         }
133       },
134       {
135         "Background": {
136           "@skyColor": [
137             0.7, 0.7, 1
138           ]
139         }
140       },
141       {
142         "Viewpoint": {
143           "@DEF": "ViewpointEntry",
144           "@description": "Olá Portugal! Divirta-se com o X3D!"
145         }
146       }
147     ]
148   }
149 }
```

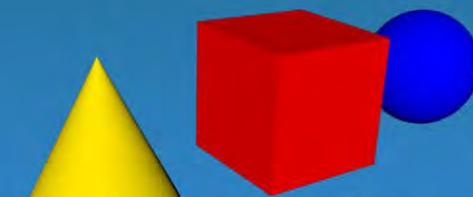
# X3DOM [x3dom.org](http://x3dom.org) (rhymes with “freedom”)



News & User's Apps   Get it   See it   Documentation ▾   Get involved  
Browser Support   Profile

Fork me on GitHub

Integrate 3D content seamlessly into your webpage - the scene is directly written into the HTML markup. No Plugins needed. Simply include a javascript file. Free for non-commercial and commercial purposes.



Place 3D data anywhere you like

The 3d context can be created without background or borders.  
Don't believe it? Just try to move the geometric objects next to this  
text...

Learn more

**Declarative**  
Scenegraph  
Part of HTML-document  
DOM Integration  
CSS/ Events



**Imperative**  
Procedural API  
Drawing context



SVG, canvas, WebGL and X3DOM relation

# Launch X3D browser rendering in HTML5 with X3DOM ([HelloPortugalX3dom.xhtml](#))

File Edit View Navigate Source Refactor Run Debug Profile Team Tools Window X3D-Edit Help X3D examples: X3dForAdvancedModeling - Apache NetBeans IDE 23 Search (Ctrl+I)

New File... (Ctrl+N) V2L1LOA4OnlyMarkers.x3d X3dTidy.xslt Flag\_of\_Portugal.svg.png X3dToXhtml.xslt HelloWorld.x3d newHtmlWrapper.html Pirouette.bvh Pirouette.bvh.txt HelloPortugal.x3d

X3D c14n X3D HTML 5 x3dom XITE HTTP Python VRML X3D X3D

Projects - X3D Examples, Schemas, Stylesheets, Tools Services Files Services

31 <meta content='https://www.web3d.org/x3d/content/examples/X3dForAdvancedModeling>HelloWorldScenes>HelloPortugal.x3d' name='identifier'/>  
32 <meta content='X3D-Edit 4.0, https://savage.nps.edu/X3D-Edit' name='generator'/>  
33 <meta content='..license.html' name='license'/>  
34 </head>  
35 <Scene>  
36 <WorldInfo title='HelloPortugal.x3d'/>  
37 <Background skyColor='1 0.835294 0.258824'/>  
38 <Viewpoint DEF='ViewpointEntry' description=''/>  
39 <Viewpoint DEF='ViewpointRotation' description=''/>  
40 <Anchor description='Wikipedia: Tourism in Portugal' url='https://en.wikipedia.org/w/index.php?title=Tourism\_in\_Portugal&oldid=910000000' type='Text'/>  
41 <Transform translation='0 -2 0'>  
42 <Transform translation='0 4.8 0'>  
43 <Shape>  
44 <Text string='Olá Portugal!'>  
45 <!-- https://translate.google.com/ -->  
46 <FontStyle justify='MIDDLE' style='italic' size='18' color='black'>  
47 </Text>  
48 <Appearance DEF='BlackAppearance'>  
49 <Material diffuseColor='0.01 0.01 0.01' ambientColor='0.01 0.01 0.01' transparency='0.5'>  
50 </Appearance>  
51 </Shape>  
52 </Transform>  
53 <Shape>  
54 <Text string='Divirta-se com o X3D!'>  
55 <FontStyle justify='MIDDLE' style='italic' size='18' color='black'>  
56 </Text>  
57 <Appearance USE='BlackAppearance'>  
58 </Shape>  
59 <Transform DEF='PortugueseFlagTransformation'>  
60 <Shape>  
61 <!-- image is 600px x 400px -->  
62 <Box size='6 4 0.01'>  
63 <Appearance>  
64 <Material/>  
65 <!-- https://upload.wikimedia.org/wikipedia/commons/thumb/5/5c/Flag\_of\_Portugal.svg/600px-Flag\_of\_Portugal.svg.png -->  
66 <ImageTexture DEF='FlagOfPortugalImage' description='Flag of Portugal' url='Flag\_of\_Portugal.svg.png' "https://www.web3d.org/x3d/content/examples/X3dForAdvancedModeling>HelloWorldScenes>HelloPortugal.x3d'>  
67 </Appearance>

X3D4 Model Integration in HTML5 Web Page

HTML page integration settings X3DOM player XITE player CORS localhost http server

X3DOM renderer in HTML page X3DOM Home X3DOM Help x3dom Instant 3D the HTML way!

showLog  Whether to display the logging console  
showStatistics  Whether to display the statistics overlay  
showProgress  Whether to display the loading indicator  
primitiveQuality High Render quality (geometry tessellation level) for Box, Cone, Cylinder, Sphere

Export X3D Model as HTML5 via XSLT, rendered with X3DOM or XITE

Save In: HelloWorldScenes

Recent Items: HelloPortugal.ttl, HelloPortugal.wrl, HelloPortugal.x3d, HelloPortugal.x3db, HelloPortugal3dv, HelloPortugalCanonical.xml, HelloPortugalIndex.html, HelloPortugalXITE.html, HelloPortugalX3dom.xhtml

Open result in browser

Open result in editor

File Name: HelloPortugalX3dom.xhtml

Files of Type: All Files

Convert and Launch Model Close Feedback Save Cancel

X3DOM (pronounced like X-Freedom) integrates 3D content seamlessly into your webpage - the scene is directly written into the HTML markup.  
No plugins are needed, simply include a javascript file. Free for non-commercial and commercial purposes.

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HelloPortugal example scene to show Portuguese special characters, built for Web3D 2024 Conference Tutorial.



## Viewing in HTML with X3DOM

### X3D Scene Metadata

archive <https://www.web3d.org/x3d/content/examples/X3dForAdvancedModeling>HelloWorldScenes>

title HelloPortugal.x3d

description HelloPortugal example scene to show Portuguese special characters, built for Web3D 2024 Conference Tutorial.

creator Don Brutzman

created 24 September 2024

modified 24 September 2024

subject Hello World, Portugal

reference <https://en.wikipedia.org/wiki/Portugal>

Image [https://en.wikipedia.org/wiki/Portugal#/media/File:Flag\\_of\\_Portugal.svg](https://en.wikipedia.org/wiki/Portugal#/media/File:Flag_of_Portugal.svg)

Image [https://upload.wikimedia.org/wikipedia/commons/thumb/5/5c/Flag\\_of\\_Portugal.svg/600px-Flag\\_of\\_Portugal.svg.png](https://upload.wikimedia.org/wikipedia/commons/thumb/5/5c/Flag_of_Portugal.svg/600px-Flag_of_Portugal.svg.png)

Image [images/HelloPortugalCastleModelViewer.png](#)

Image [images/HelloPortugalFreeWRL.png](#)

Image [images/HelloPortugalH3DViewer.png](#)

Image [images/HelloPortugalInstantReality.png](#)

Image [images/HelloPortugalOctaga.png](#)

# Olá Portugal!



Divirta-se com o X3D!  
Have fun with X3D!

Make sure to remove any initial white space. You can load external links with index.html?url=https://server/my.x3d . [KEYBOARD](#)

```
32   <meta content='X3D-Edit 4.0, https://savage.nps.edu/X3D-Edit'
33     name='generator' />
34   <meta content='../license.html' name='license' />
35 </head>
36 <Scene>
37   <WorldInfo title='HelloPortugal.x3d' />
38   <Background skyColor='.5 .8 .8' />
39   <Viewpoint DEF='ViewpointEntry' description='Olá Portugal! Divirta-se com o
40     X3D!' />
41   <Viewpoint DEF='ViewpointRotation' description='rotate the flag' />
42   <Anchor description='Wikipedia: Tourism in Portugal'
43     url='https://en.wikipedia.org/wiki/Tourism_in_Portugal' >
44     <Transform translation='0 -2 0' >
45       <Transform translation='0 4.8 0' >
46         <Shape>
47           <Text string='Olá Portugal!' >
48             <!-- https://translate.google.com/?sl=auto&tl=pt-
49               PT&text=Hello%20World!&op=translate -->
50             <FontStyle justify='MIDDLE' MIDDLE' />
51           </Text>
52           <Appearance DEF='BlackAppearance' >
53             <Material diffuseColor='0.01 0.4 0.01' />
54           </Appearance>
55         </Shape>
56       </Transform>
57     <Shape>
58       <Text string='Divirta-se com o X3D!' "Have fun with X3D!"' >
59         <FontStyle justify='MIDDLE' MIDDLE' />
60       </Text>
61       <Appearance USE='BlackAppearance' />
62     </Shape>
63     <Transform DEF='PortugueseFlagTransform' scale='0.8 0.8 0.8'
64       translation='0 2.6 0' >
65       <Shape>
```



Live editing  
with  
X3DOM Editor

# Additional X3D-Edit Conversion Capabilities

The screenshot shows a web browser window with the URL <https://www.web3d.org/x3d/content/examples/X3dForAdvancedModeling>HelloWorldScenes>HelloPortugalIndex.html>. The page title is "X3D Example Archives: X3D4AM, X3D for Advanced Modeling, Hello World Scenes, Hello Portugal". Below the title, there is a brief description: "HelloPortugal example scene to show Portuguese special characters, built for Web3D 2024 Conference Tutorial." To the right of the main content area, there is a yellow banner with the text "Olá Portugal!" and the Portuguese flag. Below the banner, it says "Divirta-se com o X3D! Have fun with X3D!". On the far right, there is a sidebar with various links:

<a href="#">X3D model source .x3d</a>	<a href="#">X_ITE (Playground)</a>	<a href="#">X3DOM (X3DOM editor)</a>
<a href="#">ClassicVRML .x3dv</a>	<a href="#">.java source (Javadoc)</a>	<a href="#">.x3db Compressed Binary Encoding</a>
<a href="#">VRML97</a>	<a href="#">.json (check)</a>	<a href="#">Version control</a>
<a href="#">Canonical XML</a>	<a href="#">.py python</a>	<a href="#">Archive issues list</a>
<a href="#">X3D Model Documentation</a>	<a href="#">.ttl Turtle (query)</a>	<a href="#">Email x3d-public</a>



- ClassicVRML ([.x3dv](#))
- VRML97 ([.wrl](#))
- Canonical XML ([.xml](#))
- Compressed Binary ([.x3db](#))

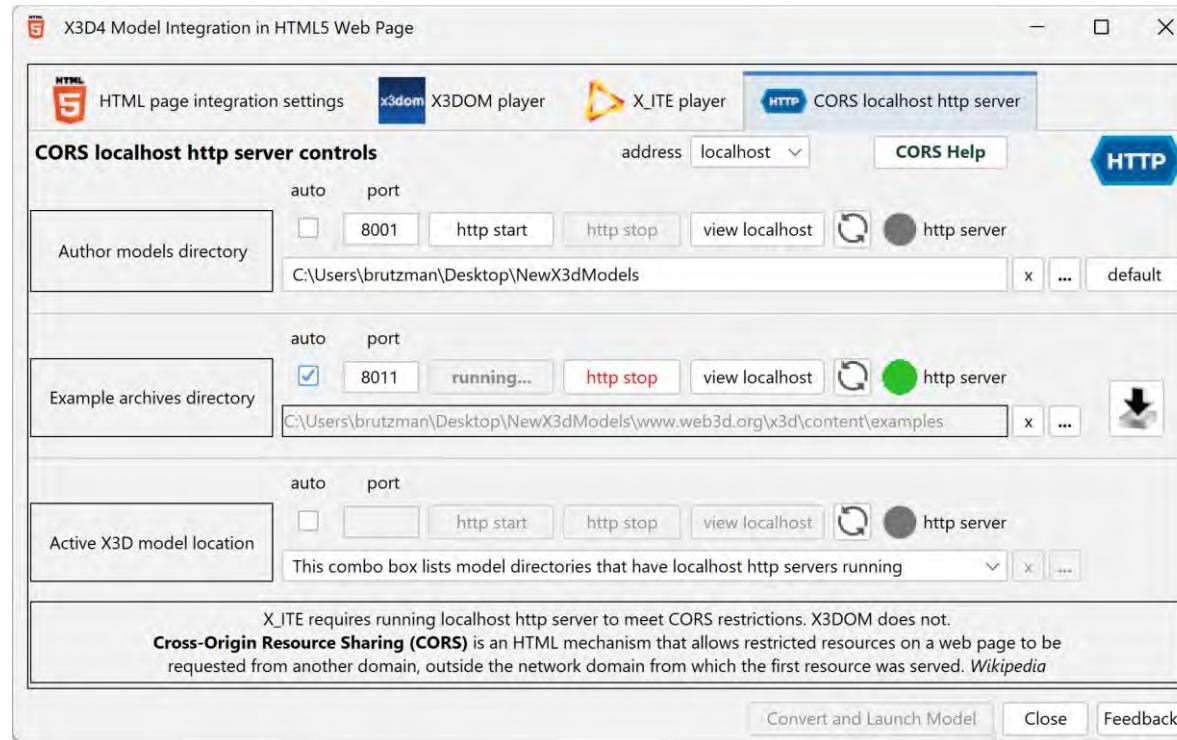


- JSON ([.json](#))
- Java ([.java, javadoc](#))
- Python ([.py](#))
- Turtle ([.ttl](#))

Planned additions: EXI, C++, C#, Python Jupyter Notebook

# Cross-Origin Resource Sharing (CORS)

- Carefully limit browser promiscuity to avoid man-in-middle attack
- Requires special permissions for remote servers, also localhost
- X3D-Edit offers a local Java Web Server to allow testing of models



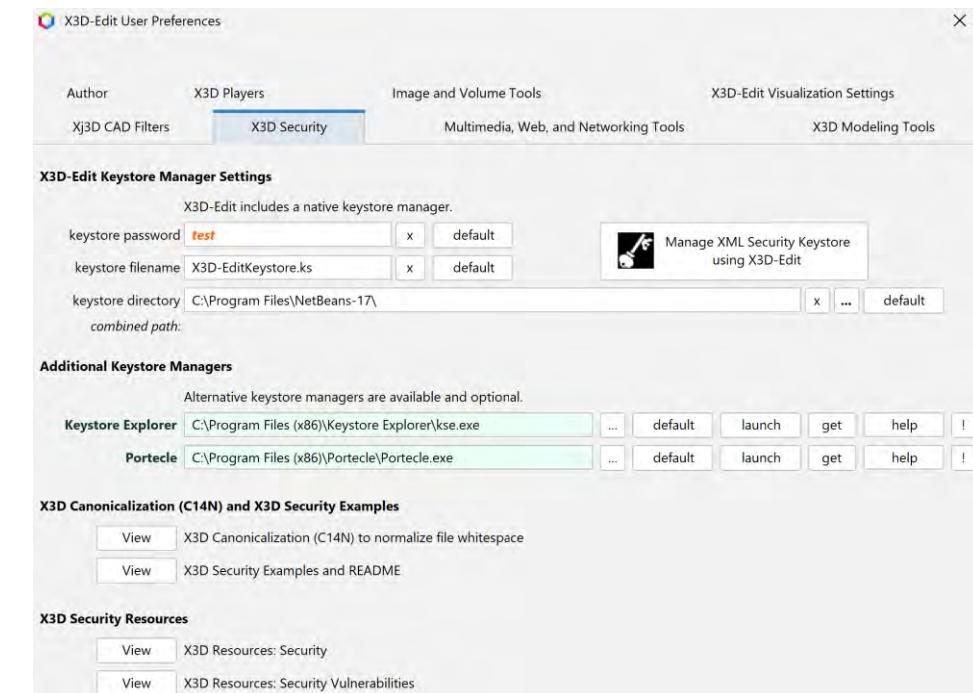
# XML Security



- XML Digital Signature for authentication
- XML Encryption/Decryption for privacy
- Implemented using [Apache Santuario](#)

## XML Security Examples

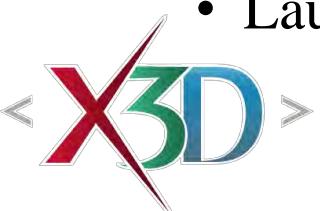
- <https://www.web3d.org/x3d/content/examples/Basic/Security>
- <https://www.web3d.org/x3d/content/examples/X3dResources.html#Security>



# More features! More features!

X3D-Edit home page, Features <https://savage.nps.edu/X3D-Edit/#Features>

- Text editing or tree navigation, color-coded syntax checking of XML source and [JavaScript editing](#)
- Drag-and-drop palette for new nodes, such as [Shape customizer](#) to quickly adding geometry
- Customized editors for each node, along with [download wizard](#) for the [X3D example archives](#)
- X3D Validator [checkmark button](#) for quality assurance (QA) provides multiple validation, data checking and format-conversion capabilities (also available via [X3D Validator online](#))
- Extensive help system includes multilingual [X3D Tooltips](#) and [X3D Standards](#)
- View changes using embedded Xj3D viewer, external Web browser plugin, or [configurable set of selectable X3D viewers](#)
- Launch an X3D scene into another [configurable set of selectable X3D authoring tools](#)



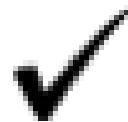
<https://savage.nps.edu/X3D-Edit/#Features>



# Additional X3D Tools of Interest

Many software applications now support X3D4. X3D-Edit can launch them.

# X3D Validator



- XML well formed
- X3D XML DOCTYPE DTD parent-child, spell checks
- X3D XML Schema strong typing for all nodes, fields
- X3D regular expressions (regexes) float checks
- X3D Schematron diagnostic rules

----- X3D Validator checks commenced for HelloPortugal.x3d -----

Performing well-formed XML check...

Checking file:/C:/x3d-

code/www.web3d.org/x3d/content/examples/X3dForAdvancedModeling>HelloWorldScenes/Hell  
oPortugal.x3d...

Well-formed XML check: pass

Performing DOCTYPE check...

[X3dDoctypeChecker] success: valid XML declaration found.[X3dDoctypeChecker] success: final  
X3D 4.0 DOCTYPE found.

Performing DTD validation...

Checking file:/C:/x3d-

code/www.web3d.org/x3d/content/examples/X3dForAdvancedModeling>HelloWorldScenes/Hell  
oPortugal.x3d...

XML DTD validation: pass

Performing X3D schema validation...

Checking file:/C:/x3d-

code/www.web3d.org/x3d/content/examples/X3dForAdvancedModeling>HelloWorldScenes/Hell  
oPortugal.x3d...

XML schema validation: pass

Performing X3D regular expression (regex) values check...

X3D regex check: complete

Performing X3D Schematron check...

X3D version 4.0 was approved by Web3D Consortium and ISO in 2023. X3D 4.0 offers many new  
features including interoperability with HTML5, glTF2.0 Physically Based Rendering (PBR) and  
Web Audio API. [/X3D, diagnostic]

----- X3D Validator checks complete for HelloPortugal.x3d -----

TODO: refactor, restore online X3D Validator

# X3D-Edit User Preferences

## X3D Players

can use  
checkboxes  
to support  
launch all viewers



X3D-Edit User Preferences

Xj3D CAD Filters X3D Security Multimedia, Web, and Networking Tools X3D Modeling Tools

Author X3D Players Image and Volume Tools X3D-Edit Visualization Settings

**X3D Players and Viewers**

Player autolaunch interval: 1 seconds

BS Contact	<input type="checkbox"/>	ME_\AppData\Local\Bitmanagement Software\BS Contact\BSContact.exe	...	default	launch	get	!	
FreeWrl	<input checked="" type="checkbox"/>	C:\Program Files (x86)\freeWRL\freeWRL.4\freeWRL.exe	...	default	launch	get	!	
H3D	<input checked="" type="checkbox"/>	C:\Program Files\SenseGraphics\H3DViewer\bin64\H3DViewer.exe	...	default	launch	get	!	
InstantReality	<input checked="" type="checkbox"/>	C:\Program Files\Instant Reality\bin\InstantPlayer.exe	...	default	launch	get	!	
Octaga	<input checked="" type="checkbox"/>	Files\Octaga Visual Solutions\Octaga Player 5.0 (64 bit)\OctagaPlayer.exe	...	default	launch	get	!	
castle-model-viewer	<input checked="" type="checkbox"/>	C:\Program Files\castle-model-viewer\castle-model-viewer.exe	...	default	launch	get	!	
Xj3D	<input type="checkbox"/>	C:\Program Files (x86)\Xj3D\browser.bat	Local file location	...	default	launch	get	!
Other player name	(Add another player using X3D-Edit User Preferences Panel)							
Other player path	<input checked="" type="checkbox"/>		...	clear	launch	find	!	
Heilan	<input type="checkbox"/>	C:\Program Files (x86)\HeilanBrowser-0.15\HeilanBrowser.exe	...	default	launch	get	!	
SwirlX3D	<input type="checkbox"/>	C:\Program Files (x86)\Pinecoast\SwirlViewer\SwView.exe	...	default	launch	get	!	
Vivaty	<input type="checkbox"/>	C:\Program Files (x86)\Vivaty\VivatyPlayer\VivatyPlayer.exe	...	default	launch	get	!	

# Castle Model Viewer



- Online at <https://castle-engine.io/castle-model-viewer>
- Viewer for 3D and 2D model formats supported by the Castle Game Engine: [glTF](#), [X3D](#), [VRML](#), [Spine JSON](#), [sprite sheets \(in Castle Game Engine, Cocos2D and Starling XML formats\)](#), [MD3](#), Wavefront OBJ, 3DS, STL, Collada, [and more](#).
- Examine or walk in the virtual world with collisions, gravity, animations, X3D sensors, shadows, mirrors, shaders and more. View it from multiple cameras at once. Take screenshots with various options (transparent background, cube maps).
- You can also convert between model formats — right now you can convert any model to X3D or STL, we plan to add output to glTF soon as well. Together with this application, we also distribute [castle-model-converter](#) command-line tool and you can also use our [online model converter](#)

File View Navigation Animation Edit Clipboard Display Help

Open

Examine

Fly

Walk

2D

Collisions

Screenshot

Animations



# Olá Portugal!



Divirta-se com o X3D!  
Have fun with X3D!

# FreeWrl

[SourceForge](#)

FreeWRL is an Open Source, cross platform VRML2 and X3D compliant browser, with script, SAI and EAI support.

Platforms supported:  
Linux and other Unix-style platforms; Mac OS/X; Windows.



# X3D-Edit User Preferences

## X3D Modeling Tools

TODO, ongoing:  
add more slides!

X3D-Edit User Preferences

Author X3D Players Image and Volume Tools X3D-Edit Visualization Settings

Xj3D CAD Filters X3D Security Multimedia, Web, and Networking Tools X3D Modeling Tools

**X3D-Capable Modeling Tools**

Altova XMLSpy	<input checked="" type="checkbox"/>	C:\Program Files\Altova\XMLSpy2024\XMLSpy.exe	...	default	launch	get	help	!
Blender	<input type="checkbox"/>	C:\Program Files\Blender Foundation\Blender 4.1\blender.exe	...	default	launch	get	help	!
BS Content Studio	<input type="checkbox"/>	s (x86)\Bitmanagement Software\BS Content Studio\x64\BSComposer.exe	...	default	launch	get	help	!
bvhacker	<input checked="" type="checkbox"/>	C:\Program Files (x86)\davedub\bvhacker\bvhacker.exe	...	default	launch	get	help	!
MeshLab	<input checked="" type="checkbox"/>	C:\Program Files\VCG\MeshLab\meshlab.exe	...	default	launch	get	help	!
Okino NuGraf	<input checked="" type="checkbox"/>	C:\Program Files\NuGraf64\NuGraf64.exe	...	default	launch	get	help	!
Paraview	<input checked="" type="checkbox"/>	C:\Program Files\ParaView 5.12.0\bin\paraview.exe	...	default	launch	get	help	!
Rhino3D	<input checked="" type="checkbox"/>	C:\Program Files\Rhino 8\System\Rhino.exe	...	default	launch	get	help	!
Seamless3d	<input checked="" type="checkbox"/>	C:\Program Files\Seamless3d\seamless3d.exe	...	default	launch	get	help	!
Sunrise	<input checked="" type="checkbox"/>	npx sunrise	...	default	launch	get	help	!
Ultimaker Cura	<input checked="" type="checkbox"/>	C:\Program Files\Ultimaker Cura 5.6.0\Ultimaker-Cura.exe	...	default	launch	get	help	!
UltraEdit	<input checked="" type="checkbox"/>	C:\Program Files>IDM Computer Solutions\UltraEdit\uedit64.exe	...	default	launch	get	help	!
White Dune	<input checked="" type="checkbox"/>	C:\installs\WhiteDune\white_dune-1.956.exe	...	default	launch	get	help	!
Wings3D	<input checked="" type="checkbox"/>	C:\Program Files\wings3d_2.2.9\Wings3D.exe	...	default	launch	get	help	!
Other tool name	Okino NuGraf		...	clear	launch	find	!	
Other tool path:	<input type="checkbox"/>	soft\Windows\Start Menu\Programs\Okino Computer Graphics\NuGraf64	...	clear	launch	find	!	

Feedback

101

Each panel change is saved upon entry.

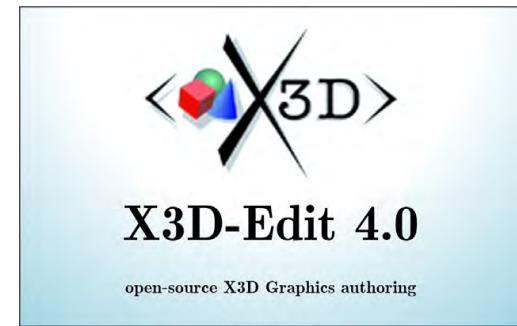
Done



# Looking Ahead

X3D-Edit continues to grow and add value to Web authors.

# The more we do, the more we do!



- Long list of capabilities and features, also matched by accompanying list of TODO goals
- We continue to test X3D and HAnim models for authors with X3D-Edit, further supporting X3D Specifications
- Quarterly release updates
- Open-source code contributions always welcome
- Your feedback is welcome
- Have fun with X3D !! ☺

# Contact

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Monterey California 93943-5000 USA