




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

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*Tutorial: Introducing X3D*  
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<http://www.web3D.org/x3d.html>



## Content

*Quicklook: X3D, VRML, XML*  
*X3D-Edit tool design*  
*Authoring examples and archives*  
*Autogeneration of content archives*  
*Tooltips and Internationalization (i18n)*  
*Recommended authoring-tool practices*  
*Related work: SIGGRAPH 2001 Online site*  
*Workshop reactions*



## What is X3D?

*Extensible 3D (X3D) Graphics*

- Virtual Reality Modeling Language (VRML) updated
- Third-generation ISO specification
- Both XML and .wrl encodings, compatibly

*Deliverables*

- Specification updates, with compatible XML tagset
- Multiple implementations, including open-source example
- Scene Authoring Interface (SAI) strongly typed API
- Conformance suite and examples
- Authoring capability: X3D-Edit



## Further X3D motivations

*Authoring is hard, "Content is King"*

- X3D is not competing with specialty formats, instead provide common interoperability/interchange
- Strong validation checks eliminate most authoring errors before content escapes
- Plays well with next-generation Web languages

*"3D hardware problem" is already solved ☺*



## Primary benefits of XML

*Simpler parsing, with lots! of software tools*

*Validation of content*

- Nodes can only go together in legal ways
- Validate values (e.g. color-triplet arrays)
- Broken content can't escape
- Fixes the "garbage in, garbage out" problem

*XML finally enables structured data*

- ...hmmm, structured programming was important...



## XML in 10 Points

<http://www.w3.org/XML/1999/XML-in-10-points>

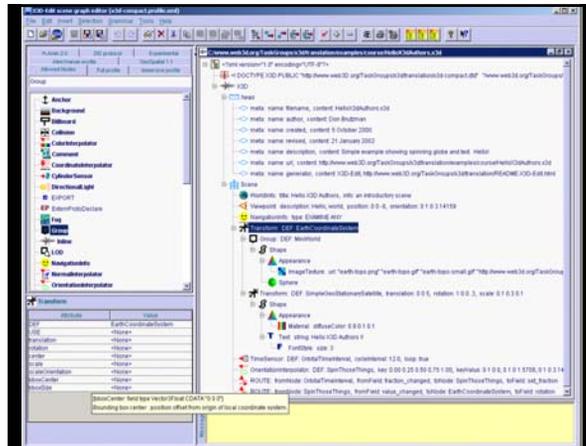
<ol style="list-style-type: none"> <li>1. XML is for structuring data</li> <li>2. XML looks a bit like HTML</li> <li>3. XML is text, but isn't meant to be read</li> <li>4. XML is verbose by design</li> <li>5. XML is a family of technologies</li> </ol>	<ol style="list-style-type: none"> <li>6. XML is new, but not that new</li> <li>7. XML leads HTML to XHTML</li> <li>8. XML is modular</li> <li>9. XML is the basis for RDF and the Semantic Web</li> <li>10. XML is license-free, platform-independent and well-supported</li> </ol>
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## XML tool design: IBM's Xeena

### X3D-Edit constructed using IBM's Xeena

- XML-based tool builder for editing XML tagsets
- Configured via XML Document Type Definition (DTD)
- Implemented in Java, portable Windows Mac Linux
- Tagset and XML configuration profile determines syntax, rules within customized interface functionality
- Multilingual customization possible
- Scalable approach for other XML tools
- <http://www.alphaWorks.ibm.com/tech/xeena> ..... thank you IBM!

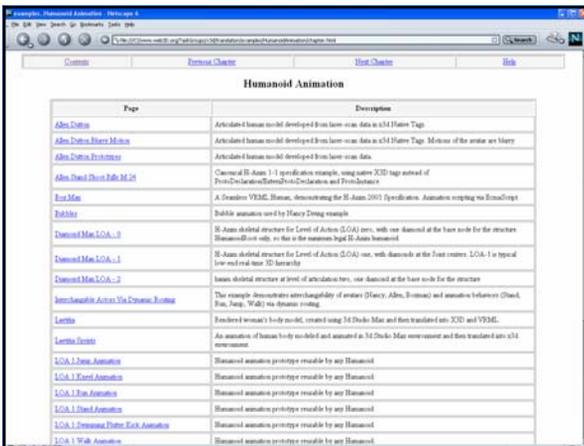




## Website content archive

### Root content is X3D in XML encoding

- Validation checking for all nodes, attributes
- Conversions**
  - Extensible Stylesheet Language for Transformations (XSLT): rule-based pattern matching, fast, flexible
  - .html, .wrl (VRML encoding), others possible
  - Website archives
- Long-term maintainability**
  - Solves "content rust" problem, which never sleeps...



# Teaching experiences



## Entry-level 3D graphics course

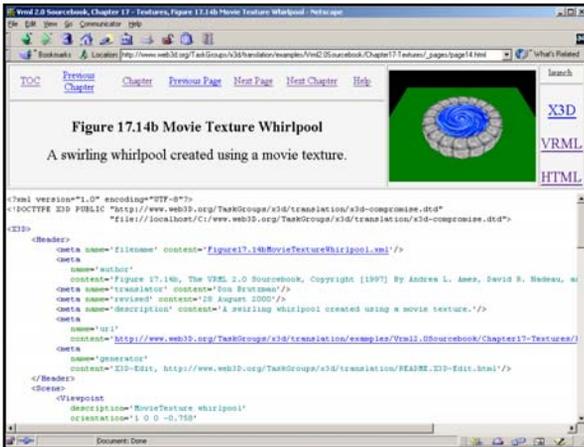
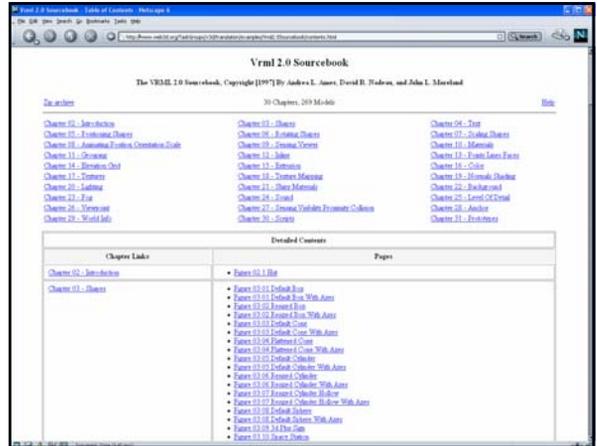
- Complete VRML Sourcebook in 1 quarter or less, accelerating.
- Student demos get better – learning by example.  $N_{classes} = 12$
- No programming prerequisite! Students from any curriculum.

## Advanced modeling course

- Image synthesis techniques, Humanoid Animation, GeoSpatial, Distributed Interactive Simulation, etc.

## Improved interactions with students

- Exchange models via mail list, web archive, pursue theses, etc.



# Website archive generation



## Clear naming and structuring does most work

- Simple Java application reads directories and subdirectories
- Creates custom XML catalog
  - CamelCaseCapitalizationForClearNaming
  - Alphabetically ordered, can augment with numbers

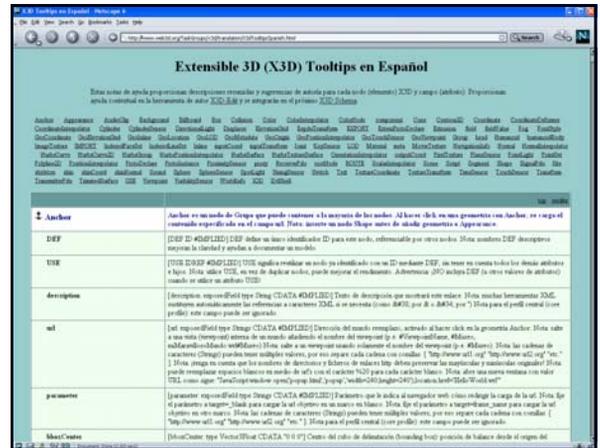
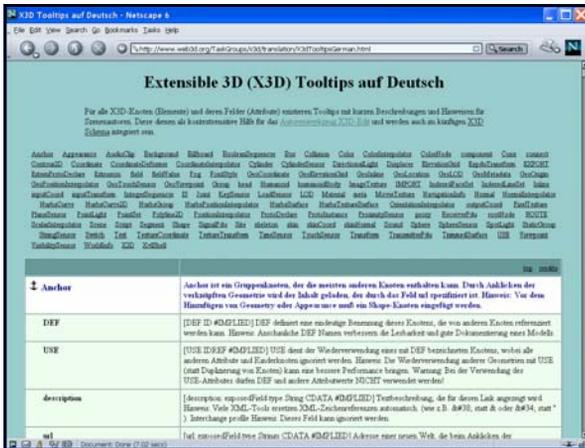
## Website-generation stylesheet

- Walks catalog tree, builds pages and links
- Cross referenced, convenient

... again: using XML, producing XML, for XML ...







**Tooltips future work**

*Not all human languages support 3D jargon*

*Furthermore, 3D graphics communities often use different meanings for same terms*

*Perhaps we are really building glossaries...*

- Possibly an explicit area of work for SIGGRAPH?

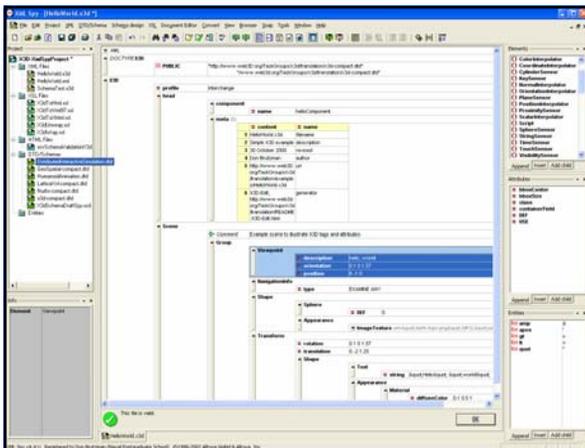
**Other XML-based tools**

*Next-generation tagset: X3D Schema*

- XML Schema specification includes tooltip and URL annotation mechanisms already
- Will merge various tooltips into master X3D schema

**Other XML-based authoring tools**

- Editors read schema and become X3D capable
- Thus numerous XML editors can become 3D-aware, without effort



**Open source available**

*Xj3D is a Java implementation of a 3D browser*

- VRML/X3D scene graph + extensions
- Now working on Java-OpenGL bindings
- Unadvertised, 26 downloads/day
- SIGGRAPH 2002 distribution: X3D Software Development Kit (SDK)
- LGPL license – unrestricted use, private or commercial
- <http://www.web3d.org/TaskGroups/source/xj3d.html>

*Open sources has completely changed our working processes for the better, both for small contributors and big companies*

- no more possibility of single-point failure
- guarantees that third-generation VRML/X3D will ship

## Plugins for VRML, X3D

### Nexternet's Pivoron

- <http://www.nexternet.com/download> (uhh, maybe)
- Upgraded version of CosmoPlayer, which is still at [http://cosmosoftware.com/download/index\\_player.html](http://cosmosoftware.com/download/index_player.html)

### ParallelGraphics Cortona

- <http://www.parallelgraphics.com>

### Blaxxun Interactive

- <http://www.blaxxun.com>

## Online resources

### X3D-Edit

- <http://www.web3d.org/x3d.html>
- <http://www.web3d.org/TaskGroups/x3d/translation/README.X3D-Edit.html>
- <http://www.web3d.org/TaskGroups/x3d/translation/X3D-Edit.zip>, .gz
- <http://www.web3d.org/TaskGroups/x3d/translation/X3D-Examples.zip>
- <http://www.web3d.org/TaskGroups/x3d/translation/X3dTooltips.html>
- <http://www.web3d.org/TaskGroups/x3d/translation/X3D-EditAuthoringTool.pdf>
- <http://www.web3d.org/TaskGroups/x3d/translation/X3D-EditAuthoringTool.ppt>
- oh yeah: it's all free and open

### Help

- <http://www.web3d.org/TaskGroups/x3d/translation/examples/help.html>

## Summary: recommended authoring-tool practices

### Use XML for 3D data structures

- specify, annotate, (upcoming) semantic ontologies

### Use X3D for cross-tool Web interchange

- designed for such extensibility

### Build and re-use example libraries

- So that cool content can become commonplace

### Consider workshop on shared issues

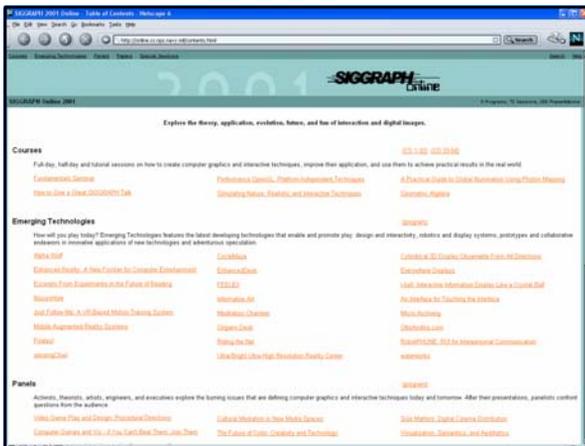
- Both up and down the "VR stack"

## Related website-generation work: SIGGRAPH 2001 Online

<http://online.cs.nps.navy.mil>    <http://online.siggraph.org>

### Archive Statistics, 2 June 2002

- 5 Programs, 70 Sessions, 266 Presentations
- Powerpoint slides
  - available: 110
  - not used: 67
  - missing: 81
- Movies
  - available: 175
  - not available: 7
  - needing digitization: 76



**Tons of future work possible...**

## Inflammatory premise

*If it isn't on the Web, it doesn't really exist.*

- Not talking about Google™ searches and connecting to cool sites/papers/code/ideas. That's OK, but much more is possible.
- Am talking about 3D models and behaviors as a fundamental media that can be viewed, imported, exported, connected, etc.

*How to get there?*

- Need to make 3D models, behaviors, streaming and interaction a first-class media type, integratable with other Web languages.

## 3D Interaction Interoperability

*No two experts, games or apps the same*

- Hey, why don't we trade demos right now ☺

*Everyone is access impaired in 3D, VR*

- At least initially, until shown or trained
- Bridging learning curve doesn't always occur
- Need 3D user-interaction design patterns

*Web methodologies and experience exist already via Web Accessibility Initiative (WAI)*

- <http://www.w3.org/WAI>

## Design patterns for 3D

*Core principles and templates for reusable design*

- Language and paradigm independent
- 3D models, interaction, animation behaviors
- Also high level, perhaps for agents interacting with 3D scenes: capabilities, motivations, relationships, story, etc.

*What might 3D patterns look like*

- Follow regular design-patterns approach, augmented for 3D domain
- Interesting exemplar: Jon Robilleaux *User Interface Design Java3D*

*Maybe patterns for VR hardware rigs, too*

- These might repeat up & down the "VR software stack"

## Contact

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