Web3D Quickstart

IEEE VR 2018 Tutorial

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Interactive 3D Graphics

+ WWW

= Web3D
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<td>WWW eb3D</td>
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<td>x - Reality</td>
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1:30 Introduction and Scope

*Immersive Web3D: ISO-IEC X3D, VRML*

1:45 Virginia Tech

2:00 HLRS

2:30 Fraunhofer IGD
3:00 break

Web3D Integration, HTML5, 3D Printing

3:15 HLRS

3:45 Fraunhofer IGD

4:15 Virginia Tech
The Web is the Interface
History of Web3D Standards

1994  Virtual Reality *Markup* Language v1.0 efforts

1997  Virtual Reality *Modeling* Language (VRML) v2.0

2000  **Non-profit Web3D Consortium** established to protect open specifications

2000s Extensible 3D (X3D) adds XML to Classic VRML Encoding v3.0

2008  IEEE VR workshop on Future Standards (Polys, Behr, Brutzman)


2011  W3C Declarative 3D Community Group and continuing efforts.

The Web is Wide

Many Domains … data
IEEE VR Workshops: X3D / VRML notables

- Mixed-Reality Interface Specification 2006
- Future Standards for Immersive VR 2007
- SEARIS 2008, 2009
- Medical Virtual Reality 2010
- Immersive Volume Rendering 2013
- Immersive Analytics 2016

SIGGRAPH, SuperComputing BOFs

Thousands of scholarly articles (including ACM DL)
The X3D suite of ISO-IEC Standards provides a system for the storage, retrieval and playback of real-time graphics content embedded in applications, all within an open architecture to support a wide array of domains and user scenarios.

http://www.web3d.org/standards
What is X3D (Extensible) 3D?

• Originated from ISO-IEC VRML
• A File Format and Runtime API (Javascript, Java, …)
• Multiple encodings (file formats): XML, VRML, JSON, based on the same abstract scenegraph content model
• Includes shaders, animation, interaction, geometry, texturing, lighting, camera
• Extensible - Capabilities added through scripting and node prototyping.
What is X3D (Extensible 3D)?

- Large set of nodes for describing interactive 3D scenes
- **Profile** and **Component** structure promotes interoperability
  - 8 Profiles for common use cases: X3D Profiles
  - 35 X3D Components for modular design: X3D Components
  - 233 X3D Nodes for every little thing!: X3D Nodes

- Implementations on multiple platforms: WWW, mobile, immersive
- Domain components - Design, 3D Printing, Medical, Geospatial, Humanoid Animation, AR and VR
- Multiple commercial and open source implementations

[www.web3d.org/what-x3d](http://www.web3d.org/what-x3d)
Web3D Consortium Overview

Web3D.org: Open Standards for Real-Time 3D Communication

- Founded in 1997, an international, non-profit, member funded, standards development organization
- Developing the ISO specification X3D for interactive 3D graphics on the Web
- Our members span from Academia, research, industry, government, and professionals
- A community of technologists, artists and enterprises
- National recognition (e.g. US National Archives)
Web3D.org   Interoperability

Web3D Consortium has MOU and Liaison agreements with multiple standards bodies to develop open interoperable 3D solutions

Converging with other standards
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*Immersive Web3D:* ISO-IEC X3D, VRML
HLRS

*Immersive Web3D: ISO-IEC X3D, VRML*
Fraunhofer IGD

*Immersive Web3D: ISO-IEC X3D, VRML*
X3D on the tubes (source: VT)

https://youtu.be/SDM97VpArSY

https://youtu.be/DO35QIAPrtg

https://youtu.be/9C6T_JYj6Lg

https://youtu.be/Jl9iL2a-pmw

https://youtu.be/p8nER5wb6cA

https://youtu.be/5V9RAd-JUas
HLRS

Web3D Integration
x3dom
Instant 3D the HTML way!
Agenda

- X3DOM Basics
- Demo
- Hot topics (PBR, glTF & WebVR)
- Demo
- Roadmap 2018
X3DOM // Overview

- Integrates 3D content seamlessly into your webpage
- Access & manipulate Nodes per DOM-API
- No Plugins needed
- Simply include a javascript file
- Open-Source
- Free for non-commercial and commercial purposes
Demo
X3DOM // Evolution of Binary Formats

Image Geometry
X3D-based Scene description + external referenced binary data images

Binary Geometry
X3D-based Scene description + external referenced binary data blobs

Shape Resource Container (SRC)
JSON-based Scene description + internal or external binary data blobs
PBR // Overview

● Modern physically-based Material description
● Minimal parameter set to describe a wide range of different Materials.
● Available in the big Engines: Unreal, Unity, Frostbite, etc...
● But not in the web.
● So we have proposed a web-ready PBR Material description at the Web3D 2016
PBR // X3DOM

- Integrated as PhysicalMaterial-Node like proposed in our paper.
- So every standard X3D Geometry-Node can rendered with this Physically-based Material.
- Direct lighting is already in.
- Image Based Lighting comes in the next weeks
gltf // Overview

- Modern 3D Transmission format
- Uses a JSON-based Scene description + internal or external referenced binary data blobs inspired by our SRC
- Uses our proposed PBR-Material as default material
- Used by Microsoft, Facebook, Sketchfab, and many many more.
gITF // X3DOM

- Simple loading per Inline-Node like an external X3D-File
- Nodes are fully integrated into the X3DOM-Scenegraph
- Easy access & manipulation per DOM-API
- Supports gITF, gITF-Embedded & gITF-Binary
- Integration is still experimental
WebVR
WebVR // Overview

- Modern WebAPI to access VR Devices like HTC Vive, Oculus Rift or Google Daydream directly in the Browser.

- Available in Chrome, Firefox & Microsoft Edge

- Easy to use
WebVR // Usage

Get the VR Display

navigator.getVRDisplays().then( ( displays ) => { ... } );

Enter VR Mode

display.requestPresent([{source:canvas}]).then(()=> { ... } );

Get the Display data

display.getFrameData( vrFrameData );

Submit a frame

display.submitFrame();
WebVR // X3DOM

Last Years

- No deep integration into the X3DOM-Core
- All examples are build around X3DOM
- Duplicated Scenes & RenderTextures

Now (still experimental)

- Deep integration into the X3DOM-Core
- Enter VR simply by clicking the VR-Button
- Single Pass Rendering with hardware Instancing
Roadmap 2018

March // April
Further integration of PBR, WebVR & glTF into the X3DOM-Core

May // June
Merge of the new experimental core features (PBR, WebVR & glTF) to the official development Branch for stabilization.

July // August
Stable Release of X3DOM v1.8.0
Links

Official Website:  www.x3dom.org

Github Repository:  www.github.com/x3dom/x3dom

Stable Build:  www.x3dom.org/download/1.7.2

Development Build:  www.x3dom.org/download/dev

Experimental Build:  www.x3dom.org/download/exp

glTF Example:  www.examples.x3dom.org/gltf2
Links

SRC Paper: https://x3dom.org/src/


WebVR Website: https://www.webvr.info

glTF Repository: https://github.com/KhronosGroup/gltf
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Web3D Integration