



Web3D Quickstart

IEEE VR 2018 Tutorial

IEEE VR 2018
REUTLINGEN

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IEEE VR 2018
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Interactive 3D Graphics

+ WWW

= Web3D

Topics

- ISO Scenegraph X X
- WWW eb3D X X
- x - Reality X X

Applications

Implementations



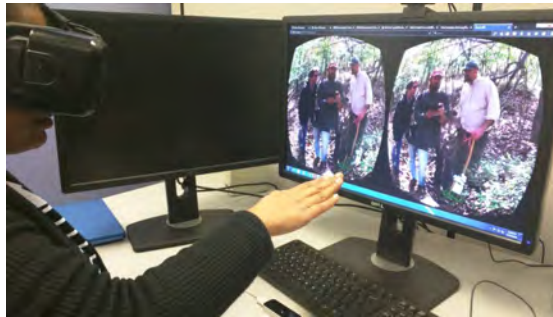
1:30 Introduction and Scope

Immersive Web3D: ISO-IEC X3D, VRML

1:45 Virginia Tech

2:00 HLRS

2:30 Fraunhofer IGD



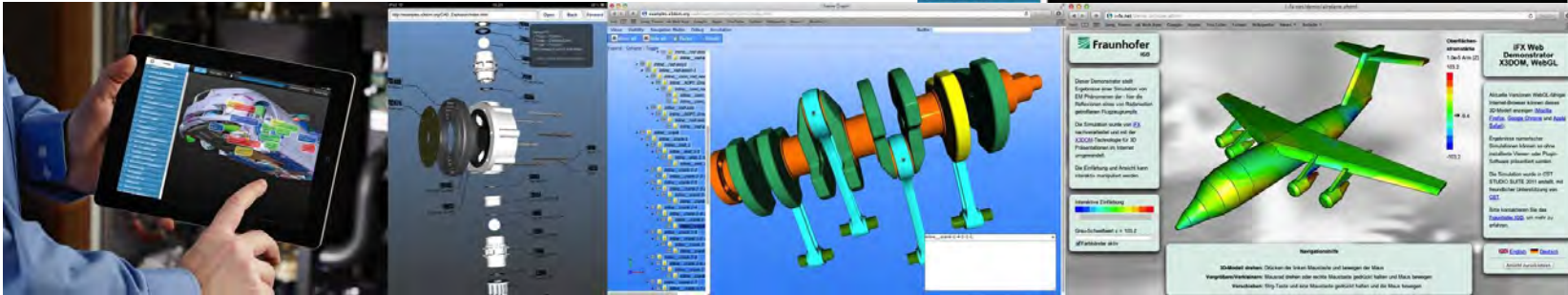
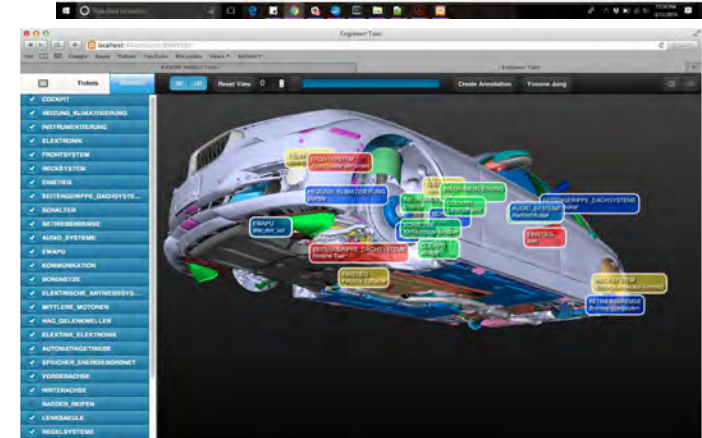
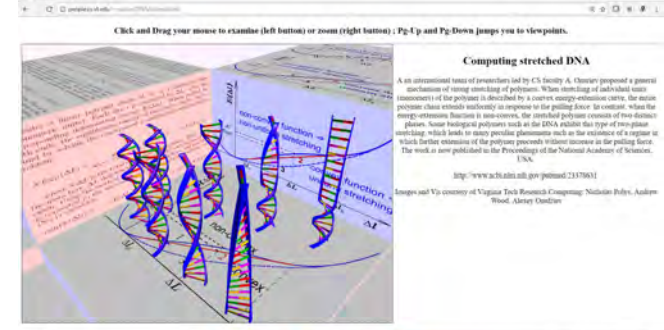
3:00 break

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

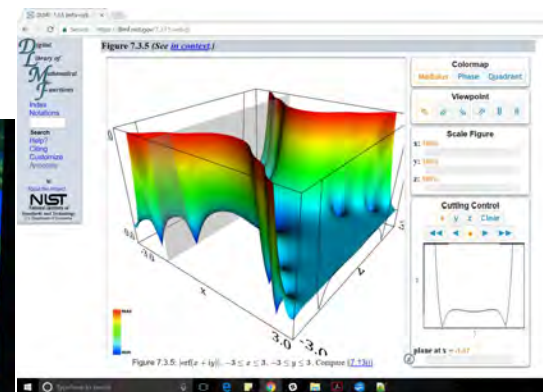
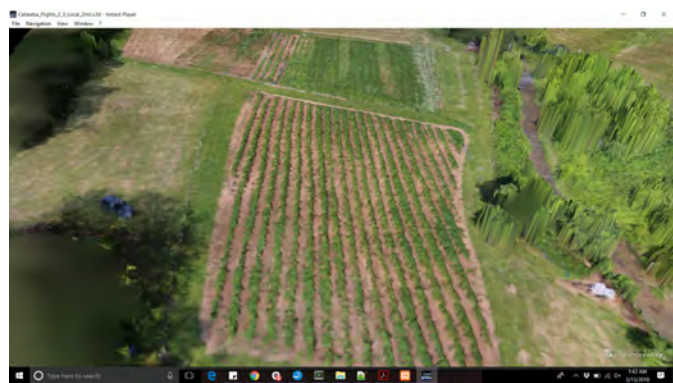
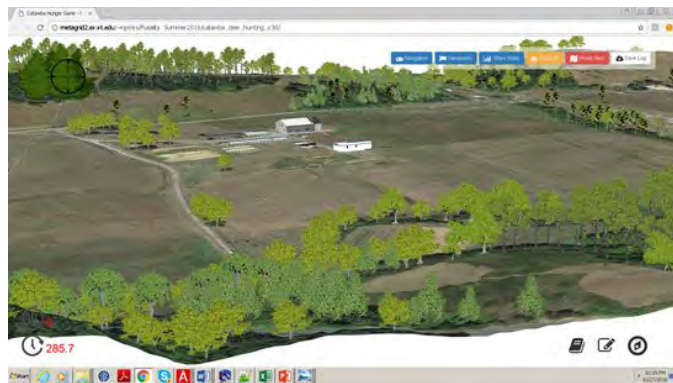
- 1994** Virtual Reality *Markup* Language v1.0 efforts
- 1997** Virtual Reality *Modeling* Language (VRML) v2.0
- 2000** **Non-profit Web3D Consortium** established to protect open specifications
- 2000s** Extensible 3D (X3D) adds XML to Classic VRML Encoding v3.0
- 2008** IEEE VR workshop on Future Standards (Polys, Behr, Brutzman)

Polys, Nicholas and Brutzman, Don and Steed, Anthony and Behr, Johannes (2008). [*Future Standards for Immersive VR: Report on the IEEE VR 2007 Workshop*](#). IEEE Computers Graphics & Applications Vol. 28, Number 2, IEEE Computer Society, **2008**.
- 2011** W3C Declarative 3D Community Group and continuing efforts.

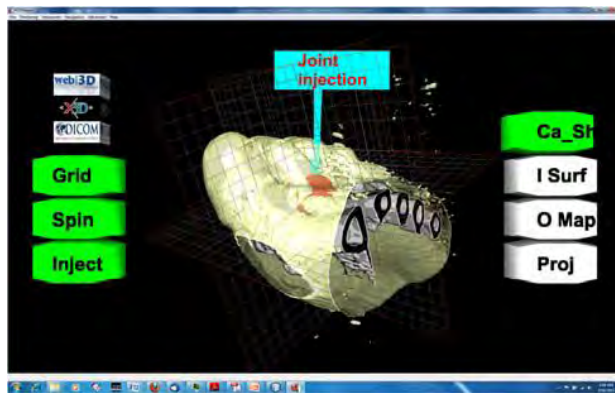
ACM Web3D Conference : 23 Years ! <http://web3d2018.web3d.org/>

The Web is Wide

Many Domains ... data



NIH 3D PRINT EXCHANGE



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



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

<https://www.youtube.com/watch?v=GY2Bg0op-Kc>



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/5V9RAAd-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

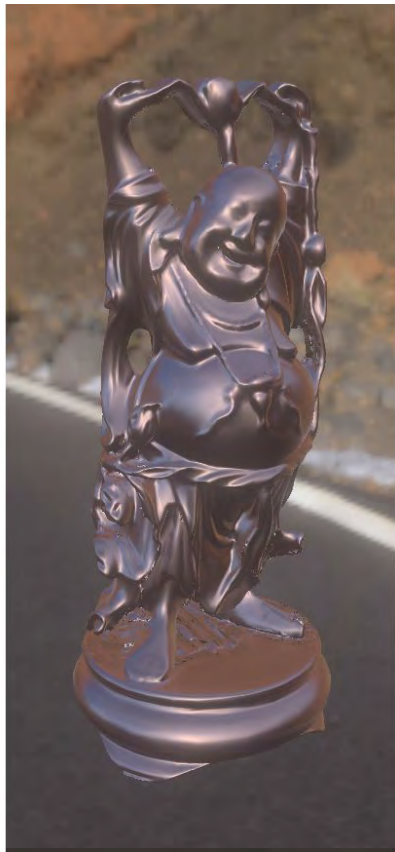
PBR

Physically-based Rendering

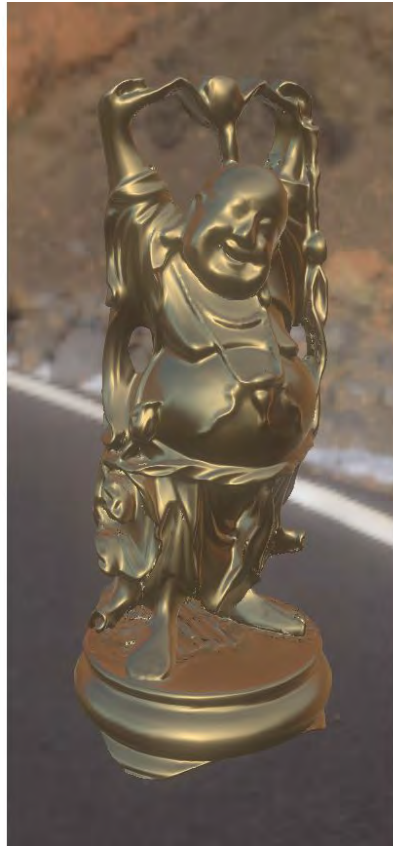
PBR // Overview

- 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

gitF

gITF // 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

Demo

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

gITF Example: www.examples.x3dom.org/gltf2

Links

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

PBR Paper: <https://x3dom.org/pbr/pbr2016.pdf>

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

gITF Repository: <https://github.com/KhronosGroup/gITF>

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Web3D Integration

Close