X3D Capabilities for DecWebVR

W3C TPAC

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6 November 2017

Web3D Consortium + World Wide Web Consortium

[Web3D Consortium is W3C Member](#) as standards liaison partner since 1 April 1999.
"The Web3D Consortium, like W3C, supports open standardization. Web3D's open standards for real-time 3D communication include X3D, a powerful and extensible ISO/IEC standard for 3D visual effects, behavioral modeling, interaction and interoperability. Web3D membership includes companies, institutions, working groups and individuals."

Active participant in multiple working groups: Efficient XML Interchange (EXI), XML Security, others. [Standards liaisons](#) and collaboration always welcome!

Keen to support advancement of WebVR and DecWebVR efforts to advance on REC track, have standing as voting members of W3C Advisory Committee (AC).

Participating in WebVR implementation efforts. What else can we do to help?

History of Declarative VR efforts for VRML, X3D

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

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.

…   **Thus "Declarative VR" is in our DNA!** More follows...

Current Background

W3C Workshop on Web & Virtual Reality, Samsung USA, October 2016

- Declarative VR session notes, VR and X3D presentation
- WWW 2012 Workshop on Declarative 3D

Declarative 3D (Dec3D) for Web Architecture Community Group

- 2011-2015. Sharing ideas X3D, X3DOM, XML3D led to multiple collaborations and improvements

WebVR Community Group

- Ongoing, productive synthesis of multiple software/hardware approaches

ISO/IEC SC24/SC29 WG9 JAHG

- Mixed Augmented Reality (MAR) Abstract Reference Model for VR/AR etc.

W3C Community Groups and Web3D Consortium: Dec3D, DecWebVR, WebVR

DecWebVR mission is to define and describe a declarative method for developing VR content:

"The hope is to define a new set of HTML tags and CSS properties that will allow web developers across the globe to write VR content for display in modern browsers"

Today:

- Summarize ongoing work in W3C and community groups
- Summarize recent X3D developments and roadmap

DecWebVR Functional Requirements

Considering Scope...

A declarative language to describe:

- **3D Assets and Scenes (may be in several formats/encodings)**
- **Display & rendering parameters for the platform**
- **Mapping events of Controllers and 3D UI to application logic**

X3D is accomplishing these tasks, further showing example implementations in the VR community for 23 years and counting… *(see IEEE CG&A 2008)*

Extensible 3D (X3D)

- Components and Profiles collect a structured nodeset (scene graphs)
  - Geometry, appearance, lighting
  - Animation, multimedia (sound, video)
  - Interaction and application logic
- File format with multiple encodings: XML, UTF8, Binary, JSON
- Runtime API for a Unified Object Model with multiple programming language bindings (JavaScript, Java, C#, C++, Python, ...)
- Widespread support through multiple commercial and open-source engines and VRML heritage

X3D Evolution Strategy for VR

1. **X3D v4.0 specification integrates with HTML5, DOM**
   a. Currently working through "how precisely do we do that in the specification"
   b. These capabilities will ensures technical alignment with WebVR is possible via Web browser (Fraunhofer and VT already demonstrated WebVR 1.1 with X3DOM)
   c. Demonstration work with Samsung, others has proven particularly helpful
   d. Similarities to SVG and other W3C examples are being examined and utilized whenever possible

2. **X3D v4.1 adds VR, AR, MAR**
   a. Add any missing WebVR technical requirements : hooks into X3D Scenegraph (SAI)
   b. Consider X3D WebVR Profile for content authors and VR-experience generators
   c. Next add Augmented Reality (AR) and Mixed Augmented Reality (MAR) features according to ISO/IEC SC24 WG9 Mixed Augmented Reality (MAR) abstract reference model
   d. 2+ open-source implementations, public evaluation, content examples, specification approval
   e. Deep-dive testing to date indicates no "show stoppers" and X3D participation continues

X3D + HTML5

Two open-source implementations, Javascript WebGL libraries

Interpret and render X3D documents with interaction:

- X3DOM - www.x3dom.org

- X_ITE   - create3000.de/x_ite

Immersive X3D Examples

- Samsung GearVR, Google Pixel
- Oculus Rift via WebVR 1.1
  - https://examples.x3dom.org/Demos/ClassroomVR/classroom-rift.html
  - VT Forestry, Nuclear Engineering
- Multi-projector CAVEs (same X3D file)
- Variety of implementation efforts
- Annual Web3D Conference June 22-24, 2017 (ACM SIGGRAPH; Poznan, Poland 2018)
- [VR Hackathons](#)
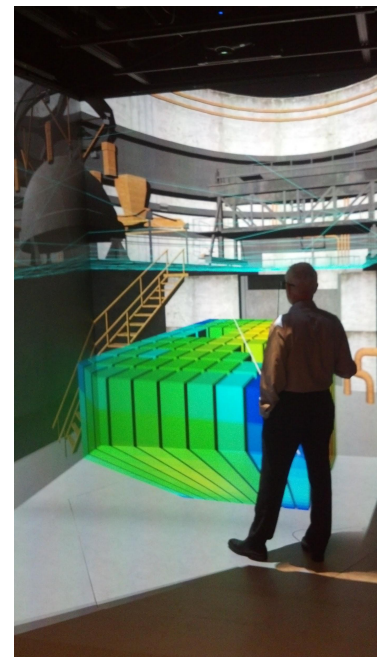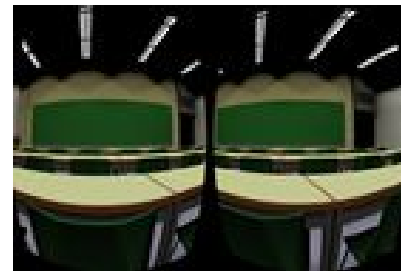
Major development work: Samsung GearVRf

Why implement X3D in GearVR

- Samsung began this effort February, 2016
- X3D is a widely supported file format
  - Exported by 3DS Max, Blender, Maya, Moto
    - Or exports VRML and converts to X3D
- No other file format had similar capabilities.
  - Interactivity via JavaScript
  - Declarative format easy to edit / visualize the scene.
- GearVR is not just a VR game console like Sony PSVR
  - We are a phone, <u>web access device</u>, camera, apps platform
  - X3D enables web applications:
    - Compliments the game influence in GearVR from Unity, Unreal.
    - Enables new VR web apps including: Google Maps, Facebook, Yelp JavaScript API's.

Presentation at SIGGRAPH 2017 Web3D BoF Session

Web3D Consortium Strategic Roadmap for X3D

| | 2017 | I | 2018 | I | 2019 | I | 2020 |

VR, AR, MR, xR

Identify Member projects
Track industry efforts

Define gaps, new goals in X3D standards

Extend X3D to support full range of Mixed and Augmented Reality (MAR)

X3D 4.0

HTML encoding and DOM binding: Design, Specification, Implementation, X3D v4 /HTML examples

Maintain alignment: W3C HTML5, DOM updates

X3D 4.1

ISO MAR Reference Model efforts Compare/contrast, align with WebVR

ISO/IEC Mixed Augmented Reality (MAR) Reference Model implemented in X3D for VR/AR

Web3D products provide a coordinated set of steadily evolving ISO/IEC standards

In development   In Planning

Ongoing Specification Development Activity

- Continued dialogue on mailing lists and at community events!
- Continue open proofs and development of X3D and HTML5, WebVR
- Web3D Specifications Development, Implementation and Evaluation
  - Multiple file encodings and programming languages within X3D Unified Object Model
  - **X3D 4.0 aligning with HTML5 and DOM**
    - Expand on CSS design efforts to date, confirm full alignment with HTML5 and DOM
    - Add glTF inline / import

  - **X3D 4.1 aligning with VR/AR/MR capabilities**
    - ISO-IEC Mixed Augmented Reality (MAR) Reference Model
    - Augment X3D node set to integrate additional WebVR parameters
    - Design, implement, evaluate WebVR Profile for X3D
- Web3D working groups are quite active. Participation and liaison are welcome.

Next Steps… your feedback is welcome!

1.

2.

3.

Connect … Catalyze …
With Open 3D Standards and Community

International not-for-profit organization dedicated to an open cyberspace ecology … W3C official Liaison voting member

The Web3D Consortium promotes deployment of X3D standards for the communication of 3D scenes in multiple applications, use cases, platforms and verticals. Members collaboratively develop the X3D standards and tools making them widely adopted across diverse markets for academia, government, industry and individuals. The Web3D Consortium offers robust ISO standardized 3D functionality and long-term stability for enterprise solutions and interoperability with other 3D standards.

Join us! www.web3d.org

2016 Year-end Report