Web3D Quickstart:
Standards-based 3D in Health and Medicine

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Abstract

Patient outcomes and enterprise efficiencies depend on the quality and timely delivery of information. Increasingly, 3D information are being generated and used in healthcare; this workshop will explore and demonstrate the value of interoperability and the opportunities of open, International Standards technologies. From imaging and scanning to 3D printing and Virtual Reality, Extensible 3D (X3D) provides for durable data interchange and portable presentation natively over the WWW. This workshop will cover the wide range of methods and patterns used to develop interactive 3D applications based on royalty-free and open ISO-IEC standards. As a high-level scene graph language and API above the graphics library, Extensible 3D (X3D) provides a suite of standards including multiple data encodings and language bindings. We will explore the myriad of approaches, tool chains, and applications for building X3D objects and scenes, especially concerning medical and health informatics.

Workshop Outline

This workshop will explore the myriad of approaches, tool chains, and applications for building X3D objects and scenes, especially concerning medical and health informatics. This includes: different formats and data types, approaches to multiple input devices and sensors, and deployment to different display devices, including 3D printers. With the same declarative-imperative programming idiom as the WWW, developers can build 2D + 3D Virtual and Mixed Reality documents and applications that publish to and integrate with the WWW ecosystem.

The format will be interactive, with chances for open-ended topical engagement with the audience, especially on each case study / demonstration. Through attendee participation, our hope is that a consensus of requirements, gaps, and opportunities will be compiled.

1. Motivation & Web3D Context
2. X3D Technology Overview
3. X3D Case Studies:
   a. 3D Imaging & Scanning
   b. 3D Printing
   c. Semantics Integration
   d. Bioinformatics Applications
   e. Therapeutics & Ergonomics
   f. Analytics (including Geospatial)
4. X3D, HL7 Opportunities & Roadmap

Learning Objectives

This workshop serves as a broad introduction to the technologies and capabilities of the ISO-IEC Web3D standard Extensible 3D (X3D) and Humanoid Animation (H-ANIM). Attendees will gain a comprehensive understanding of the standard specifications, tool chains, and publishing platforms for 3D health informatics information. The materials, including the presentation and links will be available for attendees to follow-up for more in-depth and technical resources.

Audience
We welcome anyone interested in the variety of ways to encode, share, and access 3D health and medical information. We will relate to topics and technologies such as: DICOM, HTML5, and HL7.

Level / Prerequisites
There are no pre-requisities; this workshop will provide a high-level view of X3D technologies and their strategic roles in the healthcare enterprise. Participants are not expected to have prior experience with X3D or VRML (Virtual Reality Modeling Language); similarly, a familiarity with markup languages and WWW technologies such as HTML5 & JavaScript is beneficial, but not required.

Instructor Histories
Similar material has been presented as tutorials in 2018 at the IEEE VR Conference and the ACM Web3D Conference. In addition, we have led Medical graphics meetups at the ACM SIGGRAPH conference for the last ten years.

Nicholas F. Polys is Director of Visual Computing with Virginia Tech Research Computing Group and Affiliate Research Professor in the Department of Computer Science. He has developed interactive 3D graphic content and systems for since 1997. His research interests lie at the center of graphics and Human Computer Interaction: the intersection of visualization, virtual environments, and perception. After his undergraduate research in Cognitive Science at Vassar College (1996), he jumped into the networked information space of the WWW developing audio, visual, and 3D assets and software. His doctoral work at Virginia Tech (2006) examined perceptual cues and layout behaviors for Information-Rich Virtual Environments for desktop to immersive platforms. He is a member of ACM, IEEE Computer Society, and the Web3D Consortium. He is a co-author of the international standard (ISO) Extensible 3D (X3D), elected Director and President of the Web3D Consortium, and Chair of the Web3D Medical Working Group.

Michael Aratow is a Web3D Consortium Member and the Co-Founder and Chief Medical Officer of Ellipsis Health, a digital technology startup creating a behavioral health vital sign by utilizing machine learning to analyze speech. He still practices as an Emergency Physician and is a health IT administrator. He is also an angel investor in digital health and is active in the medical virtual reality community.

Peter Sforza, Director for the Center for Geospatial Information Technology at Virginia Tech, has served as a faculty member at Virginia Tech since 1998, where Peter has successfully worked across multiple colleges and disciplines cultivating interdisciplinary collaborations to develop insights and innovations for complex problems. This includes a broad range of geospatial application domains including agriculture, broadband, facilities management, hazard assessment, transportation, safety and security, community resilience, health, energy, biotic and abiotic modeling, multi-criteria decision support systems, optimization, 3-D spatial data infrastructures, interoperability, crowdsourcing, data mining and visualization techniques.

Anita Havele has over 15 years' of experience in computer graphics and a strong background in technical marketing of open standards in 2D/3D graphics. She has developed strategic roadmaps to build and deliver next-generation new media 3D and managed programs for the promotion and adoption of standards. She is currently the executive director of the Web3D Consortium implementing strategic plans for the global growth and adoption of the Consortium's standards and 3D technology. She also coordinates and works with other standards organizations such as W3C, OGC, DICOM, ISO, and Khronos. Before joining the Web3D Consortium her standards work extended to the automotive industry as part of a leading group at GM/EDS standardizing the design engineering processes. She is a member of ACM, IEEE Computer Society, and the Web3D Consortium. She holds a Master's degree in Electrical Engineering and Computer Science from Marquette University, USA.