Virginia Tech

US Navy Workshop

December 6, 2019

Advanced Research Computing (ARC)
Center for Geospatial Information Technology (CGIT)

Topic Overview

Goal:

cover Virginia Tech's experience and outlook on 3D GIS & Facilities Management over the last 18 years and into the future

We will cover 3 topics:

- CGIT
- ARC
- Collaborations & Impact

Virginia Tech (VT): Ut Prosim

- A land-grant University serving the Public Good
- ***Science*** and the *Reproducibility* of Research is a core mission
- Investments in a broad spectrum of digital content **and access**:
  - **Capture (i.e. scanning)**
  - **Design**
  - **Simulation**
  - **Archival and sharing**
  - **Analytics**
- International Standards provide: **interoperability, accessibility, and durability**
  - the basis for a long-term strategy

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CGIT

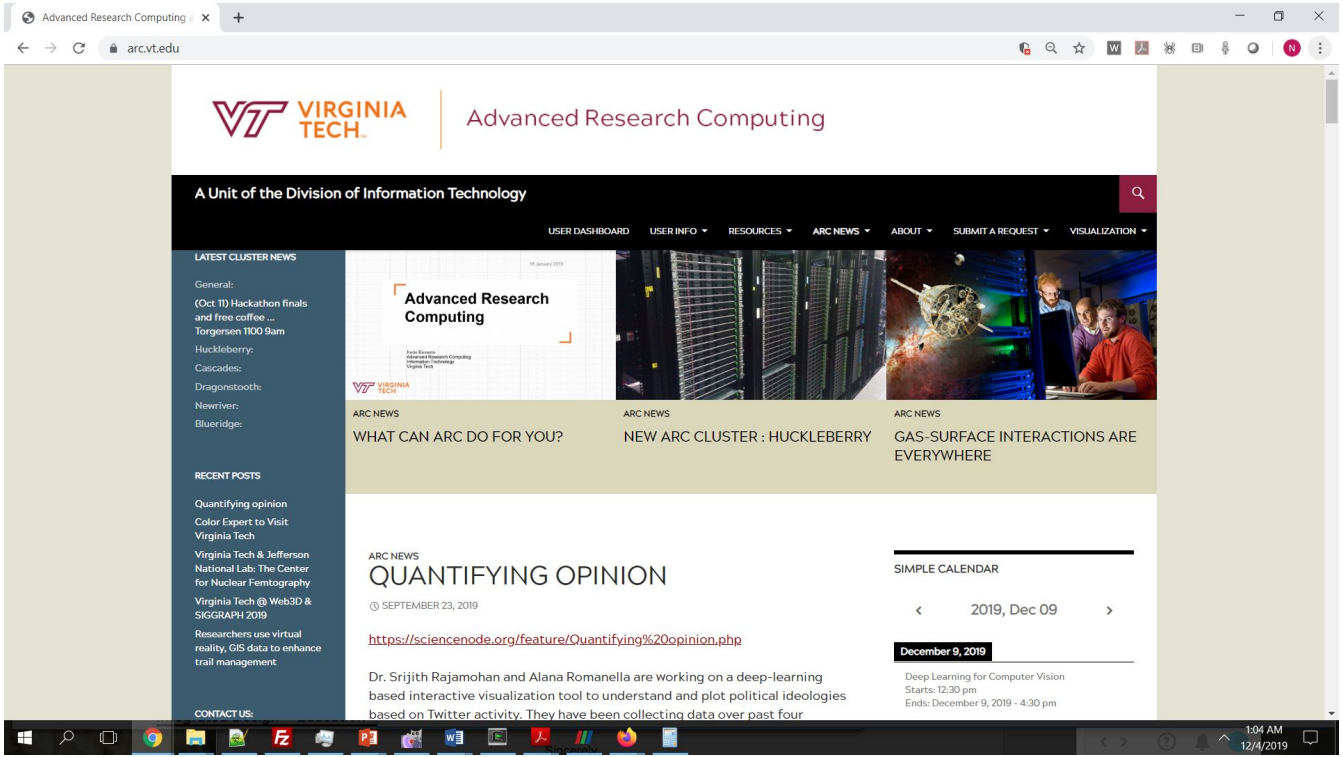
GIS Interoperability

Data Fusion, Analytics, and Web apps to solve real problems

Integrating:

- Climate
- Tides
- Flooding
- Connectivity (Broadband)
- BIM

VT Advanced Research Computing



Advanced Research Computing: arc.vt.edu

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X3D Blacksburg

X3D Blacksburg

An ongoing collaborative to build a Mirror World / Digital Twin of our campus, town, and surround

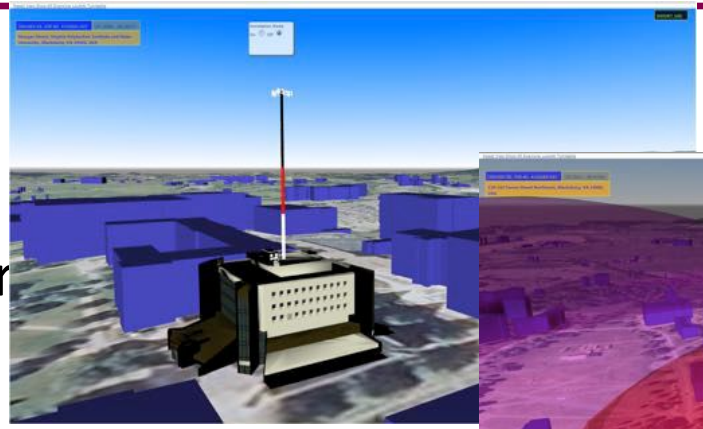
- Used lidar data to establish more accurate building elevations
- Used Lidar to provide tree locations, which were then populated with different 3D LOD models
- Videos
  - https://vimeo.com/279335135
  - https://www.youtube.com/watch?v=Y5ViPrmJ848

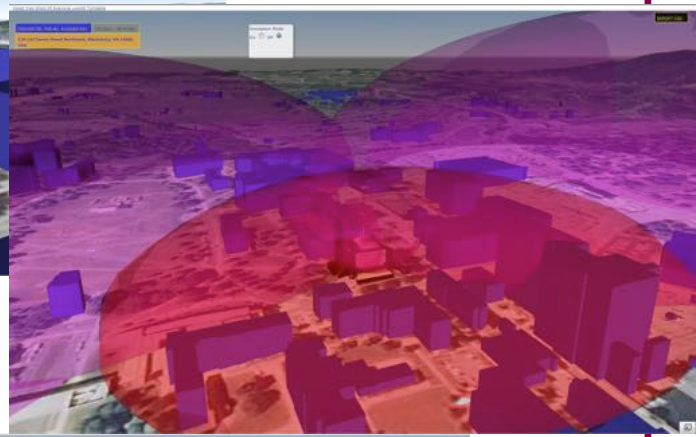
Online

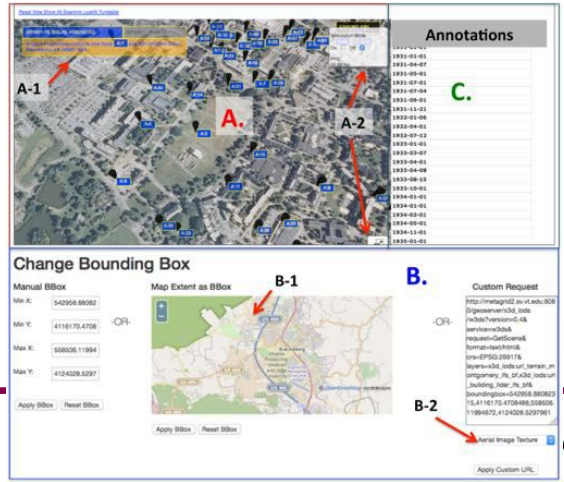
X3D Blacksburg on GeoSer

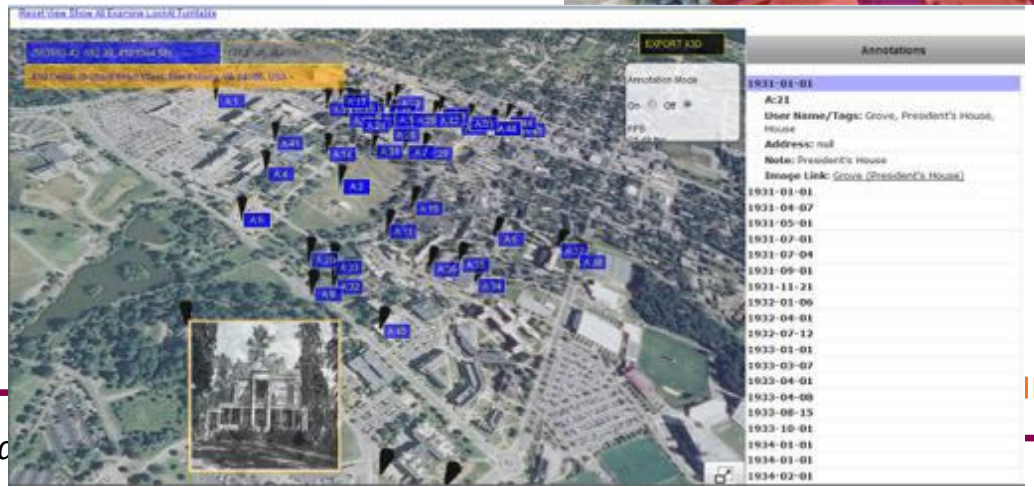
X3D LODs

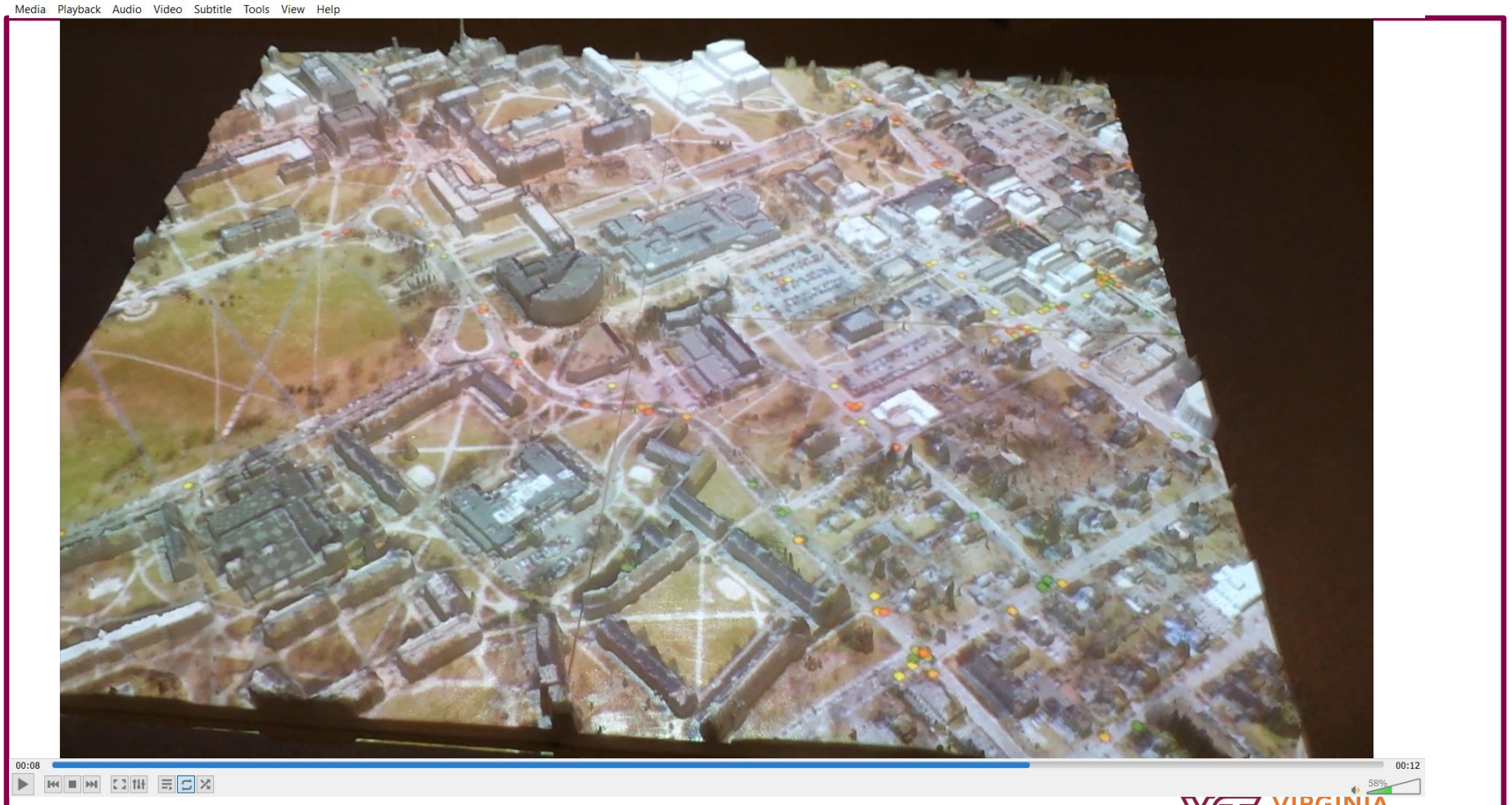
Binary X3D tiles











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Watershed and Plantings

Topography and changes are essential for accurate flood models and hazard mitigation plans.

We have flown:

- Stroubles Creek (Stream Lab)
- Catawba Sustainability Center
- Dozens of other sites in Virginia, including agricultural experiment stations
- Videos : https://www.youtube.com/watch?v=Y5ViPrmJ848

Immersive, Multi-user 3D Blacksburg

Remote site visits

Remote site visits

3D Blacksburg Collaborative Planning

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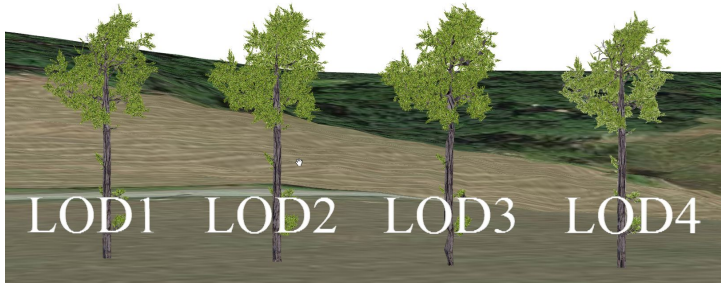
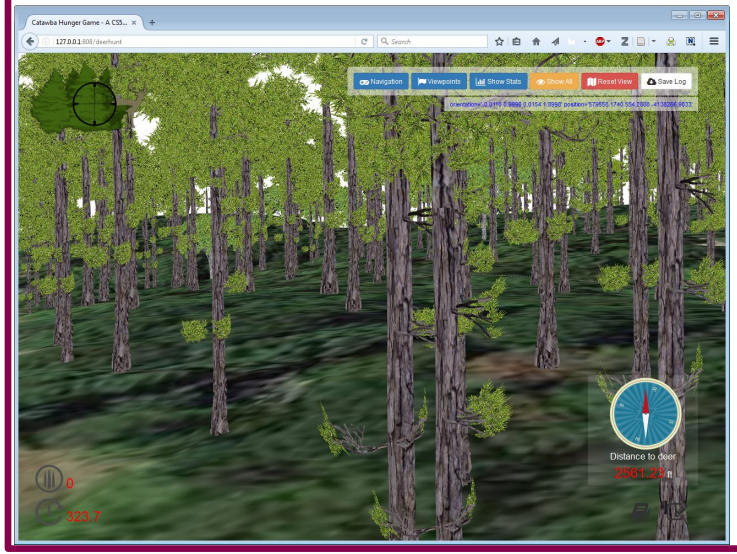
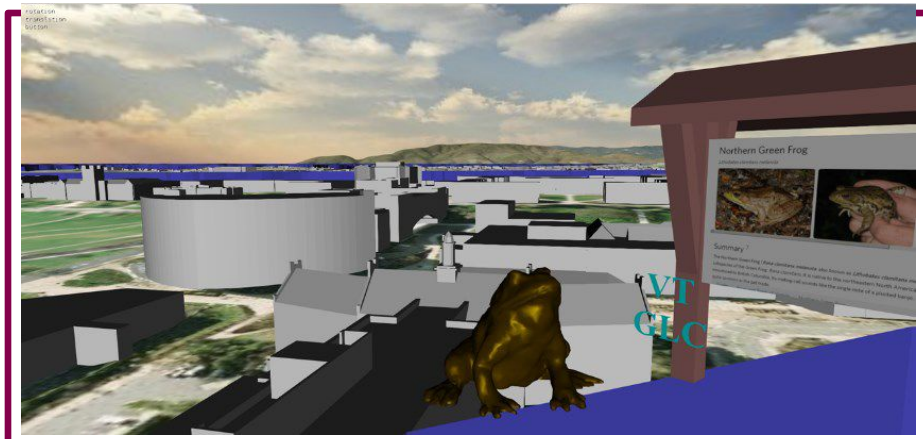
Web3D: Extensible 3D (X3D)

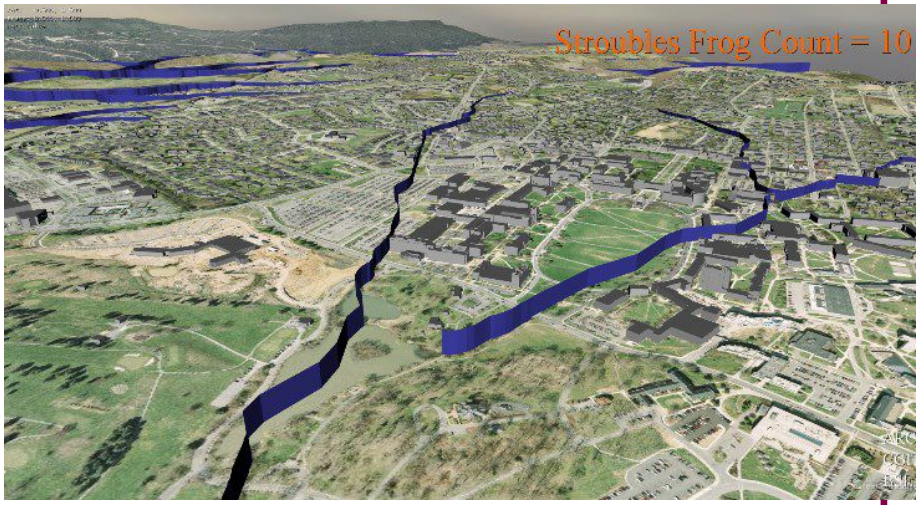
TIN, Imagery, Tree locations





Haitao Wang, Xiaoyu Chen, Nicholas Polys and Peter Sforza (2017). “A Web3D Forest Geo-Visualization and User Interface Evaluation”. In Proceedings of the 22nd International Conference on 3D Web Technology (Web3D '17). ACM, New York, NY, USA.





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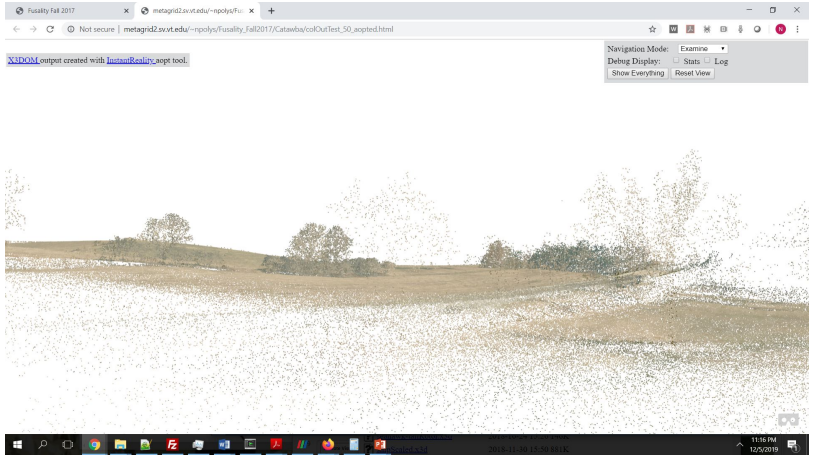
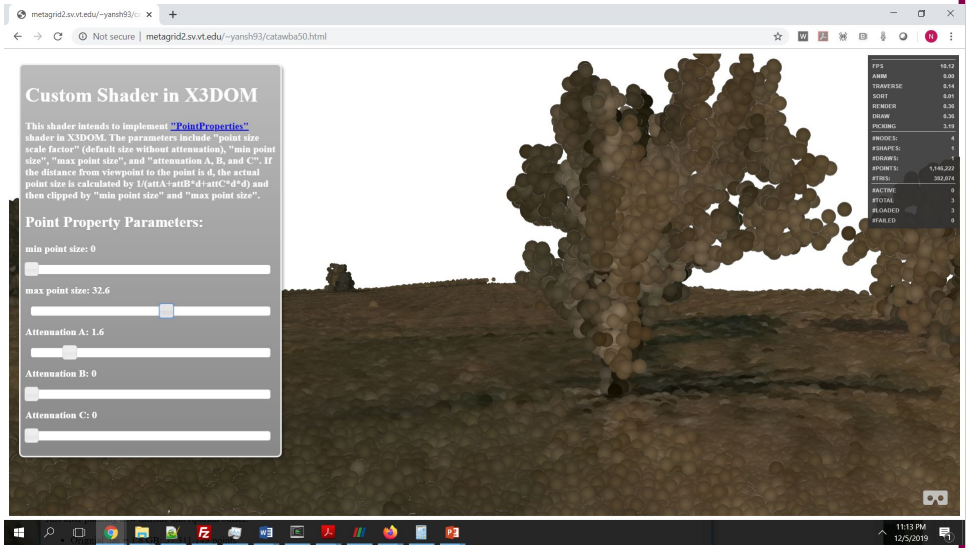
PointClouds and X3D Rendering

PointProperties in X3D 4.0

http://metagrid2.sv.vt.edu/~npolys/Fusality_Fall2017/home.html

http://metagrid2.sv.vt.edu/~yansh93/catawba50.html





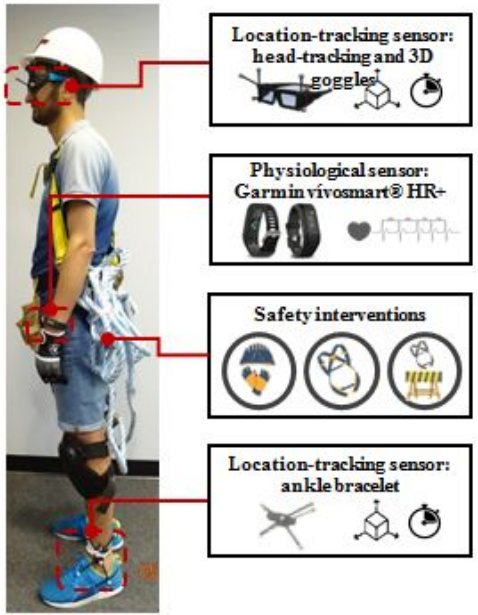
Training & Safety

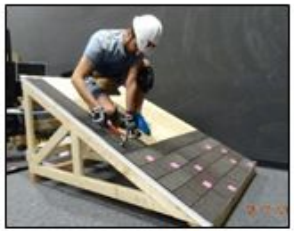
- Sogand Hasanzadeh

PhD Dissertation

Latent Effects of Safety Interventions

Sogand Hasanzadeh





Training

(a) No intervention

(b) Injury-reducing intervention

(c) Injury-preventing intervention

Hasanzadeh, 2019

Latent Effects of Safety Interventions

Sogand Hasanzadeh



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Advc

Hasanzadeh, 2019

Latent Effects of Safety Interventions

Sogand Hasanzadeh

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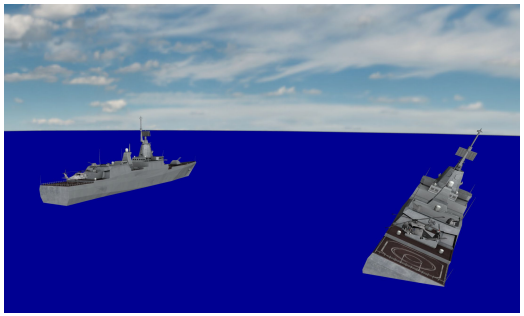
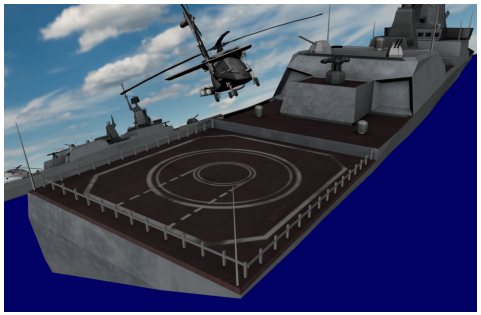
Advanced Research

Hasanzadeh, 2019

Simulation

Helicopter landing dynamics at sea





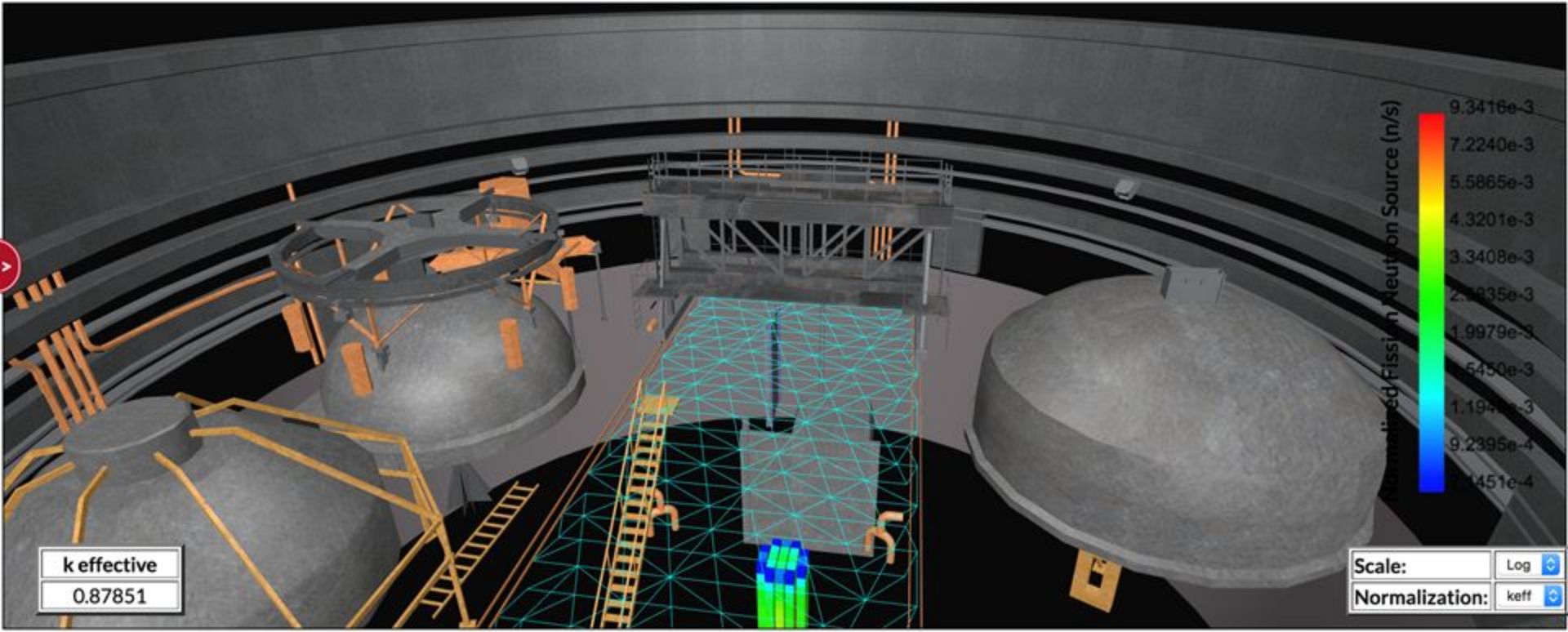
Virginia Tech @VTEngineering team uses #X3D to visualize and test multiple control algorithms for ship and aircraft maneuvers, working to improve safety and increase insight. **Cornel Sultan, Keren Chen, Nicholas Polys Virginia Tech**

- **VRS-RAPID** is a collaborative, interactive, and 3D virtual-reality **web-application** for real-time simulation of nuclear systems

- Users connect to VRS-RAPID to collaborate **on modeling and simulation** of e.g., nuclear reactors

- Valuable tool for nuclear industry operators and regulators, educators and students, and continuing and professional training

VRS Rapid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5.5865e-3
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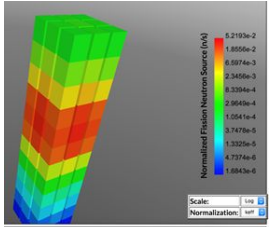
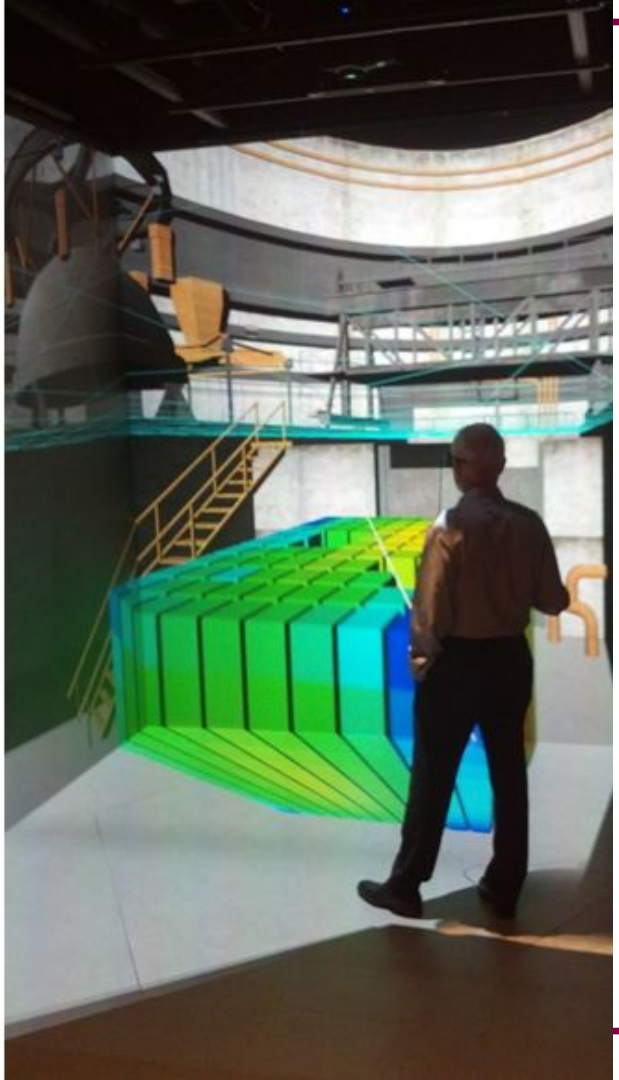


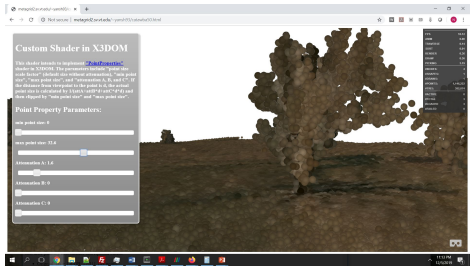
- - Producing X3D enables the delivery of results to other platforms, such as immersive Virtual Reality
- - For example, VRS output data can be loaded in the 26.7 million stereo pixel HyperCube in the VT Visionarium Lab
- - Head tracking and embodied interaction at the human scale creates a highly immersive experience supporting spatial understaning
- - Using projection VR, users can see each other and themselves in the space



A

HTML5 + X3D

Using SRC 3D Compression



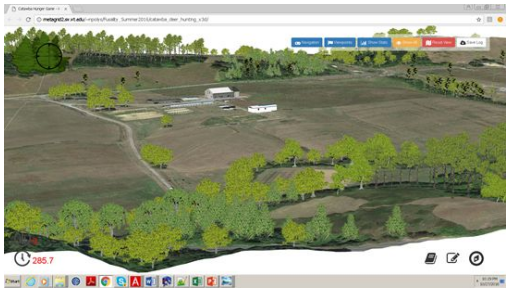
1) 440K points = 23MB.ply , 21MB.x3d

2) Compressed.X3D = 3.4 MB

3) Interaction through Web and WebVR

    - 50-60 fps on laptop

4) Gltf Inlining also demonstrated



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Take-Aways

- X3D and open standards leadership helps Virginia Tech fulfill its mission everyday
- X3D supports interoperable data, unlocking value across the enterprise, application stovepipes, and hardware platforms
- X3D is durable, providing a data strategy longer than silicon valley life-cycles

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