Update on X3D Geospatial from the Web 3D Consortium

Carto BoF

Mike McCann
mccann@mbari.org
Monterey Bay Aquarium Research Institute

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X3D

- Declarative 3D Graphics
  - Simplifies 3D for content creators
  - Integrated with the HTML5 DOM (X3DOM)
  - Extensible
  - Open
Geospatial Component

Must deal with many coordinate systems

- Geographic (latitude, longitude, elevation)*
- Geocentric – Cartesian, “ECEF”, “GCC”
- Local X3D – may be offset, may be rotated

* X3D supports other spatial reference systems via the geoSystem attribute, e.g. “UTM”
Geospatial Component

- Geographic longitude
- Geographic latitude
- Mean earth radius
- Geocentric coordinate system
- Geocenter
Geospatial Component

Makes it easy to use Geo in X3D

• Geo content provided in lat, lon, elev
• Computer graphics works in X, Y, Z
• Numerical precision issues
• Navigation, e.g. “fly” expects +Y to be “up”
X3D Geospatial Component

Handles all the transformations and precision calculations needed to work with geographic data
Geospatial Component

X3D Geospatial Node set

1. GeoCoordinate
2. GeoElevationGrid
3. GeoLocation
4. GeoLOD
5. GeoMetadata
6. GeoOrigin
7. GeoPositionInterpolator
8. GeoProximitySensor
9. GeoTouchSensor
10. GeoTransform
11. GeoViewpoint
12. GeoOriginTransform
13. GeoWebMap

X3DOM supported
X3DOM experimental
Recently Published

The X3D geospatial component: X3DOM implementation of GeoOrigin, GeoLocation, GeoViewpoint, and GeoPositionInterpolator nodes

Full Text: 📄 PDF

Authors: Andreas Plesch, Harvard University
        Mike McCann, MBARI
Example application: STOQS

How X3D Geospatial can be used in practice
Browser makes HTTP request
Server software translates to SQL request
Server responds with XHR as JSON structure
JavaScript updates DOM elements
Scene updates with selected data
Browser-database data flow

X3D Scene Graph DOM

```html
<div>
  <X3D id="spatial-3d-x3d" style="width:100%; height:100%;">
    <Scene>
      <shape id="mp-x3d-track"/>
      <Viewpoint id="mp-x3d-viewpoint1"/>
      <Inline id="mp-x3d-terrain1"/>
    </Scene>
  </X3D>
</div>
```
Browser-database data flow

XML HTTP Response (XHR) containing JSON
Browser-database data flow

JavaScript (jQuery) code to update the scene graph with data from the database

```javascript
$('#mp-x3d-track').html([  
    '<indexedlineset coordIndex="' + data.measuredparameterx3d.index + '">',  
    '<color color="' + data.measuredparameterx3d.colors + '"></color>',  
    '<geocoordinate point="' + data.measuredparameterx3d.points + '"></geocoordinate>',  
    '</indexedlineset>
'].join(' '));
```
Demonstration

Search MBARI’s YouTube channel for “STOQS”
Getting involved

• Visit the Web3D Consortium at booth #1018
  – x3d-public mailing list
  – geospatial mailing list*
  – Strong liaison with Open Geospatial Consortium

• Contribute to open source projects
  – X3DOM on GitHub
  – ...

* Members only