

Geo Web BoF Agenda

- The CURTIS Platform for City Simulation
 - Marc Petit – Electricité de France
- The X3D Geospatial Component
 - Mike McCann – Monterey Bay Aquarium Research Institute - @MBARIMike, mccann@mbari.org
- Discussion

X3D

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

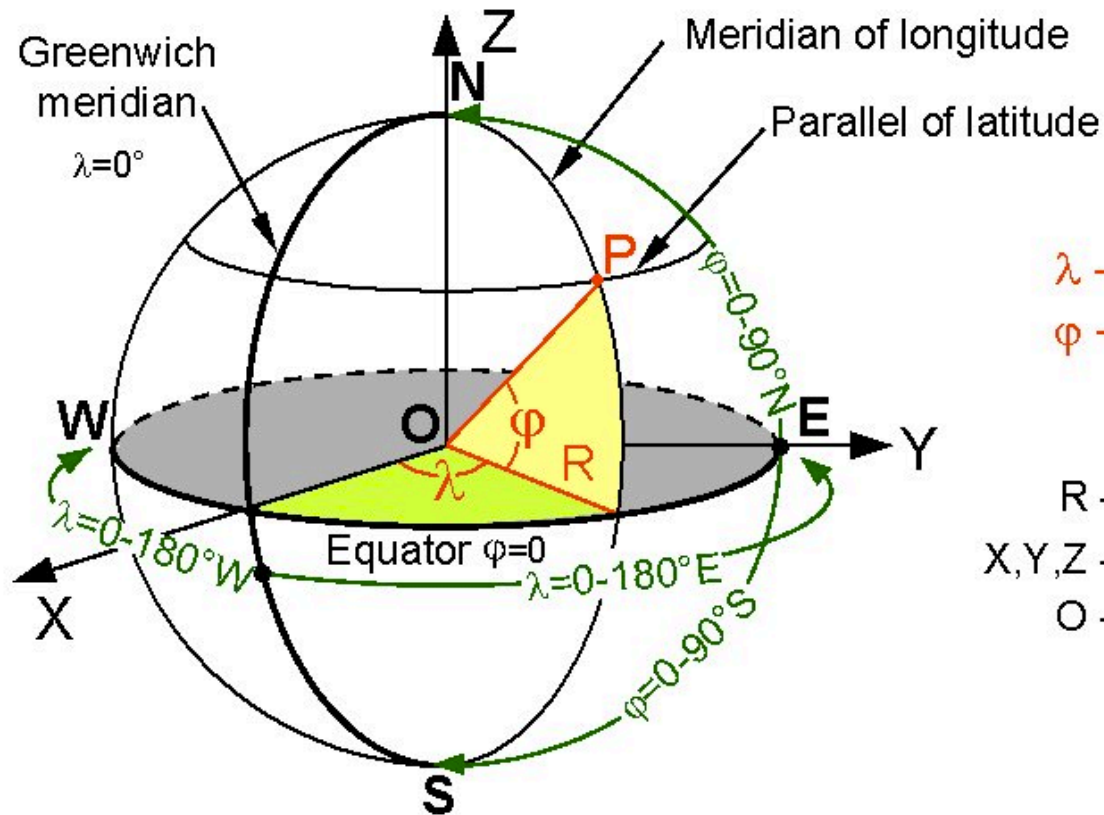
Geospatial Component

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 other spatial reference systems via the geoSystem attribute, e.g. “UTM”

Geospatial Component



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



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

Full Text:  [PDF](#)

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2015 Article

Example application: STOQS

How X3D Geospatial can be used in
practice

Browser-database data flow

- 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

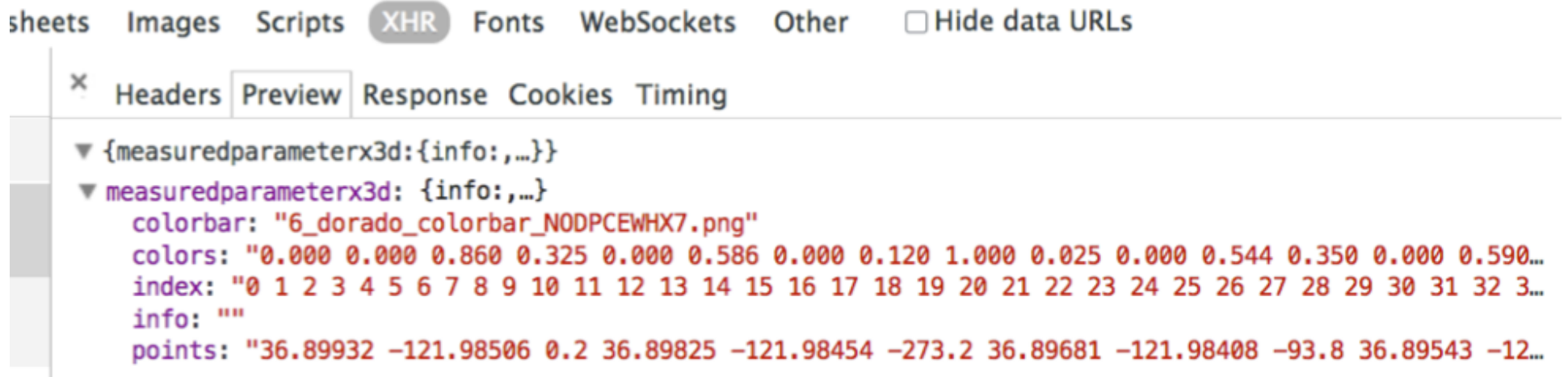
Browser-database data flow

X3D Scene Graph DOM

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

Browser-database data flow

XML HTTP Response (XHR) containing JSON



The screenshot shows a browser's developer tools interface with the 'XHR' tab selected. The 'Response' sub-tab is active, displaying a JSON object. The JSON object has a root property named 'measuredparameterx3d' which contains another object with several properties: 'colorbar', 'colors', 'index', 'info', and 'points'. The values for 'colors' and 'points' are long strings of numbers.

```
sheets Images Scripts XHR Fonts WebSockets Other  Hide data URLs
```

```
× Headers Preview Response Cookies Timing
```

```
▼ {measuredparameterx3d:{info:,...}}
```

```
▼ measuredparameterx3d: {info:,...}
```

```
  colorbar: "6_dorado_colorbar_NODPCEWHX7.png"
```

```
  colors: "0.000 0.000 0.860 0.325 0.000 0.586 0.000 0.120 1.000 0.025 0.000 0.544 0.350 0.000 0.590..."
```

```
  index: "0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 3..."
```

```
  info: ""
```

```
  points: "36.89932 -121.98506 0.2 36.89825 -121.98454 -273.2 36.89681 -121.98408 -93.8 36.89543 -12..."
```

Browser-database data flow

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

```
$('#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