

Update on X3D Geospatial from the Web 3D Consortium

Carto BoF

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X3D

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

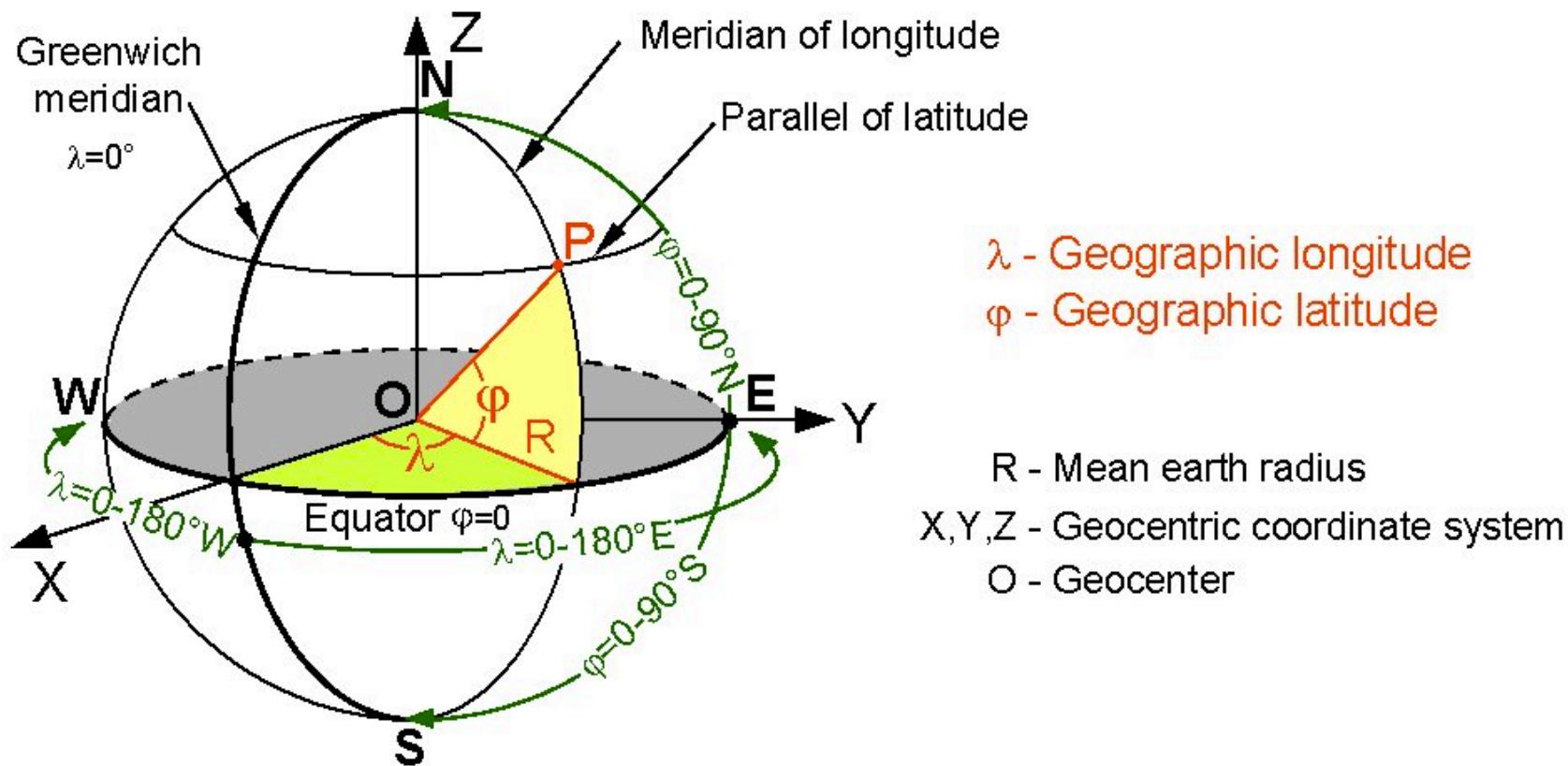
Geospatial Component

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

Geospatial Component



λ - Geographic longitude
 φ - Geographic latitude

R - Mean earth radius
X,Y,Z - Geocentric coordinate system
O - 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



[My Binders](#) [SIGN](#)

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

Full Text:  [PDF](#)

Authors: [Andreas Plesch](#) Harvard University
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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

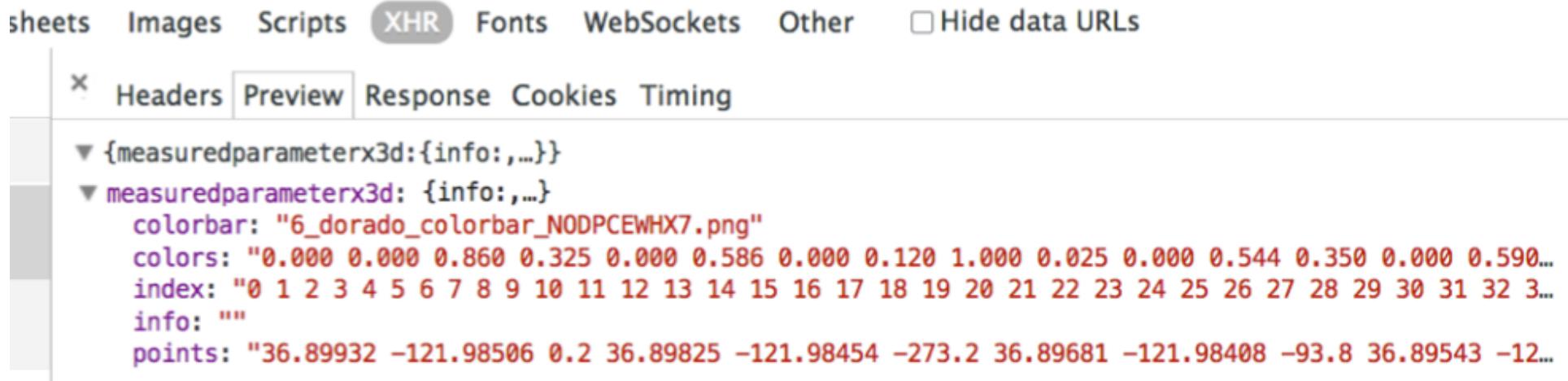
Browser-database data flow

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 the Network tab of a browser developer tools interface. The XHR tab is selected. A single request is listed, expanded to show its JSON response. The response object contains several properties: colorbar, colors, index, info, and points. The colors and points arrays are very long, truncated at the end.

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(''));
```



SIGGRAPH 2015
Xroads of Discovery
Xroads for Interactive 3D Content

Demonstration

Search MBARI's YouTube channel for
“STOQS”

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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