X3DOM
Status and Future Development

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Outline

- X3DOM – Basic Concepts

- X3DOM 1.x: Latest Developments

- X3DOM 1.x: Standardization

- X3DOM 2.0: First Steps

- X3DOM 2.0: Call For HTML Profile Refinement

- X3DOM 2.0: Next Steps

X3DOM – Basic Concepts

- „X3D in HTML5"

- Project launched & Web3D paper in 2009
  X3DOM: a DOM-based HTML5/X3D integration model

- Open Source Project (MIT / GPL)

X3DOM – Basic Concepts

- X3D declarations as part of HTML Web page

- Several rendering backends possible
  - Dedicated X3D (ActiveX) plugin
  - Flash plugin
  - **WebGL / JavaScript (no plugin)**

X3DOM – Basic Concepts

- **WebGL / JavaScript** is the usual way to do it

```html
<!DOCTYPE html >
<html >
    <head>
        <link rel='stylesheet' type='text/css' href='http...
        <script type='text/javascript' src='http://www.x3dom.org/x3dom/release/x3dom.js'></script>
    </head>
    <body>
        <h1>Hello X3DOM World</h1>
        <x3d width='400px' height='400px'>
            <scene>
                ...
            </scene>
        </x3d>
    </body>
</html>
```
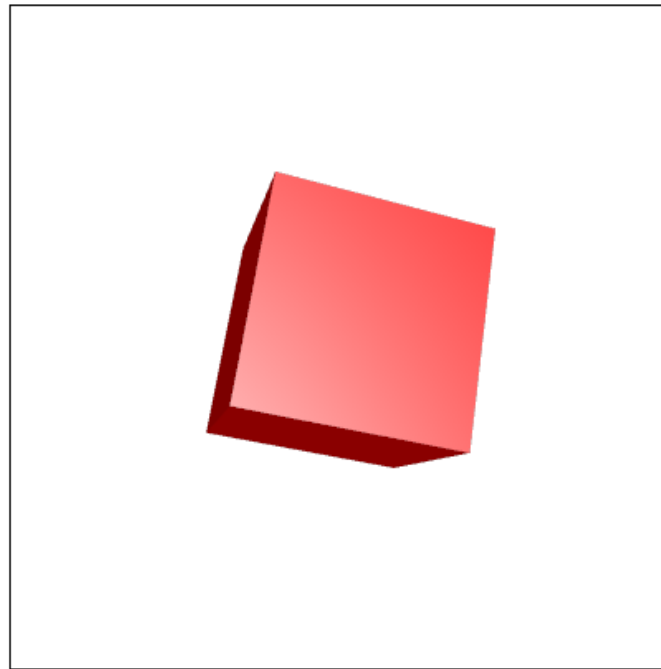
Include X3DOM JavaScript Library (*Polyfill*)

Definition of the X3D Scene in HTML (No self-closing tags, unlike X3D in XML)

X3DOM – Basic Concepts

Hello X3DOM World

X3DOM – Basic Concepts

- DOM API as Interface to X3D content
  - X3D Node = DOM Element
  - X3D Field = DOM Attribute
  - DOM Manipulation (*appendChild, setAttribute, …*)
  - HTML Events
  - (Experimental) CSS integration
- Easy to learn for Web developers

X3DOM – Basic Concepts

- Latest stable release: 1.6.1

- Originally an experiment by Fraunhofer IGD, now an open source project hosted on GitHub

- Communication: Mailing lists, GitHub tracker

X3DOM – Basic Concepts

- Recent, ideal node contribution workflow:
  - Check similar concepts (in InstantReality, Xj3D, …)
  - For self-cooked nodes: Submit proposal
    - Why do existing concepts not solve the problem?
    - Discussion on X3DOM mailing lists and GitHub
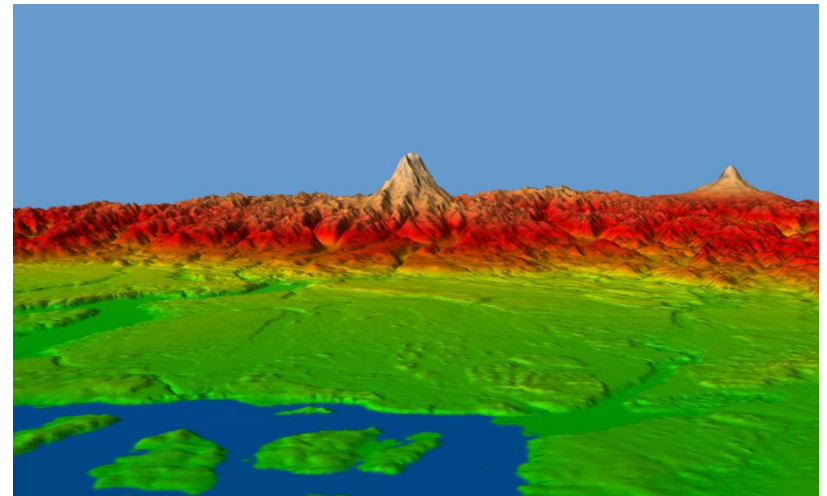 - Development, guided by ongoing discussion
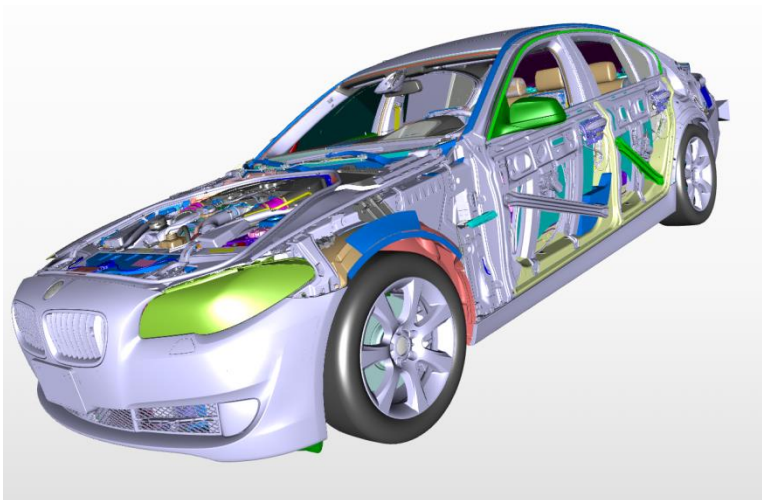 - **Pull Request** on GitHub

X3DOM 1.x: Latest Developments

- Central Web portal for examples

- Node API Documentation, Beginner's Guide, Tutorials
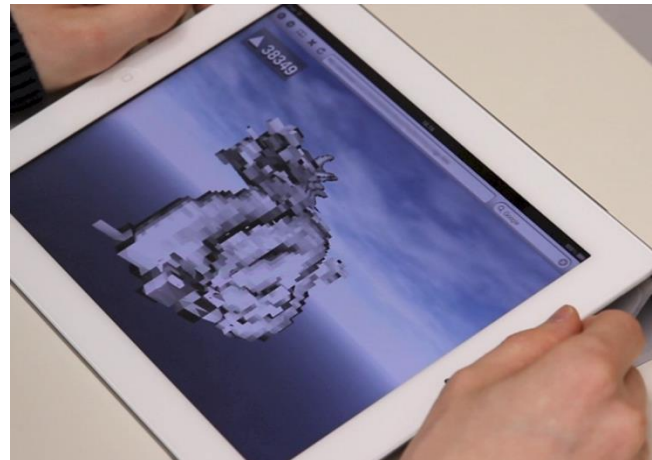
- Automated Testing Suite
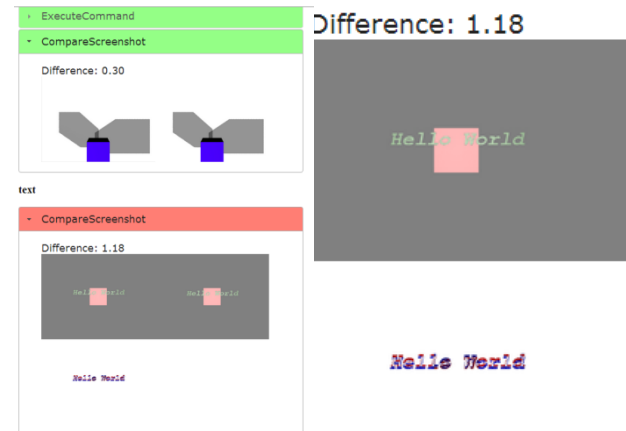
X3DOM 1.x: Latest Developments

- Additions beyond X3D mostly driven by performance reasons (see next slides)
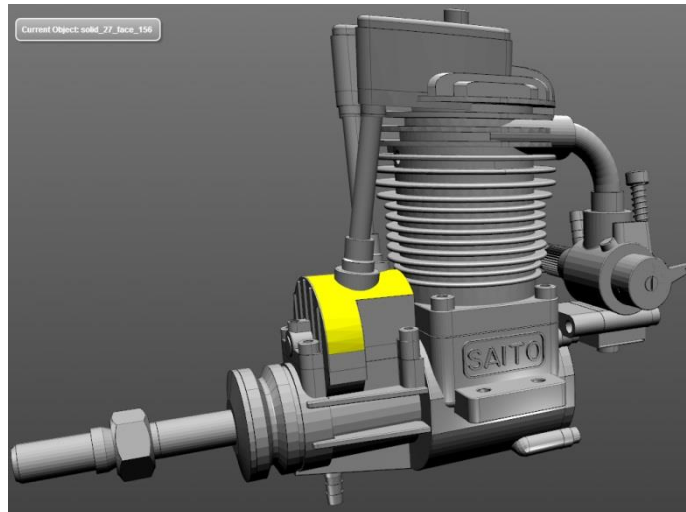
X3DOM 1.x: Latest Developments

- *ImageGeometry, BinaryGeometry, POPGeometry, ExternalGeometry (How to efficiently stream binary mesh data)*

X3DOM 1.x: Latest Developments

- *MultiPart* Node: Parts are not DOM objects
(*How to efficiently identify many small parts*)

X3DOM 1.x: Latest Developments

- JS Field Interface
  (*How to efficiently access large field values*)
  - `getFieldValue, setFieldValue`
    (uses JS objects / value types instead of strings)

  - `requestFieldRef, releaseFieldRef`
    (returns / releases reference instead of copy)

X3DOM 1.x: Latest Developments

- Other non-standard X3D behavior:
  - Mouse Events as alternative for *TouchSensor*

  - *onoutputchange* event processes ROUTEable field value changes in a JS callback function

X3DOM 1.x: Standardization

- Proposals for Integration into X3D:
  - Integration of DOM Events
  - *ExternalShape* and *ExternalGeometry* nodes
  - Popular non-standardized nodes (for example, *MatrixTransform*)
  - *LineSensor* node (*PlaneSensor* not sufficient)

X3DOM 2.0: First Steps

- X3DOM 1.x - Goal: *(X)3D in DOM*
  Started as small experiment, rapid development, at the cost of general stability and extensibility

- X3DOM 2.0 - Goal: *Scalable, long-term solution*
  Stable and extensible, TypeScript, quality assurance, rendering separated from X3D-related code

X3DOM 2.0: First Steps

- Pluggable Rendering Environment (PRE)
  - High-performance rendering of large data sets
  - Different culling, rendering and compositing components can be combined
  - Basic user interaction API (navigation, picking, ...)
  - Separation: X3DOM 2.0 as frontend for PRE

X3DOM 2.0: First Steps

- X3D layer currently very small
  - No DOM manipulation possible yet
  - Clean implementation of basic ROUTE, Event, … mechanisms still needs some time
  - Nodes: *Transform, Viewpoint, Shape, Appearance, Material, Box, ExternalShape, StaticGroup*
  - HTML profile needs to be updated

X3DOM 2.0:
Call For HTML Profile Refinement

- X3DOM HTML Profile from 2009
  - Some nodes questionable
  - Some (new) nodes probably missing
- Aims:
  - Expressive set of core features / nodes
  - X3DOM 2.0 implements refined HTML Profile

X3DOM 2.0:
Next Steps

- HTML Profile Refinement necessary
  - Process not defined yet
  - Will (shortly) be discussed on mailing lists!

- First open source alpha version:
  Q1 2015