

Semantic X3D

Thoughts and ideas drafts

What is a semantic description of a scene

A potential semantical description of a 3D scene is an expression that should support and “answer” semantic queries (Reasoning and Inference inquiries):
Structural, Conceptual, Functional

Semantic queries are implemented on named graphs, linked-data or triples.

Structural semantic info in 3D models, scene graphs

<ul style="list-style-type: none">● Geometry● Motion● Color	<ul style="list-style-type: none">● Textures● Viewpoints● Lighting	<ul style="list-style-type: none">● etc.
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Examples: number of index values, curvature, velocity, color, Texture pattern, brightness.....

Example query: TODO

Examples of implementations (structural semantics)

More or less X3D covers all these in XML format.

In [3D Modeling Ontology](#) there is an OWL DL ontology created from X3D v3.3, presenting the structural properties of the scene

- <http://3dontology.org>

In the past we presented [MPEG7](#) descriptors and some extensions that may provide semantic of structural representation of scenes

- <http://mpeg7.org>

Conceptual semantic info

- Goal:
 - Creation
 - Description
 - Exploration

of 3D content by non-IT-specialists, who use domain-specific concepts

- Spatial
- Domain specific
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Example terms: big, small, up, down, left, right,

Example query: TODO

Examples of implementations (conceptual semantics)

- Space representation
 - Spatial Indexing of Complex Virtual Reality Scenes in the Web (DOI: 10.1142/S0219467817005235)
“Object Identification Based on the Automated Extraction of Spatial Semantics from Web3D Scenes”
<http://aetic.theiaer.org/archive/v2n4/p1.html>
 - <http://www.medialab.teicrete.gr/minipages/3DRtree/index.html>
- Point cloud semantic segmentation
- VR/AR museums (<http://semantic3d.org/publications>)
 - Representation of artifacts, exhibitions using museum-specific concepts, e.g., coins, armors, sculptures
- Appliances, engineering
 - Representation of household appliances and their elements (e.g., induction hob, cookers) to build marketing contents
- Education and training
 - Representation of junctions, streets, buildings, traffic lights to create 3D scenes for training drivers

Functional (Behavioral) semantic info

- Temporal info
- Interactivity (model to model and user to model)
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Examples: quick, slow, first, second, animation path (linear, spline, easy-in-easy-out), user actions and interactions

Example query: TODO

Examples of implementations (functional semantics)

MPEG 7

What about different problem domains?

Each of the following working-group problem domains includes structured vocabularies and even ontologies. How do we refer to these categories?

- Medical
- Human Animation (HAnim)
- Computer Aided Design (CAD)
- 3D Printing
- 3D Scanning
- Cultural and Natural Heritage
- Building Information Modeling (BIM)
- Training and Education (e.g. SCORM)