SVG, GML, KML Understanding Using Ontologies & Logic

This presentation is about the SVG Metadata element and the SVG Desc element usage in the topic areas of Accessibility of SVG, Location-based Services, Making Graphics Accessible.

The Open-Meta Computing OMC name space used by the SVG Desc element is shown to be able to provide a schematized scene graph (using OpenSceneGraph OSG) and a semi-structured detailed description machine-usable beyond what a simple character-string description provides. The example SVG file which I wrote, shown in the SVG 1 spec, SVG meta data element, shows a simple example of this detail and the value of the structuring, such as including scene descriptors and Dublin Core in the meta data. The OMC name space scene graph is PCS-mappibly interoperable with RDF / OWL items in the SVG meta data section of an SVG file which depict spatial and other semantic relationships / descriptions of the component SVG items which constitute the SVG file. You can see examples of this RDF semantic representation of the spatial relationships of SVG items in the file containing the SVG meta data item, in OMC's barchart.svg file (OMC website), and in Chapter 11 and 16 of my book WROX Professional XML Meta data.

The OMC name space schematized scene graph capability enhances semantic knowledge of the SVG file content by maintaining such information as item location and attribute descriptions. External logic can use or give XML ID information on the SVG items comprising a file and incorporate those ID 'names' in both the scene graph and the meta data in the SVG meta data element of the file.

Shown in this presentation is how geo-spatial data sets using GML and KML representation, accessed through the SVG meta data element, are mapped into SVG graphics elements using meta-programming which implements aspect oriented programming technology. This external (to the SVG file) logic intelligently maps GML and KML items into visual form via SVG code generated via the mapping. The means to this intelligent meta-programming is explained in the presentation. Standardized symbols / geo-styles can be produced via the generated SVG based on the GML and KML content. KML is used in Google Maps and Earth. XML meta data (XML, RDF, RDFS, OWL, GML, KML) may be either embedded in the SVG Meta data element in the file or it may be external and referenced in the SVG Meta data element. URI, RDF:seeAlso and RDF:usedBy are used to reference external meta data, as can XML annotation and OMC PCS, the SVG meta data element is processed by parseType literal.

Additionally it is shown how the twelve NASA JPL Semantic Web for Earth and Environmental Terminology (SWEET) ontologies, in conjunction with an ontology of SVG (*), are used to permit PELLET, a description logic reasoner, to not only understand the semantics of the SVG components constituting an SVG picture but also to understand the total ensemble of those elements. An (SVG) bar-graph, pie-graph, and SVG-based geographic map are provided as focus examples. Embedded RDF and OWL show spatial relationships etc and provide semantics to backup info in the scene graph content.

(*) The SVG ontology is a multiple ontology merging comprised of specific items from the SWEET set and mapped using the OMC Processing Connection Service PCS. It performs a topic map-like mapping of select items from multiple ontologies to comprise a new 'virtual' merged-ontology. In this case that ontology provides a semantic view of SVG in terms of SWEET. In this way SVG illustrations and XML material in GML and KML data sets 'have meaning' or are 'understood'. Schemas can not provide this, ontologies can.

Named groups of SVG elements which draw standardized-stylized visual symbols, such as those used in cartography, are shown to be semantically understandable by this system using the ontologies and Description Logic reasoning. SVG can be mapped into GML / KML and vice-versa. SVG files can be mapped into natural language descriptions and vice-versa. This permits text-based query of SVG pictures including SVG geospatial illustrations.

Because of the semantic understanding of the spatial-aspects of a GML, KML data set the external logic, with help from the ontologies, can map a 2 ½ D input or a 3D (X3D) input into a picture which 2D SVG can display by using perspective / projection performed in part by POV-ray.

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