



Beyond an image: using ontology and visualization to enrich Web Map Service for geosciences



Rensselaer

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1 Motivation

The spatial data retrieved from WMS are static images, so it's hard to conduct spatial analysis and further applications. In this study we seek approaches to enrich the functionalities of WMS by using ontologies and visualization techniques.

2 Methods & materials

- (1) WMS of geological maps themed on rock ages;
- (2) An ontology of geological time scale (i.e., for rock age concepts);
- (3) An animation to visualize the ontology;
- (4) Functions for interactions between the ontology, the animation and WMS map layers.

3 Experiment & results

The current functions enrich WMS on two parts:

- (1) Spatial data: The animation can be used as a control panel to filter out certain spatial features of rock ages on a WMS map layer;
- (2) Attribute data: The program can recognize rock age term(s) in the WMS records, retrieve annotations from the ontology and show them on the user interface.

4 Conclusions & future works

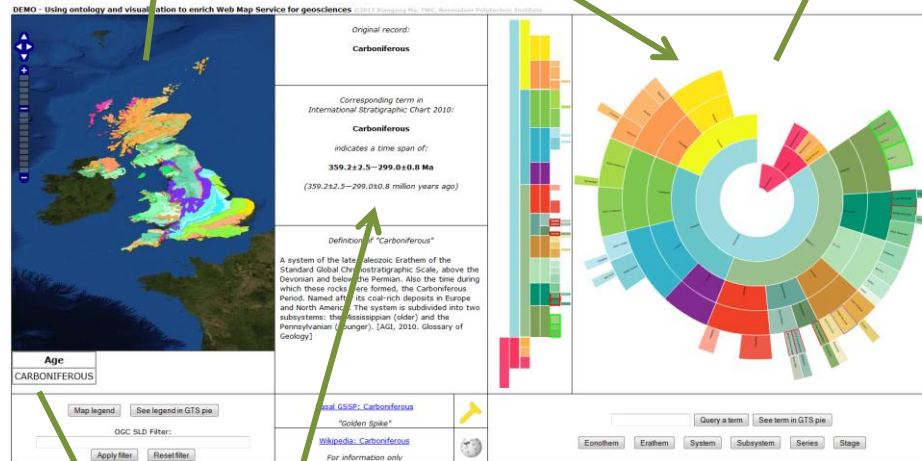
Ontologies and visualization techniques are functional to enrich the WMS for geoscience maps. Further developments will consider end user needs and a case study can be conducted.

Enriched functions for spatial data (1)

- (1) Get style information of rock ages from a WMS map layer;
- (2) Load the style information into the animation;
- (3) In the animation, show nodes of rock age concepts from the style information while hide others.

Enriched functions for spatial data (2)

- (1) Click a node in the animation;
- (2) Filter out map features of a single rock age concept, or together with its sub-concepts;
- (3) The animation refers to the ontology for inter-relationships between rock age concepts.



Filtering out Geospatial features



Mesozoic with sub-concepts

Enriched functions for attribute data

- (1) Click a polygon in the WMS map layer and obtain rock age descriptions;
- (2) The program will recognize the rock age term in the description, retrieve annotations from the ontology and show them on the user interface.

```

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  <rdf:type rdf:resource="owl:Thing"/>
  <gts:gsplInfo https://engineswz.purdue.edu/stratigraphy/gssp/detail.php?periodid=106-top_parentid=77
  [Subcommission for Stratigraphic Information of ICS, 2010, GSSP Table] /gts:gsplInfo
  <gts:cgw#Color 67A599 /gts:cgw#Color
  <skos:definition Carboniferous System/Period: 359.212.5-299.010.0 Ma /skos:definition
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  Chronostratigraphic Scale, above the Devonian and below the Permian. Also the time during which these rocks
  were formed, the Carboniferous Period. Named after its coal-rich deposits in Europe and North America. The
  system is subdivided into two subsystems: the Mississippian (older) and the Pennsylvanian (younger). [AGI,
  2010, Glossary of Geology] /rdf:comment
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  <gts:upperThan rdf:resource="gts:Devonian"/>
  <gts:subsetsOf rdf:resource="gts:Paleozoic"/>
  <gts:supersetOf rdf:resource="gts:Pennsylvanian"/>
  <gts:supersetOf rdf:resource="gts:Mississippian"/>
  <skos:inScheme rdf:resource="" />
</gts:system>

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"Carboniferous": An example concept in the ontology