An Ontological Representation for Water Resources Management

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Water representation is complex

Water bodies

Integration of the politics of the UE 2006-2008: BH, Coastal zones & Maritime regions

Beach waters, Nitrates, etc.

DQA (2000/60/CE) ARH, water bodies

Waters of Jurisdiction

High sea

Directive of the Maritime Strategy (Sub-) Maritime Regions

Limited of Exclusive Economic Zone

Territorial waters

Internal waters

Limit (4-12 mn)

Coastal zones

Maritime regions

Chemical state

1 Nautical mile - Limit of DQA
Several Environment Information Systems

SNIRH

Residual water and supply waters

Coastal zones

Institute of Navigability of the Douro

Protecting areas
Objectives

- To develop an approach for the implementation of the European Geographic Information System (GIS)

- To assist the Water Framework Directive (WFD) implementation in Portugal
  - The need for integrated environmental resources management
  - The monitoring of water quantity and quality produces huge amount of spatially distributed data
  - Each Member State is building its own water information system independent from the European system
Contributions

- An ontological approach of the geographical information representation

- Before:
  - Information ‘hidden’ in database
  - ‘Local’ semantics

- After:
  - Explicit information
  - Consensual semantics
  - Available for Semantic Web applications
  - Data harmonisation without expensive manual data integration work
Background

- WFD GIS-Working Group (JRC)
  - Conceptual Modelling of Water Resources Data within the European context

- Standards
  - Markup languages
  - Database models
  - Object-oriented modelling
  - Unified Modeling Language (UML)

- GIS Environment

- Geomatics
Ontology

- Definitions
- Metadata
- Entities
- Occurrences
- Relationships
Meta-model
Conceptual model

- Competent Authority
  - Monitoring
  - Part-of
    - Coastal Waters
    - Adjacent
      - EcoRegion
      - Part-of
      - River Segment
  - Monitoring
  - Part-of
    - River Water Body

Resources that work with XML also work with OWL
OWL allows that the systems use the archives to perform reasoning
OWL to web applications (e.g. agents)

<owl:Class rdf:ID="Type">
  <owl:oneOf rdf:parseType="Collection">
    <owl:Thing rdf:about="ECR"/>
    <owl:Thing rdf:about="GWS"/>
    <owl:Thing rdf:about="LKS"/>
    <owl:Thing rdf:about="LWB"/>
    <owl:Thing rdf:about="RVS"/>
  </owl:oneOf>
</owl:Class>

<owl:Class rdf:ID="Relationship_Type">
  <owl:oneOf rdf:parseType="Collection">
    <owl:Thing rdf:about="TOU"/>
    <owl:Thing rdf:about="PRT"/>
    <owl:Thing rdf:about="ADJ"/>
    <owl:Thing rdf:about="CHA"/>  
  </owl:oneOf>
</owl:Class>
<Type rdf:ID="LWB">
    <rdfs:label>LAKE_WATER_BODY</rdfs:label>
    <gn:related_to>
        <rdf:Bag>
            <rdf:li>
                <gn:Relationship>
                    <has_relationship rdf:resource="#MON"/>
                    <Type rdf:resource="#GWS" gn:is="MAMB"/>
                </gn:Relationship>
            </rdf:li>
            <rdf:li>
                <gn:Relationship>
                    <has_relationship rdf:resource="#PRT"/>
                    <Type rdf:resource="#LKS" gn:is="MAMB"/>
                </gn:Relationship>
            </rdf:li>
            <rdf:li>
                <gn:Relationship>
                    <has_relationship rdf:resource="#ADJ"/>
                    <Type rdf:resource="#RVS" gn:is="MAMB"/>
                </gn:Relationship>
            </rdf:li>
        </rdf:Bag>
    </gn:related_to>
</Type>
Ontology as input of geographic web applications
Final Remarks

- An approach for the ontological representation of geographic information
- Ontology as input of geographic web applications
- Data harmonisation

Future work
- Ontology extension
- Prototype implementation
QUESTIONS?

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Examples of geo-ontology , the GEO-NET-PT(version 01):

http://xldb.fc.ul.pt/geonetpt