

Building the SISE

an environmental ontology



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Motivation



- ❖ **SISE project: “to provide some sort of integrated environmental information space”**
- ❖ **EcoLexicon approach:**
 - enhances knowledge exchange
 - offers easy access to the conceptual structures underlying the environmental domain
 - facilitates learning and communication
 - eliminates conceptual and terminological confusion
- ❖ **eEnvironment community can benefit from Semantic Web technologies**

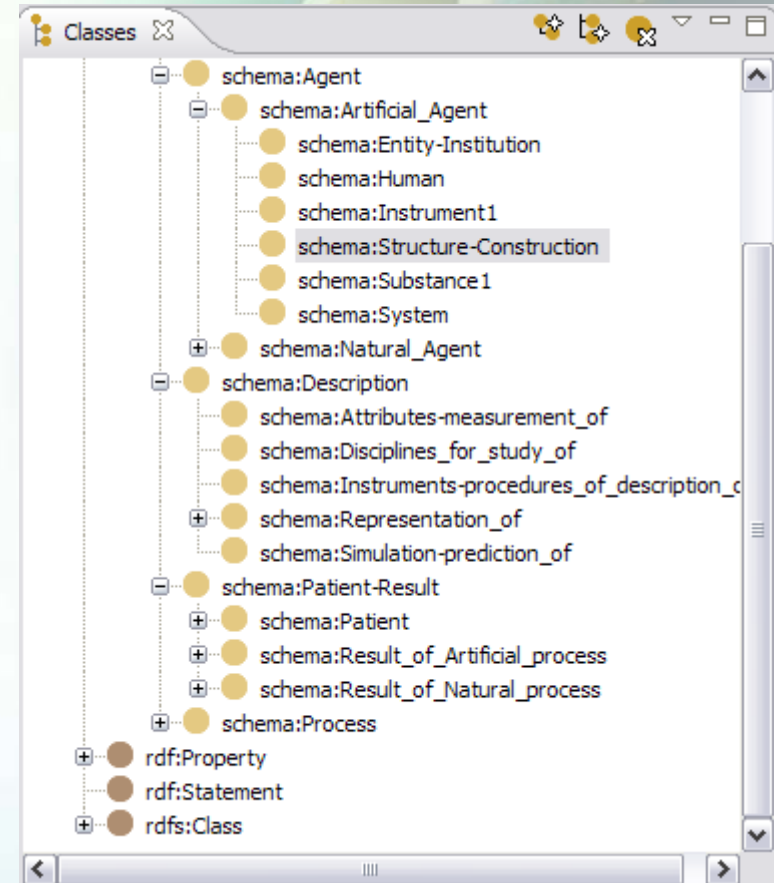
Semantic Web

A bamboo tube is shown pouring water into a wooden cup. The background is a soft, light blue gradient.

- ❖ **Knowledge needs to be represented by ontology modelling**
- ❖ **Problem:**
 - Many projects have not been conceived as such from the beginning
 - As EcoLexicon, mostly come from relational databases
- ❖ **Proposal of integration**
 - useful for projects with similar purposes
- ❖ **Terminological resources can find in ontologies a powerful representational model**

Terminological Knowledge Base

- ❖ **Environmental Event**
 - provides underpinnings for conceptual sub-hierarchies
- ❖ **Upper-level classes are based on frames and semantic roles**
- ❖ **Process-oriented overview of the domain**
- ❖ **Ontological classes fed from stored information in the database (D2RQ)**



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Relationships between concepts

- ❖ **Concepts are linked through both vertical and horizontal relations**
- ❖ **Some are domain-specific and show their own internal hierarchical structure.**
- ❖ **Determination of non-taxonomic conceptual relationships is not well-researched**
- ❖ **Relations largely depend on the type of entity being described, its nature, and its own relational power**

Relationships

	examples
<i>is_a</i>	MAIN TRUNK SEWER -> SEWER PIPE -> PIPE -> INSTRUMENT -> AGENT (semantic role)
<i>part_of</i>	SCREENING <i>part_of</i> PRELIMINARY TREATMENT
<i>made_of</i>	WASTEWATER <i>is made of</i> CONTAMINANTS
<i>delimited-by</i>	WASTEWATER TREATMENT PLANT <i>is delimited by</i> THE END OF THE SEWAGE SYSTEM
<i>located-at</i>	BREAKWATER <i>located at</i> THE COAST
<i>takes-place-in</i>	THERMAL LOW <i>takes place in</i> SUMMER

	examples
<i>attribute-of</i>	ISOTROPIC, ALLUVIAL, ABYSSAL
<i>result-of</i>	EFFLUENT <i>is the result-of</i> WASTEWATER TREATMENT (process)
<i>affects</i>	SEWER PIPE <i>affects</i> WASTEWATER
<i>has-function</i>	WATER <i>has-function</i> IRRIGATION
<i>represents</i>	HYDROGRAPH <i>represents</i> RATE OF WATER FLOW
<i>effected-by</i>	SAND TRAPPING <i>is effected by</i> A SAND FILTER

Ontology

The image shows a screenshot of a web-based ontology editor interface. The main window is titled "Resource Form" and displays the details for a resource with the URI `db:Concept3262`. The form is organized into several sections:

- Annotations:** This section is currently collapsed.
- Other Properties:** This section is expanded and shows several properties:
 - `schema:Concept_Afecta_a`: `db:Concept729`
 - `schema:Concept_Concept`: `sewer`
 - `schema:Concept_Definition`: `conjunto de tuberías que forman parte de la red de alcantarillado y transportan el agua.`
 - `schema:Concept_ID`: `3262`
 - `schema:Concept_Parte_de`: `db:Concept1142`
 - `schema:Concept_Tiene`: `db:Concept3255`
 - `rdf:type`: `schema:Concept` and `schema:Structure-0`
 - `owl:differentFrom`: (partially visible)

Overlaid on the bottom right of the "Resource Form" is a "Query Editor" window. It has tabs for "Instances", "Rules", "Domain", "SPARQL", and "Imports", with "SPARQL" selected. The "Query Editor" contains the following SPARQL query:

```
SELECT ?y
WHERE { db:Concept3262 schema:Concept_Parte_de ?object .
?object schema:Concept_Concept ?y
}
```

To the right of the query editor is a table showing the results of the query. The table has a column labeled "[y]" and three rows of results:

[y]
drainage system
sewage collection and disposal system
sewage disposal system

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Constraints

- ❖ **Relational constraints according to concept types, multidimensionality and contextual factors**
 - At a broad level
 - concepts are described in a prototypical way and relational constraints only depend upon the main properties of each concept type (*entity*, *process*, etc) and the semantic role they possess (although, due to multidimensionality, one concept may have several roles).
 - At a more specific level
 - concepts appear in more fine-grained representations, where context-dependent dimensions are added, restricted or highlighted


Contextual network

Historial Búsqueda Buscar Resultados

Términos

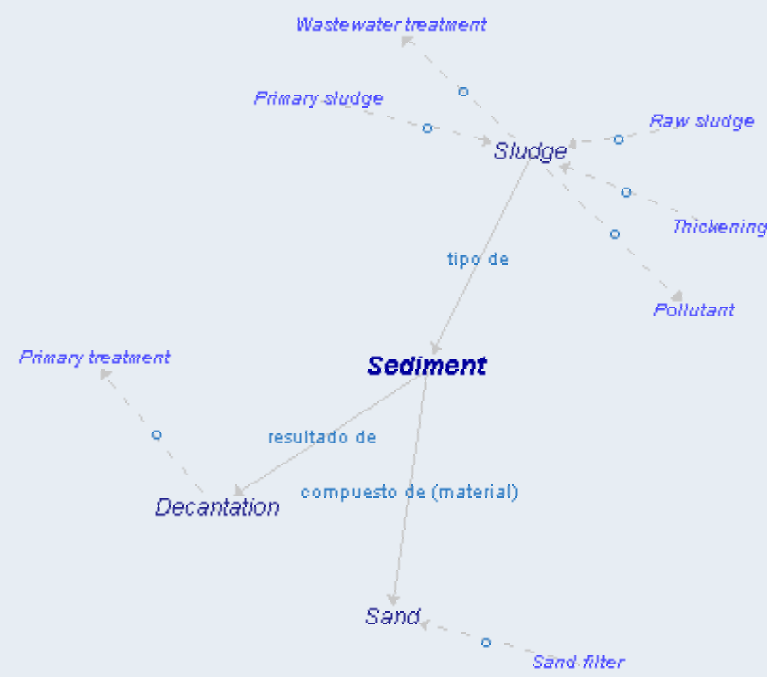
-  [sedimento](#)
-  [sediment](#)
-  [Sediment](#)

Recursos

-  [Sediment in the thalweg of Camp](#)

Dominios

- [Estructura de dominios](#)
- [Material \[C.1.1.3\]](#)
- [Material \[C.2.3\]](#)
- [Material \[C.3.3\]](#)



```
graph TD; Sediment -- tipo de --> Sludge; Sludge -- tipo de --> Wastewater_treatment[Wastewater treatment]; Sludge -- tipo de --> Primary_sludge[Primary sludge]; Sludge -- tipo de --> Raw_sludge[Raw sludge]; Sludge -- tipo de --> Thickening; Sludge -- tipo de --> Pollutant; Sediment -- resultado de --> Decantation; Decantation -- resultado de --> Primary_treatment[Primary treatment]; Sediment -- compuesto de material --> Sand; Sand -- compuesto de material --> Sand_filter[Sand filter];
```

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Conclusions

- ❖ **Legacy systems and ontologies can be integrated in a common framework by following a set of appropriate criteria**
 - Linguistic semantics stored in the database can be enriched with OWL expressiveness
- ❖ **Contextual restrictions have been proven to be a viable solution for managing overinformation**

Future work



- ❖ **Extending the procedure followed in the WASTEWATER TREATMENT context to other domains in the relational database**
 - Efficiency is an issue that deserves special attention at this stage
- ❖ **Interconnection with outside sources of information**
 - methodologies of ontology mapping and matching can be applied

Thank You !



Questions?



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