

A method for the synthesis of an ontology from predefined data

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OWL Ontologies are critical tools to describe taxonomies and the structure of knowledge. Most ontologies are created by domain experts even though the data they arrange is often given by a software system. This work presents a method for obtaining an ontology from predefined data. The resulting structure has the simplest form with an accurate support for the undelying information.

Keywords: linked data, semantic web, big data, artificial intelligence

I. INTRODUCTION

Ontologies and data-driven ontologies.

A. Related work

Ontology creation methods and data-driven methods.

II. METHOD

The method consists of probing the ontological structure in data with SPARQL queries and post-processing which can be divided in the following steps:

1. Obtaining all distinct classes with the query:

```
SELECT DISTINCT ?class WHERE { ?s a ?class }
```
2. Obtaining all distinct properties with the query:

```
SELECT DISTINCT ?p WHERE { ?s ?p ?o }
```
3. For each class, get distinct subject classes and predicates where the the object is an instance of the class:

```
SELECT DISTINCT ?p ?cs WHERE { ?i a <class_uri> . ?s ?p ?i . ?s a ?cs . }
```
4. For each class, get distinct predicates and objects where the subject is an instance of such class:

```
SELECT DISTINCT ?p ?co (datatype(?o) as ?do) WHERE { ?i a <class_uri> . ?i ?p ?o . OPTIONAL { ?o a ?co . } }
```
5. For each property, check if it is functional, i.e. if it occurs only once with each subject:

```
SELECT DISTINCT (COUNT(?o) as ?co) WHERE { ?s <property_uri> ?o } GROUP BY ?s
```
6. For each property, find the incident range and domain with the queries:

```
SELECT DISTINCT ?co (datatype(?o) as ?do) WHERE { ?s <property_uri> ?o . OPTIONAL {
```

```
?o a ?co . } } SELECT DISTINCT ?cs WHERE { ?s <property_uri> ?o . ?s a ?cs . }
```

7. For each instance of each class, get all distinct predicates. For each predicate, check if all instances of the class hold such relationship (existential restriction):

```
SELECT DISTINCT ?p WHERE { ?s a <class_uri> . ?s ?p ?o . }
```

```
SELECT DISTINCT ?s WHERE { ?s a <class_uri> }
```

```
SELECT DISTINCT ?s ?co (datatype(?o) as ?do) WHERE { ?s a <class_uri> . ?s <property_uri> ?o . OPTIONAL { ?o a ?co . } }
```
8. and if all instances that hold such relationship are instances of the class (universal restriction):

```
SELECT DISTINCT ?s WHERE { ?s <property_uri> ?o . }
```
9. Draw each class, each property and the overall figure.
10. Make `rdfs:subClassOf` and `rdfs:subPropertyOf` statements to better organize knowledge and link to third party ontologies and data.
- 11.

III. RESULTS AND DISCUSSION

Figure

IV. CONCLUSIONS

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Appendix A: Foo

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