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Semantic Web of Arts

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Introduction

This project illustrates the different aspects of creating a semantic web construct. This semantic web presents the ontology of fine arts like books, paintings, and their corresponding authors.

To define the abstract entities (classes) and the concrete individuals along with the other detailed properties, a Resource Description Framework (RDF) is used to write an OWL file. This has been carried out using a visual tool called Protégé.

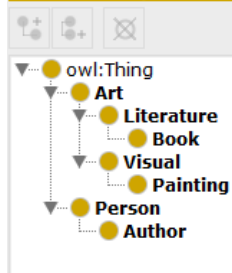
A desktop application is created to retrieve the created (semantic) information or more formally *query* it. The application accepts any query, processes it using the Apache Jena library, and then displays the results in a tabular format. For further illustration purposes, a simple web application has been created.

Ontology

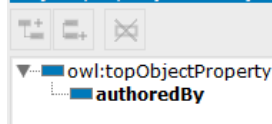
There are mainly two categories of classes: persons embodied in the authors and artworks like books and paintings. Each author has a data property of their birth year. Each artwork has an object property of the author and a data property of its publication year.

Hierarchies

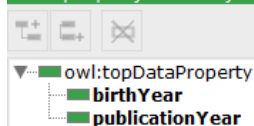
Class hierarchy:





Object property hierarchy:

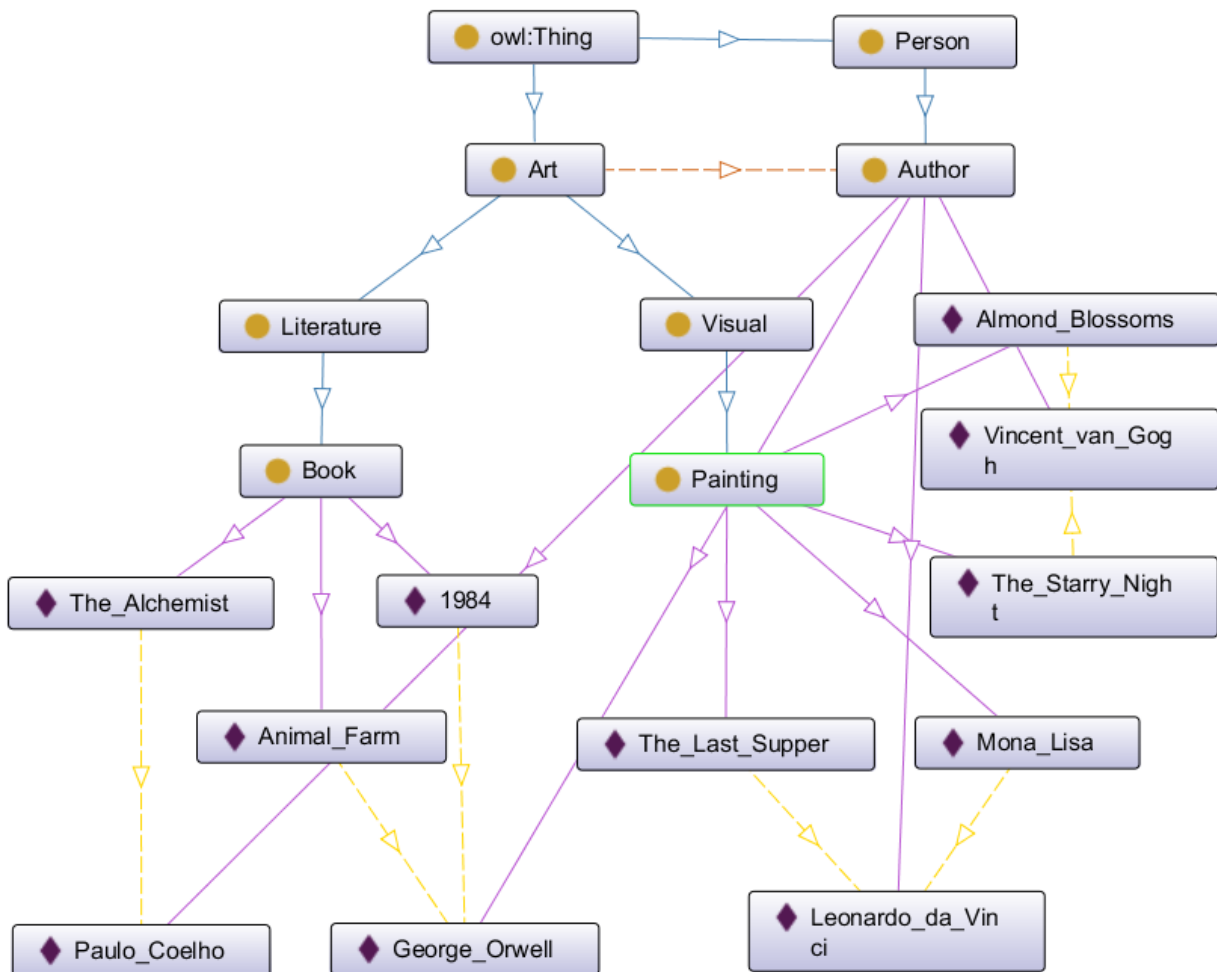


Data property hierarchy:



Individuals:	
	
◆ 1984	
◆ Almond_Blossoms	
◆ Animal_Farm	
◆ George_Orwell	
◆ Leonardo_da_Vinci	
◆ Mona_Lisa	
◆ Paulo_Coelho	
◆ The_Alchemist	
◆ The_Last_Supper	
◆ The_Starry_Night	
◆ Vincent_van_Gogh	

Graph



Queries

Query 1

List all the authors and the years they were born in.

Results

Snap SPARQL Query:

```
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX : <http://www.semanticweb.org/ali/ontologies/arts#>

SELECT ?author ?birthYear
WHERE {
    ?author rdf:type :Author .
    ?author :birthYear ?birthYear .
}
```

Execute

?author	?birthYear
:Paulo_Coelho	1947
:Leonardo_da_Vinci	1452
:Vincent_van_Gogh	1853
:George_Orwell	1903

4 results

Query

```
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX : <http://www.semanticweb.org/ali/ontologies/arts#>

SELECT ?author ?birthYear
WHERE {
    ?author rdf:type :Author .
    ?author :birthYear ?birthYear .
}
```

Query 2

List all books and their publication year.

Results

Snap SPARQL Query:

```
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX : <http://www.semanticweb.org/ali/ontologies/arts#>

SELECT ?book ?publicationYear
WHERE {
    ?book rdf:type :Book .
    ?book :publicationYear ?publicationYear .
}
```

Execute

?book	?publicationYear
:1984	1949
:Animal_Farm	1945
:The_Alchemist	1988

3 results

Query

```
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX : <http://www.semanticweb.org/ali/ontologies/arts#>

SELECT ?book ?publicationYear
WHERE {
    ?book rdf:type :Book .
    ?book :publicationYear ?publicationYear .
}
```

Query 3

List all paintings and their publication year.

Results

Snap SPARQL Query:

```
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX : <http://www.semanticweb.org/ali/ontologies/arts#>

SELECT ?painting ?publicationYear
WHERE {
    ?painting rdf:type :Painting .
    ?painting :publicationYear ?publicationYear .
}
```

Execute

?painting	?publicationYear
:Almond_Blossoms	1890
:The_Starry_Night	1889
:Mona_Lisa	1503
:The_Last_Supper	1498

4 results

Query

```
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX : <http://www.semanticweb.org/ali/ontologies/arts#>

SELECT ?painting ?publicationYear
WHERE {
    ?painting rdf:type :Painting .
    ?painting :publicationYear ?publicationYear .
}
```

Query 4

List all books and paintings, their authors, and publication year.

Results

Snap SPARQL Query:

```
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX : <http://www.semanticweb.org/ali/ontologies/arts#>

SELECT ?art ?author ?publicationYear
WHERE {
    ?art rdf:type ?type ; :authoredBy ?author ; :publicationYear ?publicationYear.
    ?type rdfs:subClassOf ?category .
    ?category rdfs:subClassOf :Art .
}
```

Execute

?art	?author	?publicationYear
:Almond_Blossoms	:Vincent_van_Gogh	1890
:Mona_Lisa	:Leonardo_da_Vinci	1503
:The_Last_Supper	:Leonardo_da_Vinci	1498
:The_Starry_Night	:Vincent_van_Gogh	1889
:Animal_Farm	:George_Orwell	1945
:The_Alchemist	:Paulo_Coelho	1988
:1984	:George_Orwell	1949

7 results

Query

```
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX : <http://www.semanticweb.org/ali/ontologies/arts#>

SELECT ?art ?author ?publicationYear
WHERE {
    ?art rdf:type ?type ; :authoredBy ?author ; :publicationYear
?publicationYear.
    ?type rdfs:subClassOf ?category .
    ?category rdfs:subClassOf :Art .
}
```


Query 5

List all authors that are born after the year 1500.

Results

Snap SPARQL Query:

```
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX : <http://www.semanticweb.org/ali/ontologies/arts#>

SELECT ?author ?birthYear
WHERE {
    ?author a :Author .
    ?author :birthYear ?birthYear .
    FILTER (?birthYear >= 1500)
}
```

Execute

?author	?birthYear
:Paulo_Coelho	1947
:Vincent_van_Gogh	1853
:George_Orwell	1903

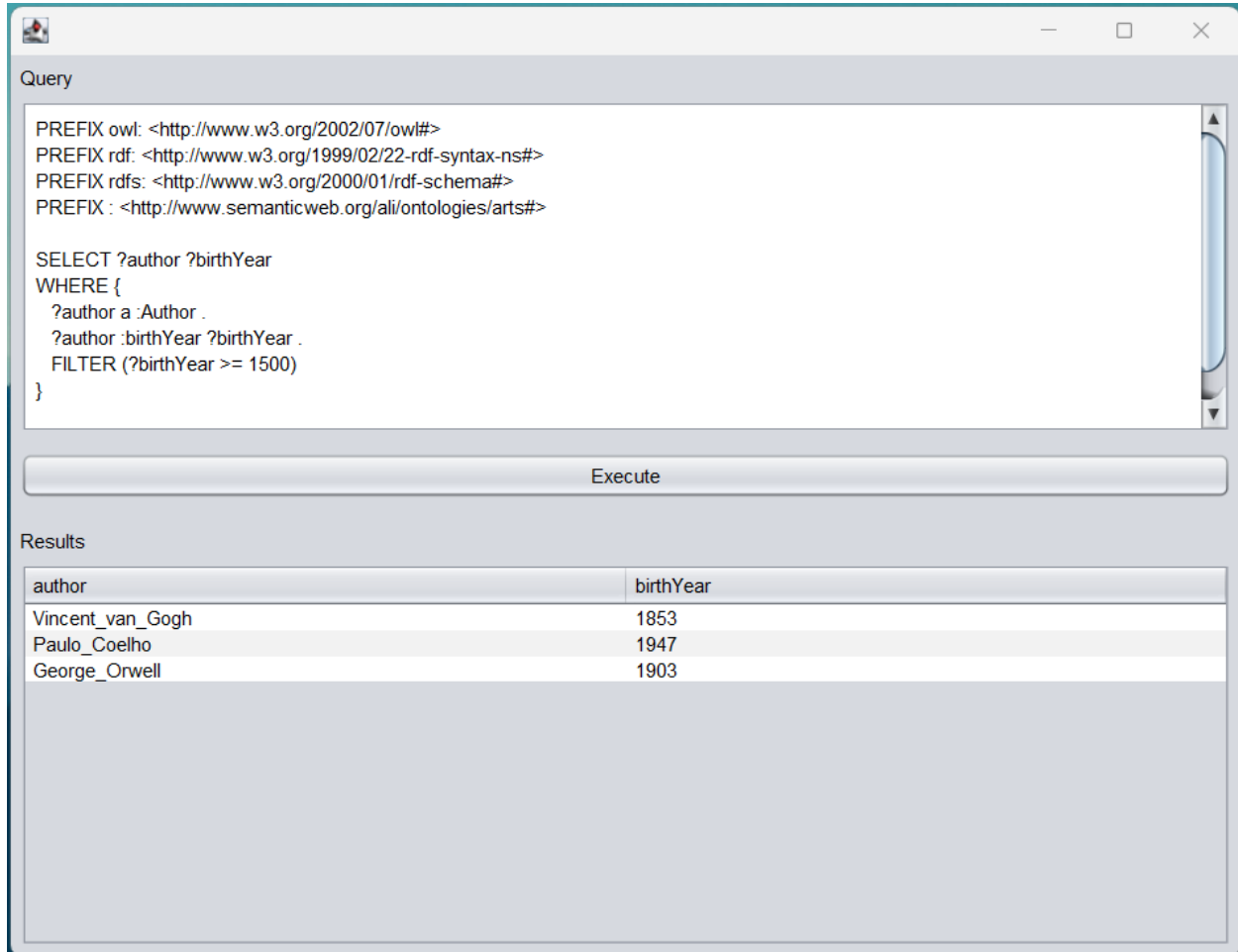
3 results

Query

```
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX : <http://www.semanticweb.org/ali/ontologies/arts#>

SELECT ?author ?birthYear
WHERE {
    ?author a :Author .
    ?author :birthYear ?birthYear .
    FILTER (?birthYear >= 1500)
}
```

Desktop Application



The screenshot shows a desktop application window with a title bar containing a small icon and standard window controls (minimize, maximize, close). The window is divided into two main sections: 'Query' and 'Results'.

Query Section:

```
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX : <http://www.semanticweb.org/ali/ontologies/arts#>

SELECT ?author ?birthYear
WHERE {
  ?author a :Author .
  ?author :birthYear ?birthYear .
  FILTER (?birthYear >= 1500)
}
```

Below the query text is a button labeled 'Execute'.

Results Section:

author	birthYear
Vincent_van_Gogh	1853
Paulo_Coelho	1947
George_Orwell	1903

Web Application

```
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX _: <http://www.semanticweb.org/ali/ontologies/arts#>
```

```
SELECT ?painting ?publicationYear
WHERE {
    ?painting rdf:type _:Painting .
    ?painting :publicationYear ?publicationYear .
}
```

Query:

Submit

Results

http://www.semanticweb.org/ali/ontologies/arts#The_Starry_Night

1889

http://www.semanticweb.org/ali/ontologies/arts#The_Last_Supper

1498

http://www.semanticweb.org/ali/ontologies/arts#Mona_Lisa

1503

http://www.semanticweb.org/ali/ontologies/arts#Almond_Blossoms

1890