Introduction to RDF and RDFS Editor: MR$^3$

Susumu Tamagawa
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• Overview of MR³
• Fundamental Concepts of RDF and RDFS
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Overview of MR$^3$

- Graphical RDF and RDFS editor
- MR$^3$: **Meta-Model Management** based on **RDFs Revision Reflection**
- Main feature
  - Managing some relationships between RDF and RDFS contents
- Place to obtain
  - http://mr3.sourceforge.net/
Fundamental Concepts of RDF (Resource Description Framework)

- **Resource**
  - an object, a “thing” we want to talk about

- **Property**
  - a special kind of resources
  - relations between resources

- **Statement**
  - an object-attribute-value triple

- **Literal**
  - an atomic value
  - the object of an RDF statement (not the subject or the predicate)
An example of RDF statements

Model

- Subject: William
- Predicate: hasFather
- Object: Charles

- rdf:type: Person

Syntax (XML)

```xml
<rdf:Description about="William">
  <hasFather>Charles</hasFather>
  <rdf:type resource="Person"/>
</rdf:Description>
```
Fundamental Concepts of RDFS (RDF Vocabulary Description Language, RDF Schema)

- Providing modeling primitives for expressing the RDF model
- **Class**
  - Defining groups of related resources
  - Hierarchical relationships between classes
    - rdfs:subClassOf property
- **Property**
  - Defining the relationships between resources
  - Hierarchical relationships between properties
    - rdfs:subPropertyOf property
  - Domain and range of a property
    - rdfs:domain and rdfs:range property
An example of RDFS statements

Model

Class

Person

rdf:type
rdfs:Class

rdfs:domain
rdfs:subClassOf
rdfs:Resource

Property

hasFather

rdf:type
rdfs:Resource

RDFS

RDFS model and syntax are same as RDF

Note

Meta-Model

Syntax (XML)

```xml
<rdf:Class rdf:about="Person">
    <rdfs:subClassOf resource="&rdfs;Resource"/>
</rdf:Class>
<rdfs:Property rdf:about="hasFather"/>
```
Issues

• High cost of building up RDF and RDFS contents manually

• Conventional Tools
  – Displaying XML based contents with RDF model

RDFS model + RDF model
Web Intelligence is taught by Takahira Yamaguchi.

Professor, Associate Professor, Assistant Professor, Academic Staff Member, Staff Member, and Course are classes.

All Professors, Associate Professors, and Assistant Professors are Academic Staff Members.

All Academic Staff Members are Staff Members.

Courses must be taught by academic staff members only.

<?xml version="1.0"?>
<rdf:RDF
xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
xmlns:mr3="http://mmm.semanticweb.org/mr3#"
xmlns:owl="http://www.w3.org/2002/07/owl#"
xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
xm:base="http://mmm.semanticweb.org/mr3#">
  <rdfs:Class rdf:about="#Academic Staff Member">
    <rdfs:subClassOf rdf:resource="#Staff Member"/>
  </rdfs:Class>
  <rdfs:Class rdf:ID="Course"/>
  <rdfs:Class rdf:ID="Professor"/>
    <rdfs:subClassOf rdf:resource="#Academic Staff Member"/>
  </rdfs:Class>
  <rdfs:Class rdf:about="#Assistant Professor"/>
    <rdfs:subClassOf rdf:resource="#Academic Staff Member"/>
  </rdfs:Class>
  <rdfs:Class rdf:about="#Associate Professor"/>
    <rdfs:subClassOf rdf:resource="#Academic Staff Member"/>
  </rdfs:Class>
  <rdfs:Property rdf:ID="isTaughtBy">
    <rdfs:domain rdf:resource="#Course"/>
    <rdfs:range rdf:resource="#Academic Staff Member"/>
  </rdfs:Property>
  <mr3:Professor rdf:about="#Takahira Yamaguchi"/>
  <mr3:Course rdf:about="#Web Intelligence"/>
  <mr3:isTaughtBy rdf:resource="#Takahira Yamaguchi"/>
</mr3:Course>
</rdf:RDF>
An example of RDF and RDFS contents of academic domain
(1) Graphical editing functions of RDF contents

(2) Graphical editing functions of RDFS contents

(3) RDF and RDFS model management facilities
RDF and RDFS model management facilities (Overview)

RDFS model

- **Class**
  - rdfs:Resource is-a Academic Staff Member
  - Course is-a Professor

RDF model

- **Property**
  - isTaughtBy

- **Type of resources**
  - Web Intelligence isTaughtBy Takahira Yamaguchi
RDF and RDFS model management facilities (Detail)

- Manipulation of an RDFS Class
  - Replace RDFS Class
  - Removal of RDFS Class
- Manipulation of an RDFS Property
  - Replace RDFS Property
  - Removal of RDFS Property
- Replacing the Type of an RDF Resource
  - Replace the RDFS class name with that referred to before the use replaced the type of the RDF resource
  - Create a new RDFS class that has yet to be defined
- Replacing the RDF Property
  - Replace the RDFS property name with that referred to before the user replaced the RDF property
  - Create a new RDFS property that has yet to be defined
RDF and RDFS model management facilities (Example: Replace RDFS Class)

RDFS model

**Class**
- rdfs:Resource
- is-a Academic Staff Member
- is-a Professor

**Property**
- isTaughtBy

RDF model

**Course**
- Web Intelligence
- Machine Learning

**Professor**
- Takahira Yamaguchi
- Akito Sakurai

**isTaughtBy**
Tutorial of MR$^3$

- How to install MR$^3$
- Importing RDF and RDFS documents
- Mapping namespace and prefix
- Class Editor
  - Inserting, Editing, Deleting, and Connecting is-a relationships between classes
- Property Editor
  - Inserting RDFS property and Defining domain and range of RDFS property
- RDF Editor
  - Inserting RDF literal and resource
- Exporting RDF and RDFS model
How to install MR³

1. Install JRE (Java Runtime Environment)

2. Download MR3_1_0RC5.zip

3. Unzip the download file and execute run.bat
Screenshot of MR³
Importing RDF and RDFS documents

OR

Other Serialization (N3, N-Triple, Turtle)
After importing example_academic_domain.rdf

Space character is not supported in MR³. Please replace space characters by underbars.

Staff Member -> Staff_Member
Academic Staff Member -> Academic_Staff_Member
Associate Professor -> Associate_Professor
Web Intelligence -> Web_Intelligence
Takahira Yamaguchi -> Takahira_Yamaguchi
Mapping namespace and prefix

[Diagram showing namespace and prefix mapping with a window layout and a namespace table showing prefixes and their corresponding URIs]
Class Editor
Inserting class
Class Editor
Editing class

spell miss
Class Editor
Removing class
Let's insert `exp:Assistant Professor` class and connect is-a relationships between Assistant Professor class and Academic Staff Member class.
Property Editor
Inserting RDFS property
Property Editor
Defining domain and range of RDFS property
Professor Takahira Yamaguchi's phone number is 045-566-1614.
RDF Editor
Inserting RDF resource (1)

Machine Learning Course is taught by Professor Akito Sakurai.
Machine Learning Course is taught by Professor Akito Sakurai.
Exporting RDF and RDFS model
Exercises

1. Convert the following English statements to an RDF and RDFS model.
   - All trucks, vans, passenger vehicles are motor vehicles.
   - All mini vans are passenger vehicles and vans.
   - All Toyota Corollas are passenger vehicles.
   - Taro owns a Toyota Corolla.
   - Taro is a person.
   - Toyota motor corporation makes Toyota Corollas.
   - Toyota motor corporation is a automobile company.
   - Taro's vehicle registration number is xxxx-xxxx.
   - Persons only have motor vehicles.
   - Motor vehicles must be owned by persons only.
   - Vehicle registration numbers must be owned by motor vehicles only.
   - Motor vehicles must be made by automobile companies only.

2. Construct an RDFS ontology including a set of instances about your interest (music, computer, sports, etc).
   - Create at least 10 classes and at least 5 properties with domain and range classes.
   - Use at least 5 subClassOf statements.
References

- A Semantic Web Primer, 2nd Edition
- http://mr3.sourceforge.net/