Giving semantics to RDF by mapping into rewriting logic*

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1 Introduction

XML has become the standard for the interchange of information on Internet. Nevertheless XML is not the language that the Semantic Web vision [Berners-Lee *et al.*, 2001] requires. RDF, which builds on top of XML, looks like the first step to enable the Semantic Web. This vision can be developed into several fields; one of this can be to define semantic definitions for services and agent interactions. Our long-term goal is to have a sound way to verify and validate the semantic web interactions that applications and agents may develop in a distributed environment. The first step for reaching this goal is to enable the possibility of reasoning about the information that is being interchanged, allowing all the involved partners to have a common understanding. Assuming that the information is described by means of RDF documents, we propose the provision of a semantic support to RDF itself. Based on this formal support, properties may be analyzed, as well as transformations and verifications can be performed in the formal world, and later return back to RDF format. In this paper we propose the provision of semantic support by means of a formal language (Maude), which offers a good set of tools and has been proved useful for reasoning about properties.

2 Why do we use Maude

Maude [Clavel *et al.*, 2000] is a high performance general purpose language based on rewriting logic. One of the main characteristics is that Maude is reflective, that is, Maude can be represented into itself so that programs in Maude may be data for another Maude programs. Besides RDF documents can be easily translated into a Maude module and therefore they may be data for Maude applications. So RDF documents and the programs managing them can be expressed in the same formalism.

3 Translation of RDF documents into Maude

The translation of an RDF document into an object oriented module of Maude is summarized in the following table. We support both RDF (including containers) and RDF Schemas.

RDF/RDFS	Maude
RDF document	o.o–module
Class	Class
Resource	Object
Property	Attribute
Container	data types
URIs	Object identifier

Due to the reflective features of Maude, this translation can be done automatically by means of a function that receives an RDF document and returns an o.o–module.

In the following we have a simple RDF schema already written in Maude syntax. It contains the description of a class printer that can be used by a buying agent.

```
<rdf:RDF
 xmlns:rdf= s 'http://www.w3.org/1999/02/22-rdf-syntax-ns
 xmlns:rdfs= s 'http://www.w3.org/2000/01/rdf-schema >
<rdfs:Class ID= s 'Printer />
<rdf:Property ID= s 'Price >
 <rdfs:range rdf:resource=
    s 'http://www.w3.org/2000/01/rdf-schema#Literal
 <rdfs:domain rdf:resource= s 'Printer />
</rdf:Property>
/rdf:RDF>
```

And here we have its translation into an o.o–module:

```
omod Printers is
  inc www.w3.org/1999/02/22-rdf-syntax-ns .
  inc www.w3.org/2000/01/rdf-schema .
  class Printer | Price : Literal .
endom
```

RDF documents based in this schema have been used in an example where a buyer agent visits several sellers which give him their printers information in RDF. The example has been implemented using Mobile Maude, a Maude extension that supports mobile computation.

4 Conclusions

We have an initial way of getting a formal model for RDF and a gateway to operate and reason about it. An example has been developed to validate the approach. Automatic tools will support in the near future translation work, and extensions to RDF will be provided for taking advantage of the formal support supplied.

References

[Berners-Lee *et al.*, 2001] T. Berners-Lee, J. Hendler, and O. Lassila. The semantic web. *Scientific American*, 2001.

[Clavel *et al.*, 2000] M. Clavel, F. Durán, S. Eker, P. Lincoln, N. Martí-Oliet, J. Meseguer, and J. Quesada. *A Maude Tutorial*. SRI International, March 2000. http://maude.csl.sri.com.

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