**Introduction**

The amount of semantic Web data is still many orders of magnitude smaller than the World-Wide-Web. One of the barriers for semantic Web novices to create machine-readable data is the lack of easy-to-use Web publishing tools that separate the schema modelling from the data creation. We present ActiveRaUL, a Web form-based user interface that particularly supports users inexperienced in semantic Web technologies in creating RDF data. These Web form-based user interfaces in ActiveRaUL can be automatically generated from any arbitrary input ontology.

**Challenges:**
- Mismatch between graph based data model of an ontology and the tree based data model of Web forms.
- Incompatibility of the triple model of RDF to a key-value pair of Web form.
- Creating objects for object properties from Web form fields rather than standard datatypes.
- Reuse of individuals across different Web forms.

**Solutions:**
- Extract relationships among the concepts in any input ontology.
- Avoid cycles of an RDF graph by removing inferable properties of the ontology.
- Use RaUL Ontology - an RDF representation of Web form elements-to:
  - map acyclic RDF graph to tree based data model of Web forms
  - map RDF triple to key-value pair of Web forms
  - encode information about objects creation from Web form fields

**Method**

- A user provides input ontology through ActiveRaUL web interface or API and selects a concept - the concept node.
- ActiveRaUL constructs a concept graph which is composed of relationships of the concept node.
- ActiveRaUL creates a RaUL graph for the concept graph. The RaUL graph is mapped to a Web form.

**Concept Graph**

Concept Graph CG(ν): A directed graph CG(ν) = < U, E, ν > where ν is the concept node and ν ∈ U, there exists a path π of length l between ν and u. Constructing a Concept Graph CG(ν): In the ontology relationships among concepts are modelled through RDFs and/or OWL modeling languages. The example physical models for "Person worksFor Organization" relation are shown.

- We adopt a breadth first approach to incrementally extract associations (relationships) of different lengths for the concept node modeled through different physical models.
- For the Person class of an example ontology, we extract associations of length 1 = 2,...,n. Where 'n' is maximum length of any association for Person.

**Raul Web Form**

Raul Graph μ(ν): is RaUL based mappings for CG(ν), where for all unique ν ∈ CG(ν) a mapping μ: ν → RaUL is one or more valid RaUL widget elements for ν.

Mapping the Concept Graph CG(ν) to a RaUL Graph: Before mapping to a RaUL graph, some cycles and redundant associations are removed from the concept graph. Base property paths (shown below) are identified that alone or together compose an association in any concept graph. A RaUL mapping is defined for each of the base property path.

Each association is mapped to the corresponding RaUL mapping based on its type of property paths. Each RaUL mapping is then mapped to a Web form element.

**Evaluation**

We validate our approach in a user study based on use cases developed by the W3C Semantic Sensor Network (SSN) Incubator group. The users created RDF data based on the SSN ontology with ActiveRaUL generated user interfaces and WebProtege. They then rated ActiveRaUL compared to WebProtege for the creation of RDF data on a System Usability Scale (SUS). An average rating for both the systems on SUS is shown here:

**Summary of results:**
- **Correctness:** ActiveRaUL 91% vs WebProtege 82%.
- **Efficiency:** ActiveRaUL between 27% to 56% faster than WebProtege.
- **Satisfaction:** ActiveRaUL 72.1/100 compared to WebProtege 32.5/100 SUS rating.

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