Humane OWL: RDF and OWL for Humans

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Abstract—**Humane OWL (HOWL) is a syntax for RDF and OWL designed for manual editing. By allowing human-readable labels to be used in place of IRIs, and providing convenient syntax for OWL annotations and expressions, HOWL files can be used like source code with tools such as GitHub, then translated into any other RDF or OWL format for use with other tools.**

Keywords—RDF, OWL, syntax, source code

I. INTRODUCTION

Humane OWL (HOWL) is a novel format for RDF [1] and OWL [2] that is easy for humans to read and write. Human-readable labels can be defined and used in place of any IRI [3], making it much easier to use numeric or "opaque" IRIs such as Open Biomedical Ontologies (OBO) term IRIs [4]. A subset of Manchester syntax [5] can be used for OWL logical expressions, and OWL annotations have a simple syntax.

Simply put, HOWL looks like the text was copied from the "Annotations" and "Description" views of the Protégé OWL editor [6] (see Fig. 4). The key advantage is that HOWL format is plain text, and easy to use with the vast range of tools designed for source code: file comparison tools such as "diff" and "patch"; version control systems such as Subversion and Git; issue trackers and pull requests, as seen on GitHub; powerful text editors; text search and manipulation tools such as Unix coreutils; and many more. By making it easier for humans (both expert and non-expert) to read, write, and work with RDF and OWL, HOWL can help expand the community of linked data and ontology developers and users.

Fig. 1 shows how the "assay" class from OBI can be written in HOWL (in part), given the right HOWL "context". Fig. 2 shows the HOWL context for Fig. 1: prefixes, labels, default types, and initial declarations that provide all the required details. Fig. 3 shows the Turtle that is equivalent to the HOWL in Figs. 1 and 2. Fig. 4 shows the Turtle from Fig. 3 displayed in Protégé 5.0.0 beta 17.

An interactive demonstration of HOWL is available at <http://try.humaneowl.com>. Code and documentation are available at <https://github.com/ontodev/howl>, under an open source (BSD) license.

```
assay
definition: A planned process with the objective
to produce information about the material entity
that is the evaluant, by physically examining it
or its proxies.
> comment: An OWL annotation on the definition.
type:> owl:Class
equivalent to:>> achieves_planned_objective some
'assay objective'
```

Fig. 1. Example of HOWL

II. DESIGN

HOWL is designed to be a source format for RDF and OWL, much like the source code for a programming language such as Python. Python and HOWL code both serve two purposes: first to communicate clearly between humans, and second to translate into other machine-readable formats. Python soufce code can be compiled down to instructions for a CPU, but just as importantly the same source code can be: checked in to Git, published on GitHub, read by another programmer, debugged, modified, with the changes submitted as a pull request that is reviewed and merged. Not only can humans read and write Python in their text editors, they can use standard tools to visualize differences between versions, view the history of a project as a series of small meaningful changes, find and replace meaningful pieces of code, share precise sets of requested changes as a tracker issue or pull request, etc.

Human-readable HOWL code can easily be translated into any of the existing RDF and OWL formats, such as RDF/XML [7], Turtle [8], or JSON-LD [9]. Because it is easier to read and write than these alternatives, HOWL makes all the other operations easier: visualizing differences, tracking changes, finding and replacing elements, requesting changes, etc.

III. SYNTAX AND COMPARISONS

An RDF graph is composed of IRIs and literal values. IRIs and graphs can be hard for humans to read and write: IRIs because they are often long and opaque; graphs because they are less structured than familiar tables or hierarchies, and because some elements such as OWL annotations and logical expressions require compound structures made of many nodes. HOWL applies old and new techniques to these problems.
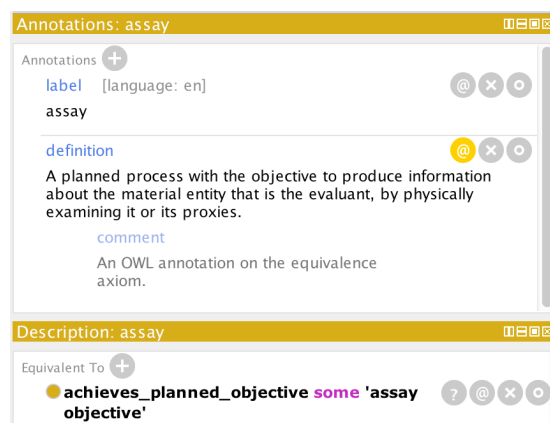

Fig. 4. The same example in Protégé

1) IRIs
   a) BASE: used to resolve relative IRIs (like Turtle)
   b) PREFIX: used to shorten IRIs (like Turtle)
   c) LABEL: used in place of IRIs (like JSON-LD)
2) Literals
   a) TYPE: sets the default datatype or language tag for a predicate (like JSON-LD)
   b) no quotation marks
   c) multi-line literals (using indentation)
3) Graphs
   a) GRAPH: sets the current named graph or default graph, allowing for RDF datasets (quads)
   b) "stanzas" group statements for a subject (like Turtle)
   c) OWL annotations are statements prefixed with ">"
   d) Manchester syntax logical expressions (like Protégé)

IV. FUTURE WORK

The 0.2.0 release of HOWL converts HOWL to N-Quads, N-Triples, and JSON. Other existing tools can then convert N-Quads and N-Triples to any other RDF or OWL format. We aim to support lossless translation from HOWL to RDF and back. We also plan to include a default HOWL context with standard prefixes and labels for OBO projects. Work-in-progress toward a HOWL version of the Ontology for biomedical investigations is available at <https://github.com/ontodev/obi-howl>.

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```
# Define prefixes for shortening IRIs.
PREFIX rdf:> http://www.w3.org/1999/02/22-rdf-
syntax-ns#
PREFIX rdfs:> http://www.w3.org/2000/01/rdf-
schema#
PREFIX owl:> http://www.w3.org/2002/07/owl#
PREFIX obo:> http://purl.obolibrary.org/obo/

# Define labels for later use.
LABEL rdf:type: type
LABEL rdfs:label: label
LABEL rdfs:comment: comment
LABEL owl:equivalentClass: equivalent to

# Define default datatypes or language tags.
TYPE label:> @en

# Declare some supporting terms.
obo:IAO_0000115
label: definition
type:> owl:AnnotationProperty

obo:OBI_0000417
label: achieves_planned_objective
type:> owl:ObjectProperty

obo:OBI_0000441
label: assay objective
type:> owl:Class

# Declare 'assay' and provide its label.
obo:OBI_0000070
label: assay
```

Fig. 2 HOWL context for Fig. 1

```
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-
syntax-ns#> .
@prefix rdfs: <http://www.w3.org/2000/01/rdf-
schema#>.
@prefix owl: <http://www.w3.org/2002/07/owl#> .
@prefix obo: <http://purl.obolibrary.org/obo/> .

obo:IAO_0000115
  rdfs:label "definition"@en ;
  a owl:AnnotationProperty .
obo:OBI_0000417
  rdfs:label "achieves_planned_objective"@en ;
  a owl:ObjectProperty .
obo:OBI_0000441
  rdfs:label "assay objective"@en ;
  a owl:Class .
obo:OBI_0000070
  rdfs:label "assay"@en ;
  obo:IAO_0000115 "A planned process with the
objective to produce information about the material
entity that is the evaluant, by physically
examining it or its proxies." ;
_:b0 a owl:Axiom ;
  owl:annotatedSource obo:OBI_0000070 ;
  owl:annotatedProperty obo:IAO_0000115 ;
  owl:annotatedTarget "A planned process with the
objective to produce information about the material
entity that is the evaluant, by physically
examining it or its proxies." ;
  rdfs:comment "An OWL annotation on the
equivalence axiom." .
  a owl:Class ;
  owl:equivalentClass _:b1 .
_:b1 a owl:Restriction ;
  owl:onProperty obo:OBI_0000417 ;
  owl:someValuesFrom obo:OBI_0000441 .
```

Fig.3. Turtle syntax equivalent to HOWL in Figs. 1 and 2