Populous: A Tool for Populating an Ontology

Simon Jupp[1], Matthew Horridge[1], Luigi Iannone[1], Julie Klein[2], Stuart Owen[1], Joost Schanstra[2], Katy Wolstencroft[1], and Robert Stevens[1]

[1]School of Computer Science, University of Manchester,
Kilburn Building, Oxford Road, Manchester, UK, M13 9PL.
[2]Institut National de la Santé et de la Recherche Médicale, Toulouse, France
`robert.stevens@manchester.ac.uk`

Abstract. We present Populous, an open source application for gathering content for an ontology and populating that ontology *en masse*. Populous presents authors with a table-based form where columns are tied to take values from particular ontologies; the user can select a concept from an ontology via its meaningful label to give a value for a given entity. Populated tables are fed into templates that can then be used to generate the ontology's axioms. Populous separates knowledge gathering from the conceptualisation; it also removes users from the usual ontology authoring tools.

Availability: Download, source and video via `http://www.e-lico.eu/populous`.

Ontology building environments such as Protégé and OBOEdit offer facilities for the manual authoring of axioms. Such tools are vital for capturing an ontology's form. Many ontologies are, however, large with considerable portions formed of repetitions of the same pattern of axioms, varying only in the fillers within that pattern. To avoid the tedium and potential errors of doing this manually, templates can be filled and the axioms for the pattern generated, avoiding the manual authoring of many axioms.

Populous [1] does this by presenting a familiar form-filling table-based user interface for any ontology authors to populate ontology patterns or templates. Rows are tied to the entities being described; columns are tied to properties and the cells constrained to take values from particular ontologies or fragments of an ontology. As an author fills out the template, he or she is guided to place appropriate values within the template. The content of this table can then be transformed into the axioms of the target ontology with an OWL scripting language.

Populous is an extension of RightField,[1] which is used for creating Excel documents that contain ontology based restrictions on a spreadsheet's content. RightField is primarily designed for generating spreadsheet templates for data annotation; Populous extends RightField to support knowledge gathering and ontology generation. Populous and RightField are both open source, cross platform Java applications released under the BSD licence. They use the Apache-POI [2] for interacting with Microsoft documents and manipulating Excel spreadsheets.

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[1] `http://www.rightfield.org.uk`
[2] `http://poi.apache.org`

Both OWL and OBO ontologies can be uploaded into Populous. Users can also browse and load ontologies directly from BioPortal. Once the ontologies are loaded they are classified by a reasoner and the basic class hierarchy can be inspected. Terms can be selected from the ontology to create validation sets for values that are permitted for a particular selection of cells in the table. Labels from an ontology's entities can be used within a cell, not just URI or URI fragments. Populous allows the addition of free text, even if the cell has an associated validation range; these values are highlighted in red and can act as placeholders for new or suggested terms when no suitable candidate can be found in the validation set.

Populous supports the use of the Ontology Pre-Processor Language [3] (OPPL) patterns in order to generate new OWL axioms from the populated template. OPPL is an extension of Manchester OWL Syntax to `select`, `add` and `remove` axioms and it has an interpreter for scripts that manipulate the ontology. Variables from the OPPL pattern are mapped to columns from the table using the column name through the Populous pattern Wizard.

We have used Populous with biologists to populate large portions of a kidney and urinary pathway ontology [2]. Populous is another piece in the 'jigsaw' of tools that support the ontology authoring process. It starts to fill the gap between the term request system and the manual axiom authoring systems by providing a mechanism for 'filling out' templates in such a way that they can be validated against the ontologies with which the ontology is being composed. We see Populous as a means for engaging domain experts who are not ontology experts in the authoring process and any ontology author to more effectively populate their ontology's content.

References

1. Simon Jupp, Matthew Horridge, Luigi Iannone, Julie Klein, Stuart Owen, Joost Schanstra, Robert Stevens, and Katy Wolstencroft. Populous: A tool for populating ontology templates. In *Semantic Web Applications and tools for the Life Sciences (SWAT4LS)*, Dec 2010.
2. Simon Jupp, Julie Klein, Joost Schanstra, and Robert Stevens. Developing a Kidney and Urinary Pathway Knowledge Base. In *Bio-ontologies SIG*, 2010.

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[3] `http://oppl2.sourceforge.net/`