

The uComp Protégé Plugin for Crowdsourcing Ontology Validation

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Abstract. The validation of ontologies using domain experts is expensive. Crowdsourcing has been shown a viable alternative for many knowledge acquisition tasks. We present a Protégé plugin and a workflow for outsourcing a number of ontology validation tasks to Games with a Purpose and paid micro-task crowdsourcing.

Keywords: Protégé plugin, ontology engineering, crowdsourcing, human computation

1 Introduction

Protégé³ is a well-known free and open-source platform for ontology engineering. Protégé can be extended with *plugins* using the Protégé Development Kit. We present a plugin for crowdsourcing ontology engineering tasks, as well as the underlying technologies and workflows. More specifically, the plugin supports outsourcing of some typical ontology validation tasks (see Section 2.2) to Games with a Purpose (GWAP) and paid-for crowdsourcing.

The research question our work focuses on is how to integrate ontology engineering processes with human computation (HC), to study which tasks can be outsourced, how this affects the quality of the ontological elements, and to provide tool support for HC. This paper concentrates on the integration process and tool support. As manual ontology construction by domain experts is expensive and cumbersome, HC helps to decrease cost and increase scalability by distributing jobs to multiple workers.

2 The uComp Protégé Plugin

The uComp Protégé Plugin allows the validation of certain parts of an ontology, which makes it useful in any setting where the quality of an ontology is questionable, for example if an ontology was generated automatically with ontology learning methods, or if a third-party ontology needs to be evaluated before use. This section covers the uComp API, and the uComp Protégé plugin (functionality and installation).

³ protege.stanford.edu

2.1 The uComp API

The Protégé plugin sends all validation tasks to the uComp HC API. Depending on the settings, the API further delegates the tasks to a GWAP or to CrowdFlower⁴. CrowdFlower is a platform for paid micro-task crowdsourcing. The uComp API⁵ currently supports classification tasks (other task types are under development). The API user can create new HC jobs, cancel jobs, and collect results from the service. All communication is done via HTTP and JSON.

2.2 The plugin

The plugin supports the validation of various parts of an ontology: *relevance of classes*, *subClassOf relations*, *domain and range axioms*, *instanceOf relations*, etc. The general usage pattern is as follows: the user selects the respective part of the ontology, provides some information for the crowdworkers, and submits the job. As soon as available, the results are presented to the user.

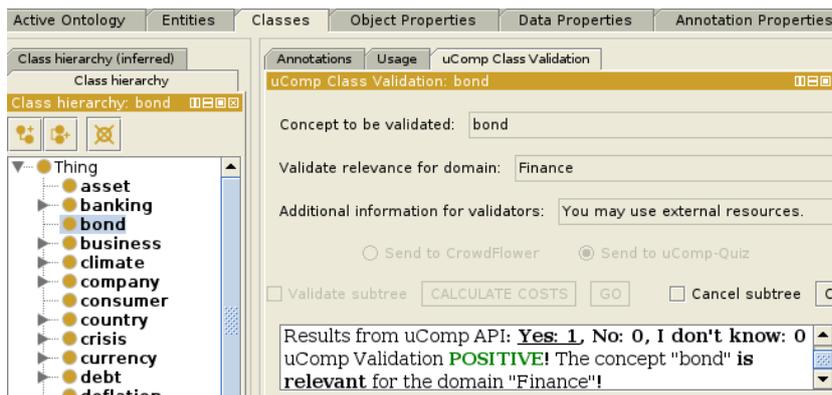


Fig. 1. Class relevance check for class *bond* including results.

Class relevance check For the sake of brevity, we only describe the *Class Relevance Check* and *SubClass Relation Validation* in some detail. The other task types follow a very similar pattern. Class Relation Check helps to decide if a given class (or a set of classes) – based on the class label – is relevant for the given domain. Figure 1 shows an example class relevance check for the class *bond*. After selecting a class, the user can enter an ontology *domain* (here: *Finance*) to validate against, and give additional advice to the crowdworkers. Furthermore, (s)he can choose between the GWAP and CrowdFlower for validation. If CrowdFlower is

⁴ www.crowdfunder.com

⁵ tinyurl.com/mkarmk9

selected, the expected cost of the job can be calculated. The *validate subtree* option allows to validate not only the current class, but also all its subclasses (recursively). To validate the whole ontology in one go, the user selects the root class (Thing) and marks the validate subtree option. When available, the results of the HC task are presented in a textbox. In Figure 1 only one judgment was collected – the crowdworker stated that class *bond* is relevant for the domain.

Validation of SubClass Relations With this component, a user can ask the crowd if there exists a subClass relation between a given class and its super-classes.

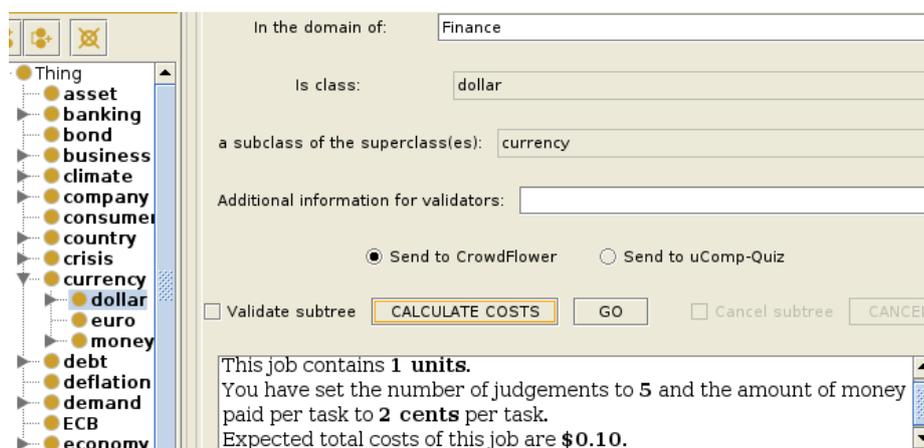


Fig. 2. Validation of class *dollar* and its superclass *currency*.

Similar to the class relevance check, users can set the ontology domain, and choose CrowdFlower or GWAP (“uComp-Quiz”). In Figure 2 the subClass relation between *dollar* and *currency* is evaluated. Before sending to CrowdFlower, expected costs can be calculated as number of units (elements to evaluate) multiplied by number of judgments per unit and payment per judgment.

2.3 Installation and Configuration

As the uComp plugin is part of the official Protégé repository, it can easily be installed from within Protégé with *File* → *Check for plugins* → *Downloads*. To configure and use the plugin, the user needs to create a file name `ucomp_api_settings.txt` in folder `.Protege`. The file contains the uComp API key⁶, the number of judgments per unit which we be collected, and the payment per judgment (if using CrowdFlower), for example: `abcdefghijklmnopqrst,5,2`

⁶ For API requests see tinyurl.com/mkarmk9

Detailed information about the functionality, usage and installation of the plugin is provided with the plugin documentation.

3 Related Work

Human computation outsources computing steps to humans, typically for problems computers can not solve (yet). Together with altruism, fun (as in GWAPs) and monetary incentives are central ways to motivate humans to participate. Early work in the field of GWAPs was done by von Ahn [1]. Games have successfully been used for example in ontology alignment [6] or to verify class definitions [3]. Micro-task crowdsourcing is very popular recently in knowledge acquisition and natural language processing, and has also been integrated into the popular NLP framework GATE [2]. A number of studies show that crowdworkers provide results of similar quality as domain experts [4, 5].

4 Conclusions

In this paper we introduce a Protégé plugin for validating ontological elements, and its integration into a human computation workflow. The plugin delegates validation tasks to a GWAP or to CrowdFlower and displays the results to the user. Future work includes an extensive evaluation of various aspects: HC workflows in ontology engineering, quality of crowdsourcing results, and the usability of the plugin itself.

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