OnToCode: Template-based code-generation from ontologies

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Summary

In support of research into software-based methods for spacecraft development and manufacturing, ontologies have been (e.g. (Hennig, Viehl, & Benedikt Kämpgen, 2016)) and are being developed. These ontologies serve as domain models in model-driven engineering processes for the development of software tool prototypes.

Since modern software applications usually have components written in multiple programming languages (e.g. a front end in JavaScript and a back end in Python) with derivatives of the domain model (platform-specific models as well as additional code) in each component, it is attractive to generate those derivatives from a single (platform-independent) domain model.

Internet based research and a review of the relevant literature (Strmečki, Magdalenić, & Radosević, 2018) (Syriani, Luhunu, & Sahraoui, 2018) showed that there was no tool that helps generating code in arbitrary languages from ontologies. OnToCode satisfies this need.

OnToCode is a Python package that allows a developer to generate code given a set of ontologies and templates. Based on Owlready2 (Lamy, 2017), OnToCode provides a fixed API for loading and querying ontologies. In addition, it offers an extensible API for processing query results (result processors) and for template instantiation (templates). OnToCode comes with a set of result processors for common tasks as well as support for Jinja2 based templates.

Since OnToCode is a Python package, it can be easily integrated into the build process of Python projects. Integration into build systems outside the Python ecosystem are not part of the package. The source code for OnToCode has been archived on Zenodo with the linked DOI: (Schäfer, 2019)

Currently, spacecraft systems engineers have to rely on data collected from human readable data sheets and individual correspondence with the manufacturer. As part of a research project on the merits of automatic transfer of spacecraft part data ((Schäfer et al., 2018), (Peters, Fischer, Schäfer, Opasjumruskit, & Gerndt, 2019)) from suppliers to integrators, we develop an ontology ((Opasjumruskit & Schäfer, 2019)) that formally captures all spacecraft part concepts relevant during the design phase of a spacecraft. To use this formal specification as a basis for all models in the implementation of our software prototypes that form the basis of systems engineering support method's evaluation, we developed OnToCode that generates code in multiple languages from a single main model, our ontology.

Acknowledgements

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