Object oriented modeling - from natural language to programming language

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Abstract

Considering the fact that every concept modelled using a programming language can also be expressed using natural language, we consider useful the existence of a tool that can extract the object oriented model out of a controlled natural language and expose it in a programming language.

The application should be able to receive a controlled natural language text in English and a programming language, to extract the object-oriented model from the text and to generate the code associated with the model, in the specified programming language.

We should be able to extract and model the following concepts: class, inheritance, abstract class, interface, final class, member, method, constructor, access modifier. The application should also be extensible in relation to:

- the concepts it models (it should be possible and easy to add a new concept or delete an old one)
- the identification of the object oriented concepts in the text, since a concept can be represented through multiple natural language expressions
- the programming language in which it generates the resulting code.

In order to implement the application in a flexible way, we chose to use web services: a natural language processing service extracts the concepts using a grammar and builds a modelling structure; a code generation service which receives the modelling structure and generates the classes and methods in multiple programming languages; and an integration service, which manages the whole process. Our personal contributions, in order to achieve the proposed goals, are:

- the creation of an expressive grammar, which validates the natural language text and creates a series of propositional trees;
- the creation of the propositional trees, which help us model the object oriented concepts;
- the proposal of the "dictionary-model", a data structure used to express the object oriented concepts independently from any programming language;
- the creation of an extensible code generator which receives a dictionary-model, analyses its validity and generates object oriented code in multiple programming languages;
- the aggregation of these modules and functionalities in three web services.

This application could serve as a useful tool for programmers to generate classes they want to implement later on; it would also help beginner programmers to understand certain object oriented concepts and can help facilitate conversations between them and persons familiar with the object oriented concepts.

The references:

[1] S. Bird, E. Klein, E. Loper, Natural Language Processing with Python, http://www.nltk.org/book/,

[2] JSON Schema, http://json-schema.org/,

[3] Servicii Web, https://profs.info.uaic.ro/~busaco/teach/courses/wade/presentations/web02ServiciiWeb-REST-API.pdf