Extension of the semantic machine of transparent intensional logic prototype

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Motivation

The thesis aims to extend the prototype of the semantic machine, which uses transparent intensional logic.

The prototype of the semantic machine is a console application, which can analyze and form the meaning of the natural language sentences by an external syntax analyzer, Stanford CoreNLP.

The prototype covers the implementation of type analysis for some basic and also extended TIL types and the creation of sentence meaning construction.

Transparent intensional logic

Transparent intensional logic is logical apparatus of higher-order based on Frege's objectual semantics, which primary use is logical analysis of natural language sentences, but it is also used within analytic philosophy, computer science, etc.

In Transparent intensional logic, the meaning of the natural language expression is explicated as an abstract procedure called Construction. The construction represents an object, which is created by sub-constructions of individual expressions within the sentence.

Transparent intensional logic represents part of Tichý's type theory which contains basic types individuals, truth values, possible worlds, time moments.
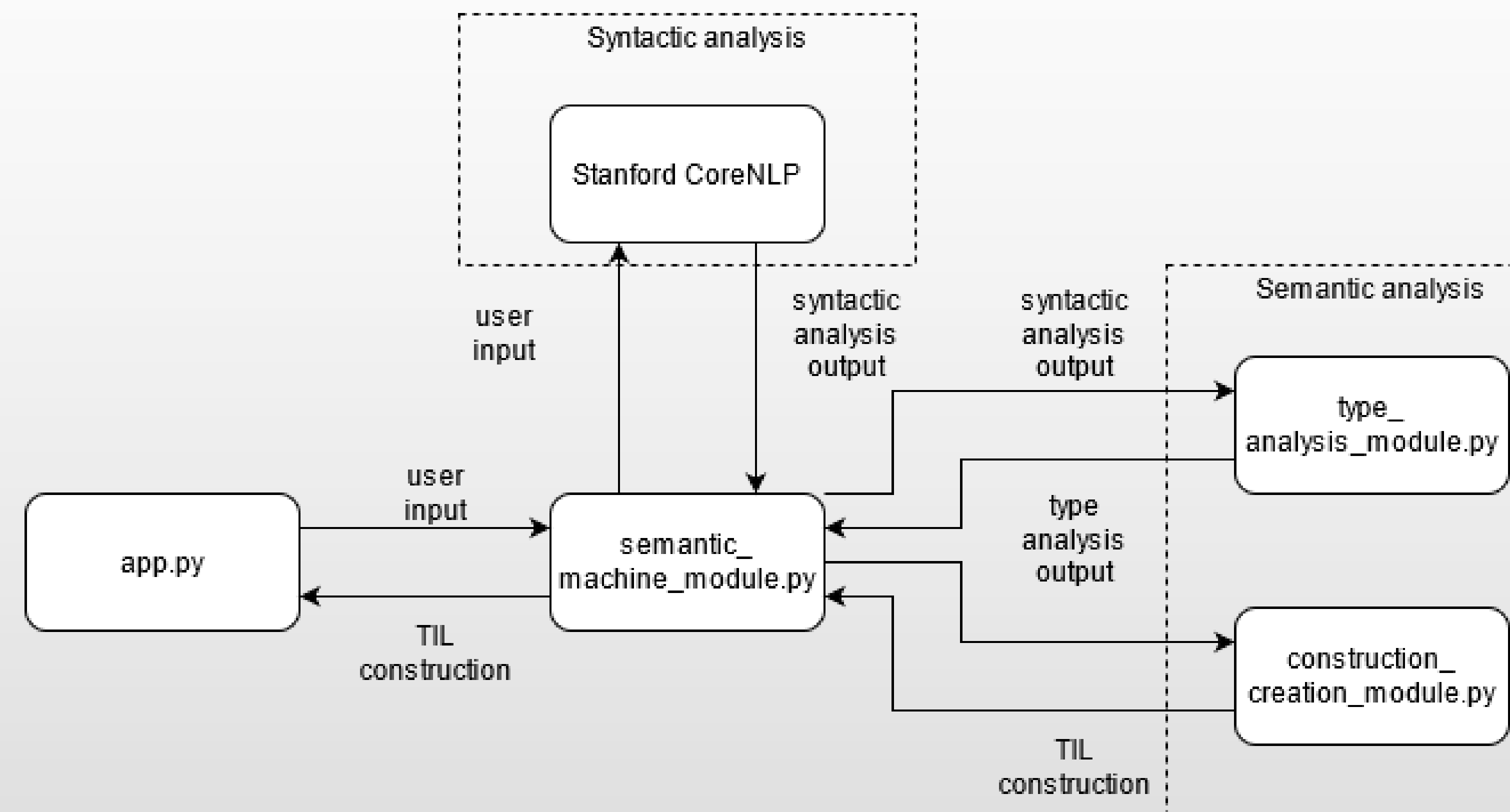
Technical improvements

As we wanna make a good product from our prototype, we need to ensure that the extension and maintaining of the product in the future will be simpler and safer. This can be achieved by two main aspects, splitting of application into the modules by functionality which will this modules covers (shown in the figure), and implement unit tests which will test these modules and its functionality.

Console application prototype was changed to a web service based on Flask microframework. The semantic machine is now available for other users and also applications.

Functional improvements

The implementation of the proposed extensions in terms of functionality meant the creation of new algorithms for conjunction, implication, variables, and quantifiers processing.

These new extensions had to be implemented within type analysis as well as the creation of TIL constructions within the semantic machine.

The fulfillment of these objectives pointed to some of the shortcomings of the prototype that were removed and also set of natural language sentences that can be processed by the semantic machine increased.

Conclusion

The thesis aimed to extend the prototype of a semantic machine, which as the initial logic apparatus uses transparent intentional logic.

Fulfillment of this goal meant to analyze the current state of the prototype over the technical and functional side and study of the logical apparatus and its possibilities for functional extension of the prototype, which would allow covering a larger set of natural language sentences.

Namely, processing of natural language sentences which contains conjunction, implication, variables and quantifiers was implemented.

After the successful implementation of the mentioned extensions, the last step was necessary to provide and thus the creation of a web service that would provide the functionality of the semantic machine. This last request was realized by the Flask framework and its use enabled the change of the prototype to a full-fledged product.

Due to the complexity and number of extensions that have been implemented within the presented thesis, it is possible to consider the set goals as fulfilled.