

Opponent report

Subject: Ph.D. thesis of Ing. Jiří Koutný

Title of the thesis: Grammars with Restricted Derivation Trees

Report:

I have read this thesis in detail, along with the attached papers.

I think that the title and the contents of the thesis correspond fully to the study field Computer Science and Informatics (Výpočetní technika a informatika). The thesis deals with grammars with restricted derivation trees, which generate a proper superclass of context-free formal languages and are some leading edge research topic of the theoretical computer science and the theory of formal languages. The write-up in the thesis is up-to-date in its own contents, but also with reference to other related works.

The research results presented in the thesis represent an original contribution of the author, suitably use the previous research results and add valuable theoretical knowledge to the research field in question. The results of presented thoroughly and correctly from the formal point of view. The results can be divided into three main parts according to the kind of derivation-tree based restrictions: cut-based, path-based and several path-based. The main contributions of the thesis include are: The author introduced the cut-based restriction and so opened a new investigation area. In the area of the path-based restriction he studied the impact of empty rules in generative power of the grammar and has shown that the empty rules can be removed without affecting the generated language. Finally, some important properties of the generative power of grammars with the several path-based restrictions have been proved.

The results have been published in several conferences and journals and include also a paper in a journal with an impact factor. This fulfills the requirements given for a possible successful PhD candidate.

Based on the thesis and on the publications I think that Jiří Koutný has obviously mastered the field and demonstrated original meaningful scientific research in the field.

Despite all my very positive statements above I have several remarks and questions, which are written below. I would like for Jiří Koutný to react to them during the defense of the thesis.

1. In some parts Jiří Koutný considers polynomial time parsing algorithms for the tree-based restriction grammars. I would like to ask author for detailed discussion on the linear time (deterministic?) parsing algorithms for such grammars during the defense.
2. In Chapter 1 the author states that "...many of the languages commonly used in practice...are not context-free..." and then summarizes two approaches for extending the generative power of context-free grammars. I am not sure if adding semantics (eg. by attributed grammars), which is the most common way of such extending for example in the theory of

compiler construction, is included in these two considered ways. In this part of the text no reference appears and therefore it is not clear what exactly the author means. This should be clarified. Also, a motivating example of extending power of context-free grammars by both mentioned ways would be fine for the reader.

3. On page 12 in the definition of the tree, an acyclic DIRECTED graph should be used. Furthermore, it could be noted that we use ORDERED trees (and not unordered ones).
4. My general comment: I would recommend adding some more examples to the text, which would contribute to its clarity and could also demonstrate important use cases of tree based restriction grammars.
5. In paper "Syntax Analysis of Tree-controlled Languages" the author states "...syntax analysis...is concerned with finding whether the given string...belongs to the language...". However, the main goal of the syntax analysis is to provide the syntactic structure of the given string (in the form of a coded derivation tree, for example), which is not mentioned in that text.

Overall evaluation: The thesis and the attached papers indicate to me beyond a doubt that Jiří Koutný has met the requirements for receiving Ph.D. title.

In Prague, 31.8.2012

doc. Ing. Jan Janoušek, Ph.D.

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