A Reduction of Finitely Expandable Deep Pushdown Automata (Presentation)

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Abstract. For a positive integer n, n-expandable deep pushdown automata always contain no more than n occurrences of non-input symbols in their pushdowns during any computation. As its main result, the presentation demonstrates that these automata are as powerful as the same automata with only two non-input pushdown symbols—$ and #, where # always appears solely as the pushdown bottom. Moreover, the presentation demonstrates an infinite hierarchy of language families that follows from this main result. The presentation also points out that if # is the only non-input symbol in these automata, then they characterize the family of regular languages. In its conclusion, the presentation suggests open problems and topics for the future investigation.

In essence, deep pushdown automata represent language-accepting models based upon new stack-like structures, which can be modified deeper than on their top. As a result, these automata can make expansions deeper in their pushdown lists as opposed to ordinary pushdown automata, which can expand only the very pushdown top. At present, the study of deep pushdown automata represent a vivid trend in formal language theory (see [3, 4, 1, 5]).

This presentations narrows its attention to n-expandable deep pushdown automata, where n is a positive integer. In essence, during any computation, their pushdown lists contain #, which always appears as the pushdown bottom, and no more than $n-1$ occurrences of other non-input symbols. As its main result, the presentation demonstrates how to reduce the number of their non-input pushdown symbols different from # to one symbol, denoted by $, without affecting the power of these automata. Based on this main result, the presentation shows that an infinite hierarchy of language families resulting from these reduced versions of n-expandable deep pushdown automata can be established. More precisely, consider n-expandable deep pushdown automata with pushdown alphabets containing #, $, and input symbols. The presentation shows that $(n+1)$-expandable versions of these automata are stronger than their n-expandable versions, for every positive integer n. In addition, it points out that these automata with # as its only non-input symbol characterize the family of regular languages. In its conclusion, this presentation formulates several open problem areas related to the subject of this presentation for the future study.

The presentation is based on the paper accepted to Schedae Informaticae [2].

References

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