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Closure properties of linear context-free tree languages with an application to optimality theory. (English summary)

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A context-free tree grammar [W. C. Rounds, Math. Systems Theory **4** (1970), 257–287; MR0269440 (42 #4336)] is "linear" (also called: non-copying, non-duplicating) if no rule permits the copying of subtrees. For these linear grammars the inside-out and the outside-in modes of derivation [cf. J. Engelfriet and E. M. Schmidt, J. Comput. System Sci. **15** (1977), no. 3, 328–353; MR0502290 (58 #19381a); J. Comput. System Sci. **16** (1978), no. 1, 67–99; MR0502291 (58 #19381b)] result in the same language.

The authors show that the family of linear context-free tree languages is closed under the operations of (a) deterministic linear frontier-to-root tree transduction mappings (mappings induced by deterministic linear bottom-up tree transducers), (b) deterministic linear root-to-frontier (top-down) tree transduction mapping, and (c) an intersection with regular tree languages.

Then these results are applied to the formalization of a particular framework in computational linguistics, viz. of optimality theory (OT). In OT the mapping of one level of linguistic representation to another is based on rules and filters (constraints). The rules generate candidate expressions in the target representation, which are subsequently checked against the filters. As a generator of an OT-system the authors use a deterministic linear frontier-to-root tree transducer applied to a linear context-free tree language, whereas filtering is done by finite-state tree automata. In this way, certain linguistic modeling problems can be dealt with by finite-state techniques over trees.

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Note: This list reflects references listed in the original paper as accurately as possible with no attempt to correct errors.