

TITLE: "Formalizing Attribute Grammars and Circularity Checking"

ABSTRACT: Attribute grammars are an extension of context-free grammars with attributes and semantic equations. For attribute evaluation to be well-defined on all parse trees for all interpretations of attribute types and semantic functions, the grammar must be without cycles. As a step in developing a framework for attribute grammars in the Agda dependently typed programming language, we have formalized Knuth's algorithm for circularity checking of attribute dependencies. We have formalized positions and paths in parse trees and proved several structural properties about them. We have implemented a terminating circularity checking function and proved that it is sound and complete (if the check says yes, then one parse tree with a cycle of attribute dependencies is exhibited; if some such parse tree exists, then the check says yes).

(Joint work with Tarmo Uustalu.)