Syntax-Guided Synthesis

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The classical formulation of the program-synthesis problem is to find a program that meets a correctness specification given as a logical formula. Recent work on program synthesis and program optimization illustrates many potential benefits of allowing the user to supplement the logical specification with a syntactic template that constrains the space of allowed implementations. Our goal is to identify the core computational problem common to these proposals in a logical framework. The input to the syntax-guided synthesis problem (SyGuS) consists of a background theory, a semantic correctness specification for the desired program given by a logical formula, and a syntactic set of candidate implementations given by a grammar. The computational problem then is to find an implementation from the set of candidate expressions so that it satisfies the specification in the given theory. We describe three different instantiations of the counterexample-guided-inductive-synthesis (CEGIS) strategy for solving the synthesis problem, report on prototype implementations, and present experimental results on an initial set of benchmarks.

References


*This research was supported by NSF Expeditions in Computing award CCF-1138996.