Program Understanding as Constraint Satisfaction: Representation and Reasoning Techniques

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Abstract

The process of understanding a source code in a high-level programming language involves complex computation. Given a piece of legacy code and a library of program plan templates, understanding the code corresponds to building mappings from parts of the source code to particular program plans. These mappings could be used to assist an expert in reverse engineering, legacy code, to facilitate software reuse, or to assist in the translation of the source into another programming language. In this paper we present a model of program understanding using constraint satisfaction. Within this model we intelligently compose a partial global picture of the source program code by transforming knowledge about the problem domain and the program itself into sets of constraints. We then systematically study different search algorithms and empirically evaluate their performance. One advantage of the constraint satisfaction model is its generality; many previous attempts in program understanding could now be cast under the same spectrum of heuristics, and thus be readily compared. Another advantage is the improvement in search efficiency using various heuristic techniques in constraint satisfaction.

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