Satisfiability Testing: Recent Developments and Challenge Problems

Bart Selman

Department of Computer Science

Cornell University

Abstract

Recently, there has been much progress in the area of prepositional reasoning and search. Current techniques can handle problem instances with thousands of variables and up to a million clauses. This has led to new applications in areas such as planning, scheduling, protocol verification, and software testing. Much of the recent progress has resulted from a better understanding of the computational characteristics of the satisfiability problem. In particular, by exploiting connections between combinatorial problems and models from statistical physics, we now have methods that enable a much finer-grained characterization of computational complexity than the standard worst-case complexity measures. These findings provide insights into new algorithmic strategies based on randomization and distributed algorithm portfolios.

I will survey the recent progress in this area and I will discuss the current state-of-the-art in propositional reasoning focusing on a series of challenge problems concerning propositional encodings, compilation techniques, approximate reasoning, robustness, and scalability.