

Abstract

This thesis presents results within the area of constraint reasoning and programming. The primary contributions are new hybrid techniques that spans the gap between search based techniques relying on exploiting the global structure of constraint problems and the more generic compilation-based techniques. These contributions consists of:

- Considering the use of compiled data structures as generic global constraints, extending previous results and providing new features such as efficient domain entailment detection.
- Showing how to replace the domain store relaxation used in constraint solvers with a more expressive size-limited Multi-valued Decision Diagram (MDD), and thereby allowing a new more powerful type of propagators.
- Presenting a new compilation technique for constructing both exact and approximate MDDs from constraint models containing global constraints. It allows decision diagrams to be conjoined directly with global constraints without first compiling the global constraint into a decision diagram. The approximation technique provides guarantees for the degree of violation of the involved global constraints while also allowing faster compilation of exact MDDs in some cases.

In addition to these primary contributions, we also present results on reducing the storage space requirement for decision diagrams, both in the case where random access is required as well as when it is acceptable to decompress the diagram first.