AN ABSTRACT OF THE DISSERTATION OF

Jeffrey M. Young for the degree of Doctor of Philosophy in Computer Science presented on September 23, 2011.

Title: Variational Satisfiability Solving

Abstract approved: _____

Eric Walkingshaw

Over the last two decades, satisfiability and satisfiability-modulo theory (SAT/SMT) solvers have grown powerful enough to be general purpose reasoning engines employed in various areas of software engineering and computer science. However, most practical use cases of SAT/SMT solvers require not just solving a single SAT/SMT problem, but solving sets of related SAT/SMT problems. This discrepancy was directly addressed by the SAT/SMT community with the invention of incremental SAT/SMT solving. However, incremental SAT/SMT solvers require end-users to hand write a program which dictates terms in a set that are shared between problems and terms which are unique. By placing the onus on end-users to write a program, incremental solvers couple the end-users' solution to the end-users' exact sequence of SAT/SMT problems—making the solution overly specific—and require the end-user to write extra infrastructure to coordinate or handle the results. In this thesis, I apply results from research on *variational* programming languages to the domain of SAT/SMT solvers to automate this interaction, creating the first variational SAT/SMT solver. I demonstrate numerous benefits to this approach: End-users need only identify the set of SAT/SMT problems to solve rather than identify the set *and* provide a program. Otherwise difficult optimizations can now be automatically detected and applied. Through use of variational constructs, the variational SAT/SMT can be made asynchronous and both single threaded and multi-threaded versions of variational SAT/SMT solvers are more performent in their expected use case.

Variational Satisfiability Solving

by

Jeffrey M. Young

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APPROVED:

Major Professor, representing Computer Science

Director of the School of Electrical Engineering and Computer Science

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Dean of the Graduate School

I understand that my dissertation will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my dissertation to any reader upon request.

Jeffrey M. Young, Author

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I would like to acknowledge the Starting State and the Transition Function.

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Wow, that really was excellent.

7.1 Fin

This is the end, my only friend, the end.

APPENDICES

Appendix A: Redundancy

This appendix is inoperable.