Preface

Strategies are ubiquitous in automated deduction, because the inference rules at the heart of reasoning systems are typically non-deterministic in nature, and need to be complemented by another component, usually called *strategy* or *search plan*, which is responsible for the *control* of the inference rules.

In automated theorem proving, the *search plan* selects inference rule and premises for the next step in the derivation, which involves priorities on inferences rules, heuristics to sort formulae or subgoals, and criteria, also typically heuristic in nature, to prune the search space. In rewriting engines, the *rewriting strategy* selects redex and rule for the next step. Similar considerations apply to decision procedures, model building methods, SAT or QBF solvers. In interactive systems, *tactics* define conditions for the application of inference rules, and *tacticals* control the application of tactics. It is still the control component of the proof assistant that is responsible for requesting the user to instantiate variables, or select lemmas.

Not only strategies are necessary to turn a non-deterministic inference system into a mechanical procedure, but they play a central role in making the procedure efficient, and capable of solving problems of practical interest. Most deduction paradigms (generation of consequences, subgoal-reduction, generation of instances, case analysis, enumeration) generate huge spaces of choices, so that sophisticated strategies are essential to implement them efficiently. This is as true as ever today, when a major challenge is the *integration* of paradigms and procedures, to create *automated reasoning environments* for applications such as verification. Combining theorem proving and model finding, or SAT solvers and decision procedures, proof assistants and theorem provers, just to name a few, poses all sorts of *control problems* to be solved in the definition, design and implementation of strategies.

The series of workshops on "Strategies in Automated Deduction," or STRATEGIES for short, aims at understanding the nature of strategies and search plans, their description, properties, and usage, in all automated reasoning systems. At its fifth meeting, it provides a well-established forum for researchers working on all aspects of strategies, under different terminologies and in various domains. Previous workshops were held at CADE 1997 (Townsville, Australia), CADE 1998 (Lindau, Germany), CADE 1999 within FLoC (Trento, Italy), and IJCAR 2001 (Siena, Italy). This year the International Joint Conference in Automated Reasoning in Cork, County Cork, Ireland, merges an unprecedented number of events: CADE (Conference on Automated DEduction), the Calculemus Symposium, FroCoS (Workshop on Frontiers of Combining Systems), FTP (Workshop on First-order Theorem Proving), and TABLEAUX (Conference on Analytic Tableaux and Related Methods), providing an excellent context for STRATEGIES.

Topics of interest of the series and this year's workshop include:

- Models of the search space and languages or mathematical formalisms to define strategies and prove properties about them, including machine-independent evaluation and comparison of strategies;

- Analysis of the search space (e.g., regularities, symmetries, classification, stratification);

- Meta-level features (e.g., pre-processing, compilation, lemmatization, caching, usage of semantics or domain knowledge);

- Strategies in (existing) systems (e.g., implementation of the proof search model, flexibility and programmability of strategies, role of the user);

- Strategies defined for specific theories or applications, including inductive theories, arithmetic, decidable theories, and combinations of theories;

- Applications and case studies in which strategies play a major role;

as well as all aspects related to *control* in theorem provers, model builders, decision procedures, proof assistants, proof planners, and logical frameworks, in first-order (including propositional and purely equational as special cases) as well as higher-order logics. This technical report presents twelve papers (two invited, nine regular, one position paper) featured at STRATEGIES 2004, touching upon some of the most exciting among these topics.

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