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Introduction to the Special Issue on Principles and Practice of Constraint Programming

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The annual conference on the Principles and Practice of Constraint Programming was held at Cornell University in 2002. The conference attracted a record number of submissions (which has been broken since then) and featured a high-quality technical program covering many aspects of constraint programming.

This special issue contains revised and extended versions of four articles originally published in the conference proceedings (LNCS 2470, Springer Verlag, 2002). Two of the articles study symmetry breaking in constraint programming, which was a hot topic at the conference and has remained so since then. The other two articles concern numerical constraints over the reals, an area which has grown steadily in the last decade.

The first article, "Solving the Kirkman's Schoolgirl Problem in a Few Seconds," by Nicolas Barnier and Pascal Brisset, considers the highly symmetrical golfer problem which has attracted significant attention in recent years. It proposes some new results that make it possible to prune large subtrees in the search space and to achieve orders of magnitude improvements in efficiency.

The second article, "Symmetry Breaking Revisited" by Jean-François Puget, presents an improvement over the well-established SBDD method by representing nodes in the search tree as sequences of decisions. The article also discusses how to combine various symmetry-breaking techniques and presents experimental results demonstrating the benefits of the new schemes.

The third article, "A Rigourous Global Filtering Algorithm for Quadratic Constraints," by Yahia Lebbah, Claude Michel, and Michel Rueher, considers polynomial systems of constraints and proposes a new filtering algorithm for quadratic constraints. The key idea consists of safely linearizing the constraints and of using linear programming to obtain new variable bounds. The article presents experimental results indicating the effectiveness of this pruning technique on a variety of benchmarks.

The last article, "A Framework for Optimal Correction of Inconsistent Linear Constraints" by Paula Amaral and Pedro Barahona, considers the challenging problem of correcting a set of inconsistent linear constraints to ensure feasibility. The article studies corrections under the Frobenius norm, and presents new theoretical results, as well as algorithms based on them.

These four articles represent interesting and promising developments in constraint programming and capture some of the technical depth and multi-disciplinary nature of constraint programming. They will give readers some of the flavors of the conference which, hopefully, will encourage them to look at the proceedings to discover other fascinating research that were presented there.