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Introduction to the CPAIOR 2017 fast track issue

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The 14th Conference on the Integration of Artificial Intelligence (AI) and Operations Research (OR) Techniques in Constraint Programming (CPAIOR 2017) was held in Padova, Italy, from June 5 to June 8, 2017.

After a successful series of five CPAIOR international workshops in Ferrara (Italy), Paderborn (Germany), Ashford (UK), Le Croisic (France), and Montreal (Canada), in 2004 CPAIOR evolved into a conference. More than 100 participants attended the first meeting held in Nice (France). In the subsequent years, CPAIOR was held in Prague (Czech Republic), Cork (Ireland), Brussels (Belgium), Paris (France), Pittsburgh (USA), Bologna (Italy), Berlin (Germany), Nantes (France), Yorktown Heights (USA), Cork (Ireland), Barcelona (Spain) and Banff (Canada). In 2017 CPAIOR returned to Italy.

The aim of the CPAIOR conference series is to bring together researchers from constraint programming (CP), artificial intelligence (AI), and operations research (OR) to present new techniques or applications in the intersection of these fields, as well as to provide an opportunity for researchers in one area to learn about techniques in the others. A key objective of the conference is to demonstrate how the integration of techniques from different fields can lead to novel and effective methods for large and complex problems. Therefore, papers that actively combine, integrate, or contrast approaches from more than one of the areas are especially welcome. Application papers showcasing CP/AI/OR techniques on innovative and challenging applications or experience reports on such applications are also strongly encouraged.

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The call for papers mentioned a Journal fast track where the best papers would be directly submitted to the Constraint Journal while still be presented at the conference. The program committee identified papers that were judged outstanding. The authors were invited to add novel material to their paper and submit it for a second round of review. This process led to the selection of these four papers.

Efficient Filtering for the Resource-Cost AllDifferent Constraint addresses a family of optimization problems where a number of items, each requiring an amount of some resource, must be assigned to different slots. Assigning an item to a slot incurs a cost that is proportional to the amount of the required resource and to a slot-dependent price. The authors provide a filtering algorithm that enforces stronger consistency than a decomposition based on ELEMENT constraints, and is more scalable than a MINIMUMASSIGNMENT constraint. The approach is tested on variants of Production Scheduling and of the Traveling Salesman problem.

In *Auto-Tabling for Subproblem Presolving in MiniZinc* the authors present an extension of the MiniZinc language for the automatic encoding of suitably annotated model parts as extensional constraints (i.e. via the TABLE constraint). Tabling is a powerful pre-processing technique, which is however seldom employed since it is non-trivial to implement and makes the model less clear. The approach dramatically improves the accessibility of the technique, and provides evidence of its potential via experimental results.

Cumulative scheduling with variable task profiles and concave piecewise linear processing rate functions considers a class of complex scheduling problems where resource requirements can be adjusted over time, and activities are completed once they have consumed a certain amount of energy (i.e. resource-time integral). The authors provide two filtering algorithms for the case where the usage functions are convex and piecewise linear. The approach is suitable, for example, for scheduling problems where a limited amount of workers can be dynamically switched from one activity to another to reduce the makespan.

Finally, *Mining Time-constrained Sequential Patterns with Constraint Programming* presents a CP based approach for (univariate) sequence mining with gap and span constraints. The paper builds over previous work by some of the same authors, and shows how the new, more complex, restrictions can be taken into account in frequency constraints. By employing techniques to avoid unnecessary scans and by making use of efficient data structures, the authors manage to obtain an approach that is capable of outperforming both specialized algorithms and other CP-based methods.

We would like to thank the reviewers, for their excellent work despite they had to operate on a very tight schedule: this Journal fast track would have not been possible without their efforts.

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