EURO Working Group on Vehicle Routing and Logistics Optimization

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CONFERENCE PROGRAM

Includes the Book of Abstract

UNIVERSITÀ DI TRENTO — Dipartimento di Ingegneria Industriale

EWG VEROLOG VEHICLE ROUTING AND LOGISTICS

Abstract

Heuristics *Room 2*

Chair: Prof. Demetrio Laganà

Exploring Search Methods for Configuring Multi-Phase Parallel Optimisers in Vehicle Routing Problems   **15.20**
*Speaker***:** Tomas Murarik (Optrak Distribution Software, United Kingdom)
Co-authors: Tim Pigden

Optrak, a vehicle routing solutions provider, is investigating advanced search methodologies to efficiently tune configurations of the low-level heuristics of our multi-phase parallel optimisation platform, which is implemented in Scala. In our optimiser we use a wide range of heuristic algorithms ranging from standard methods, such as the Clarke and Wright savings algorithm, to uniquely developed heuristics for complex routing contexts. Each potential configuration is represented by a specific sequence of these heuristics and their constituent parameters. This results in a vast, complex search space. We have developed a domain-specific language (DSL) on the JVM, which we call the Parallel Metaheuristic Optimisation Language (PMOL), to express a population of configurations in a statically typed, safe way. An API allows for external search algorithms in Python to alter configurations, we can then evaluate each configuration by passing it back to the PMOL and running our multi-phase optimiser. In our survey, we evaluate the effectiveness of several heuristic search algorithms in finding optimal configurations, including: Bayesian Optimization, Simulated Annealing, several population-based metaheuristics, Reinforcement Learning approaches and random search. The separation of the search space into combinatorial and parametric components gives scope for the application of hybrid search methods, with distinct search algorithms acting on each component. We use anonymised, real-world industrial data-sets to collect the results for our survey. Our study provides empirical evidence for the relative effectiveness of these search methodologies when applied to the practical challenge of tuning complex vehicle routing optimisation in industry. In a broader sense, the results contribute to understanding which strategies are most effective for configuring large-scale optimisation systems employing diverse sets of heuristic components.