Crew Pairing Optimization using Hyper-Heuristics

Bahadır Zeren · Ender Özcan · Muhammet Deveci

Abstract A crew pairing is a sequence of flight legs beginning and ending at the same crew base. The crew pairing problem is a vital part of crew scheduling that all airlines carry out regularly comprises generation of set of crew pairings that cover all flight legs in the airline's timetable. This process directly affects the operational crew cost factors, such as total man day, number of overnights, number of deadheads. Considering the significant impact on the operational costs, finding an optimal solution is crucial as well as a challenging task. Numerous solution methods have been proposed in the scientific literature, ranging from exact methods to metaheuristics. The LP based mathematical techniques are commonly used in this area, frequently accelerated by means of special (branching) heuristics to obtain solutions in a reasonable amount of time. On the metaheuristics side, classical approaches, such as genetic algorithms are often capable of obtaining high quality solutions for *small* to *medium* size problem instances. Even though hybridizing genetic algorithm with local search (i.e., memetic algorithms) or exact methods with heuristics can reportedly lead to improvements in the performance and solution quality, still metaheuristics struggle dealing with the large scale crew pairing problem instances. In this study, we present a general-purpose solver underpinned by a hyper-heuristic to solve large scale airline crew pairing problems. Based on our previous work [1,2], we equipped the proposed hyper-heuristic approach with domain specific heuristics and an efficient adaptive learning strategy leading to an improved performance and solution quality. We have access to a benchmark of real-world large scale crew pairing problem instances from a well-known Turkish airline carrier. We will report on progress and provide performance comparison of our approach against the previously proposed methods at the conference.

Keywords Crew pairing · hyper-heuristic · metaheuristic · optimization

References

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Bahadır Zeren, Ender Özcan, Muhammet Deveci
Istanbul Technical University, University of Nottingham, Yıldız Technical University
E-mail: bzeren@gmail.com, ender.ozcan@nottingham.ac.uk, muhammetdeveci@gmail.com