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CONSTRAINT HANDLING BASED MULTIOBJECTIVE EVOLUTIONARY ALGORITHM FOR AIRCRAFT LANDING SCHEDULING

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Abstract. *Aircraft landing scheduling, which is to decide landing times for a set of planes, is a multiobjective optimization problem with lots of constraints. It is difficult to be dealt with by multiobjective evolutionary algorithms which use merely general constraint handling methods. In this paper, an effective constraint handling method is specially designed first; then a multiobjective evolutionary algorithm using that method, named EACH, is presented to solve the aircraft landing scheduling problem. Comparative experiments show that the problem can not be solved effectively by general constraint handling methods alone; on the contrary, EACH is able to find the feasible region in the search space, obtain the jagged Pareto front, and thereby provide efficient schedule for aircraft landing.*
Keywords: Multiobjective optimization, Evolutionary algorithm, Constraint handling, Air traffic control

1. **Introduction.** Many real world problems involve multiple measures of performance, or objectives, which should be optimized simultaneously. These problems are called multiobjective optimization problems (MOPs). Since the objectives are interwoven and conflicting (e.g. performance and cost) in most cases, an MOP has no overall best solution which surpasses all the others in every objective dimension, but a set of Pareto-optimal solutions instead. Evolutionary algorithms (EAs) have been recognized to be well-suited for MOPs since early because they can process a set of solutions in parallel, thereby can obtain an approximation of the Pareto front which consists of multiple Pareto-optimal solutions in a single run [1]. Up to present, various multiobjective evolutionary algorithms (MOEAs) have been proposed to solve MOPs more effectively [2, 3, 4, 5, 6].

In the application of EAs, as well as MOEAs, how to handle constraints is always a challenging research topic. The most common approach to handle constraints in EAs is a penalty function, which is to punish infeasible solutions by imposing penalties upon their fitness values. Various penalty functions appeared in the literature for single objective problems, including static, dynamic, annealing, adaptive, coevolutionary and death penalties [7, 8, 9]. In the field of multiobjective optimization, constraint satisfaction and multiobjective optimization are often considered as two aspects of the same problem, where constraints can be seen as hard objectives which need to be satisfied before the optimization of the remaining soft objectives [10]. A representative work is the definition