Weekly Airline Fleet Assignment with Homogeneity

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Abstract

Given the flight schedule of an airline, the fleet assignment problem consists of determining the aircraft type to assign to each flight leg in order to maximize the total expected profits while satisfying aircraft routing and availability constraints. The profit for a leg is a function of the leg's stochastic passenger demand, the capacity of the aircraft assigned to the leg, and the aircraft operational costs. This paper considers the weekly fleet assignment problem in the case where homogeneity of aircraft type is sought over legs sharing the same flight number. Homogeneity allows, among other things, easier ground service planning. An exact mixed-integer linear programming model, as well as a heuristic solution approach based on mathematical programming, are presented. Computational results obtained on Air Canada instances involving up to 4400 flight legs are reported. The system produces realistic solutions arising from a trade-off between profits and homogeneity, and solves large-scale instances in short times with very small optimality gaps.

Key Words: Linear programming, mixed-integer programming, airline fleet assignment.