Advanced Techniques in the Column Generation Method for Crew Pairing Problems

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Abstract: Crew Pairing Problem is often solved by Column Generation in the framework of Branch and Price. The main idea of the method has two basic steps: (1) solving the linear problem for a subset of variables, (2) pricing a subproblem to find out new variables with negative reduced costs. Since the dual variables are not bounded, this leads to instability of the standard form of this method. Therefore, a so-called stabilized column generation is suggested in step (1) to overcome this phenomenon by reducing the number of redundant variables. With a good approach of updating algorithm parameters, the performance could be improved dramatically. The time consuming pricing step (2) is also under consideration with several pricing algorithms which are tuned to adapt to the crew pairing problem. This paper will discuss an approach of using a cluster of computers to solve the problem. With a quite simple implementation, a good speedup is obtained in solving randomly generated crew pairing problems.

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