A new Hybrid approach to solve crew scheduling problem: Column generation and ant colony optimization

Abstract

Crew's schedule has a great influence on human resources satisfactory, and in transportation companies, crew scheduling is a cost consuming problem. This research is on solving the Crew scheduling problem. Crew scheduling is one of the large scale problems in operation research, which needs an effective solution method. This research solves the problem by two algorithms. The first one is column generation approach. The column generation results indicate that the larger the problem, the more the running time. In order to improve the column generation, a new hybrid algorithm is presented. We hybridize an exact method and a Meta heuristic one. In other words, ACO as a Meta heuristic method is used to improve column generation. In order to test algorithms performances, we have solved ۱۵ different sized problems for train conductor scheduling in Raja Trains Company. The proposed algorithm's results are compared to the first one. The results indicate that in small problems the algorithm can find optimal solutions in less running time, and in larger ones, good near optimal solutions are found. For the problems that the first algorithm needs more than ۲۰h running time, we compare the proposed algorithm to a checking algorithm. In this case, the hybrid algorithm gets good near optimal solutions with less than ۵% error in less than ۲ hours. We have implemented all algorithms with ILOG CPLEX۱۱.۱ in C# language.