

Two-phase graph coloring heuristic for crew rostering

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Nowadays, the companies and institutions have numerous employees, therefore the crew rostering problem became increasingly important. In most cases, some of the shifts take more time than others, which means that the employees don't spend the same amount of time working. These differences produced an "overtime cost" which is added to the basic salary. However, the companies and institutions must guarantee the basic salary for everyone, even if the employee does not spend the normal amount of time at work. This causes an additional cost for the companies.

The objective is to assign the crew members to shifts, meeting the constraints, and optimize the overall cost in such a way that the sum of the guaranteed basic salaries and the induced overtime cost is minimized. We improved a two-phase graph coloring method for the crew rostering. In the first step, a graph is built and colored, and in the second step, the graph is recolored with the tabu search method by our algorithm. The lower bound of the algorithm depends on the number of the employees and the working time. Our method has been tested with artificially generated and real inputs. For moderate size problems, the results of the new algorithm have been compared to the solutions of the appropriate integer programming model.

We obtained that our algorithm is able to handle relatively large inputs, and in the majority of the test cases, it has reached the theoretical lower bound with producing a satisfactory running time.

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