

Sirirat Muenvanichakul 2009: Benders' Decomposition Based Heuristics for the Dynamic Quadratic Assignment Problem. Doctor of Engineering (Industrial Engineering), Major Field: Industrial Engineering, Department of Industrial Engineering. Thesis Advisor: Associate Professor Peerayuth Charnsethikul, Ph.D. 128 pages.

The objective of the dynamic quadratic assignment problem (DQAP) is to minimize the sum of the assignment cost and the rearrangement cost over all periods. As a result, DQAP is an NP-hard problem and it is extremely difficult to determine an optimal solution of DQAP. This thesis has focused on developing optimization methods to approximate the exact solution of large-scale DQAPs. Three approaches are taken – Benders' decomposition (BD) based method, dynamic programming (DP) and logic-based method.

Benders' decomposition based optimization method is applied to the equivalent mixed-integer linear programming problem (MILP) of the original DQAP. DP technique is introduced into the method in order to determine the sub-optimal solution and help accelerating the convergence rate. BD generates a database of a subset of feasible solutions for DP to determine an approximate optimal solution. For large-scale DQAPs, the solution of MILP problem in the master problem is further approximated by the round-up of the solution from the relaxed linear assignment problem using the original Hungarian method. The proposed method is tested with large-scale DQAPs against simulated annealing, tabu search and genetic algorithm. Starting from a random initial layout or the best solution from simulated annealing, the result from the method is comparable but is not as good as that from other methods. In order to accelerate BD, a trust-region constraint is implemented into the master problem. The convergence rate improves significantly but the cost of the solution improves slightly. A successive adaptation procedure is implemented to improve its performance. The result shows that the proposed method is competitive with other methods.

For implementing the logic-based model to the DQAP, the proposed methodology provides efficient solutions for small-scale problems. It takes considerable amount of computing time and provides poor solutions when the number of candidates is getting larger.

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Thesis Advisor's signature

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