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Title

GUIDED LOCAL SEARCH WITH SHIFTING BOTTLENECK FOR JOB SHOP SCHEDULING PROBLEMS

Abstract

Many optimization problems of practical interest are computationally intractable. Therefore, a practical approach for solving such problems is to employ heuristic (approximation) algorithms that can find nearly optimal solutions within a reasonable amount of computation time. An *improvement algorithm* is a heuristic algorithm that generally starts with a feasible solution and iteratively tries to obtain a better solution.

Neighborhood search algorithms (alternatively called *local search algorithms)* are a wide class of improvement algorithms where at each iteration an improved solution is found by searching the "neighborhood" of the current solution.

Many recently developed local search algorithms for Job Shop Scheduling use interchange of operations, embedded in a simulated annealing or tabu search framework. We developed a new variable depth search procedure, GLS (Guided Local Search), based on an interchange scheme and using the new concept of neighborhood trees. Structural properties of the neighborhood are used to guide the search in promising directions. While this procedure competes successfully with others even as a stand-alone, a hybrid procedure that embeds GLS into a Shifting Bottleneck framework and takes advantage of the differences between the two neighborhood structures proves to be particularly efficient. We report extensive computational testing on all the problems available from the literature.

We also report computational results for a variant of the Job Shop Scheduling Problem. We consider the addition of release dates and deadlines to be met by all the jobs.

Finally we will present results where we combine Mixed Integer Linear Programming and GLS/Shifting Bottleneck Procedure and develop a decomposition algorithm for a Parallel Machine Scheduling Problem.

Biographical Sketch

Alkis Vazacopoulos is a Director at Dash Optimization, Inc since 1998. Dr. Vazacopoulos was an Associate Professor at Fairleigh Dickinson University from 1994 to 2001. He attended Florida International University, Miami, Florida and received a Masters of Science, Management Information Systems (1988). He then attended the Graduate School of Industrial Administration at Carnegie Mellon University. In 1994 he completed his Ph.D. in Industrial Administration. His Ph.D. thesis solves large job shop scheduling problems using the Shifting Bottleneck Procedures.