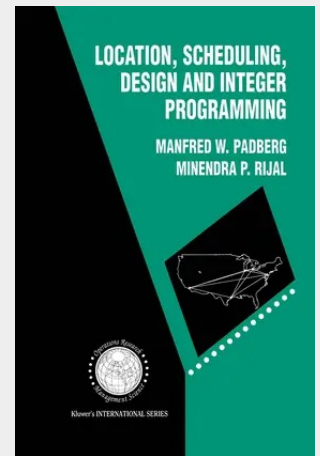


Location, Scheduling, Design and Integer Programming

Location, scheduling and design problems are assignment type problems with quadratic cost functions and occur in many contexts stretching from spatial economics via plant and office layout planning to VLSI design and similar problems in high-technology production settings. The presence of nonlinear interaction terms in the objective function makes these, otherwise simple, problems NP hard. In the first two chapters of this monograph we provide a survey of models of this type and give a common framework for them as Boolean quadratic problems with special ordered sets (BQPSs). Special ordered sets associated with these BQPSs are of equal cardinality and either are disjoint as in clique partitioning problems, graph partitioning problems, class-room scheduling problems, operations-scheduling problems, multi-processor assignment problems and VLSI circuit layout design problems or have intersections with well defined joins as in asymmetric and symmetric Koopmans-Beckmann problems and quadratic assignment problems. Applications of these problems abound in diverse disciplines, such as anthropology, archeology, architecture, chemistry, computer science, economics, electronics, ergonomics, marketing, operations management, political science, statistical physics, zoology, etc. We then give a survey of the traditional solution approaches to BQPSs. It is an unfortunate fact that even after years of investigation into these problems, the state of algorithmic development is nowhere close to solving large-scale real life problems exactly. In the main part of this book we follow the polyhedral approach to combinatorial problem solving because of the dramatic algorithmic successes of researchers who have pursued this approach.

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