GREEDY ALGORITHMS IN COMBINATORIAL OPTIMIZATION

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The *greedy algorithm* is perhaps the intuitively most natural optimization principle: take in each step the locally best decision, where “best” is measured by an objective function that is evaluated locally. The question, then, arises under what conditions such a local strategy leads to a globally optimal solution. Particular attention has therefore been paid to combinatorial structures for which the greedy algorithm works provably optimally (at least relative to certain types of objective functions): for example, matroids, polymatroids and their generalizations (e.g., greedoids).

The greedy approach is often quite successfully employed not as a full algorithm but as a fast subroutine within other algorithmic frameworks (e.g., pruning rule in branch-and-bound procedures or local optimizer in a Lagrange relaxation). In general, the greedy algorithm may be seen as a direct attempt to find local optima in search procedures. The greedy strategy appears to be of particular importance in the design of on-line algorithms (e.g., coloring, partitioning, scheduling), where it is often known as the *first fit* principle.

Recent interest in probabilistic aspects of optimization has exhibited the greedy strategy to be quite powerful in the design of deterministic algorithms based on the evaluation of conditional probabilities (de-randomization techniques) or in the analysis of average case behavior (TSP, graph coloring).

This survey lecture cannot give a full treatment of all aspects of greedy principles in combinatorial optimization but tries to sketch some of the results and recent developments in the aforementioned areas.