

Searching Graphs with Lexicographic Goal References

Madow, Lorenzo (*) Pérez-de-la-Cruz, José L.
Universidad de Málaga Universidad de Málaga

Pulido, Francisco Javier
Universidad de Malaga

We consider the problem of searching for paths in a multiobjective graph from given source and destination nodes. More precisely, we search for the subset of all Pareto-optimal paths that satisfy a set of lexicographic goals, i.e. goals grouped in preemptive priority levels. We assume additive costs, and minimize the weighted deviation of goals for each priority level. We propose LEXGO*, a new algorithm for the efficient solution of this problem. LEXGO* is a label-setting algorithm that generates partial paths from the start node to the destination. Each partial path is in turn expanded, filtered, or pruned. Conditions for filtering and pruning are defined in such a way that discarded paths are among those that would never generate an optimal solution. Hence, it can be proved that LEXGO* is admissible (i. e., it finds exactly the set of best solutions). The algorithm can exploit heuristic information to improve search efficiency. It can be also proved that, under certain conditions, the number of explored labels can be reduced using better heuristics. Some experiments have been carried out to analyze the performance of LEXGO*. Random problem have been generated on a grid and solved (i) by LEXGO*; (ii) by the optimal multiobjective algorithm NAMOA*, first generating all Pareto-optimal solutions and then selecting among them those that satisfy the goals. Experiments show that: (a) when few solutions exist, LEXGO* achieves a substantial reduction of execution time over procedure (ii); (b) when many solutions exist, execution times are very similar.

Keywords: Artificial Intelligence, Goal Programming, Multi-Objective Optimization, Pareto Optimal Solutions.