

VNS approaches for rich vehicle routing

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Abstract: One of the main application areas of VNS has been "rich vehicle routing" and this talk will focus on different design decisions for this problem class. In some "clean" standard problem classes, the neighborhoods can be nested as suggested by Hansen and Mladenovic in their original presentation of VNS. For "rich" and "messy" vehicle routing (periodic, multiple depot, heterogeneous fleet, etc.) this is often not possible, since the various neighborhoods will have to focus on different aspects of the problem and are therefore not contained in each other. Then the question of the optimal order arises.

Another design decision is the choice of local search (LS). Either one can choose a quick LS, e.g. simple iterative improvement focusing on just one tour, which enables one to make many shaking steps that must take care of the other aspects (inter tour ...) of the problem. Or one can use a full fledged metaheuristic (such as tabu search or VND) as a LS working more or less on the whole solution and just use a few large shaking steps for diversification. Both design decisions have been successfully applied.

The presentation will give some examples of successful VNS applications in rich vehicle routing, mainly focusing on our own work in Vienna. Finally, connections to adaptive large neighborhood search are discussed.