Routing for couriers : a multi-objective tabu search method to rebalance a tactical route plan with microzones

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Courier companies face a highly *dynamic vehicle routing problem* with many *thousands of pick-ups and deliveries*. Currently, even the best vehicle routing algorithms are not up to the challenges posed by such routing problems because : (1) courier routing problems are too large for most algorithms, and (2) processes that rely on the final routing plan, such as the sorting and loading of parcels in vehicles, need to start long before all the data required for such a routing plan is available. As a result, the planning processes in most courier companies are currently poorly supported by automatic planning tools. Instead, they rely on more stable organisational structures for the distribution of their parcels.

A popular technique is to partition the distribution area into zones, based on, e.g., zip codes. In this talk we propose to create smaller *microzones* that can be used as building blocks, and are more or less permanently assigned to vehicles in a so-called *tactical plan*. The final vehicle routing should be based on this plan, but the plan is adapted when capacity violations or workload imbalances occur due to the stochastic nature of the problem.

In this talk we tackle the problem of rebalancing unbalanced tactical plans. In order to do this we assume that a tactical plan is given, and that estimates on the workload per region are known. We focus on combining the zones into feasible vehicle routes while taking into account three objectives : the total transportation cost, the number of reallocated microzones, and the workload balance. By solving this problem, couriers are able to convert their tactical route plan into an efficient operational plan with balanced workloads, without reallocating too many microzones.

The algorithm presented in this talk produces a set of non-dominated solutions, and leaves it to the decision maker to choose the final solution according to

his/her preferences. As he/she should not be overwhelmed with choices, we argue that the algorithm should only present a limited number of interesting solutions. In practice, this means the set of produced non-dominated solutions should be filtered so that only the most diverse ones remain.