Aggregation based on road topologies for large scale VRPs

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In large scale vehicle routing problems, such as waste collection or distribution of media products, the large number of customers are challenging for transportation planning tools. The topology distance table becomes too large for the available memory, and search operators may become exceedingly slow when routes contain a large number of customers.

We present work which aggregates customers in real-world VRPs based on the road topology. Customer locations are snapped to their nearest road link in the topology. Customers sharing the same road link are aggregated, up to some upper limit on demand size and/or service time. The location of the *aggregate customer* is represented by an edge which may be traversed in both directions. The demand size of the aggregated customer is simply the sum of the customer demands forming the aggregate, whereas the service time of the aggregate also takes into account the road topology travel time between the customers. The service time may therefore depend on the direction of travel the aggregate is being serviced in a given plan. Other attributes of aggregate customers are similarly set and problem constraints are updated, based on the attributes of the original rich VRP. The new VRP, having much fewer customers, is optimized with our SPIDER solver engine, and the resulting plan to the aggregate VRP is transferred back to a plan for the original VRP.