

Rubbish-lorry routing

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In the standard travelling salesman (TSP) problem, we are given a number of houses and are required to find a route of minimal total length, which visits every house exactly once. Usually the simple Euclidean norm is used and the constraints induced by streets are ignored. There are many variations on this; some are well studied as vehicle-routing problems. The problem is typically solved by branch-and-bound; that is, tree searches with pruning of branches known not to lead to optimality. For really big problems, heuristics are needed. This project will study a specific variant known to be of interest to councils to improve the efficiency of rubbish collection.

Firstly, we may easily include the effect of streets by using a distance matrix with as many rows and columns as houses. This will force the optimal route to visit adjacent houses on most steps.

Secondly, let us specialize to the rubbish-lorry routing problem. This just has the extra condition that the lorry must return to depot when full. This can be modelled by assuming a value of n (typically $n = 100$); every n houses the lorry must return to depot, which may not be near its current location.

The project is to design a branch-and-bound (or similar) algorithm for this problem, and apply it to some problem data with realistic distance matrix and value of n .