

Exercise 1 is a relatively minor modification to the original algorithm that was provided in the ttp package.

Mutation: The mutation operator is unchanged, flipping one random bit in the packing plan.

Crossover: A crossover operator is added. For each item, the new packing plan copies the first parent with 50% probability, and the second parent otherwise.

Population size is increased from 1 to 10, with Fitness Proportional parent selection, and Elitism(10,10) survivor selection.

These changes were made to provide exploration and mixing of multiple parts of the search space, while being minimally complicated, allowing the algorithm to better avoid local optima.

It was originally intended that an optimisation process would be applied to the result of each variation operation before it was returned that would remove any excess items in the knapsack, before adding back the best profit/weight items that could fit. This turns out to be a bad idea, because the effect on trip time is determined by the fraction of remaining weight that is filled by an item, not a linear function of its weight, which prevents the increased trip time from being incorporated into the profit/weight calculation, which therefore ended up producing terrible results. As such, this was not included in the final version.