A modified HGS for static VRPTW and a neighbors addition-postponement strategy for dynamic VRPTW

Team HowToRoute

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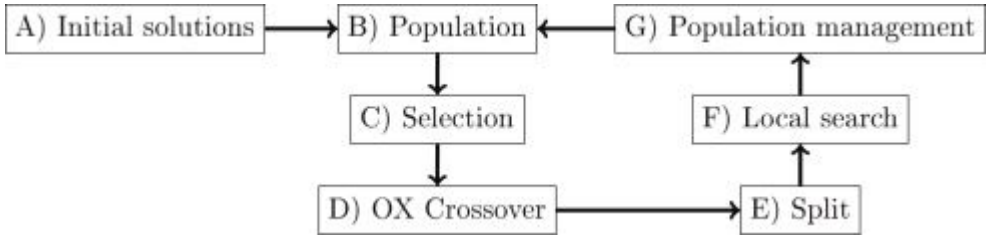
Static variant

Improved the HGS-VRPTW baseline solver

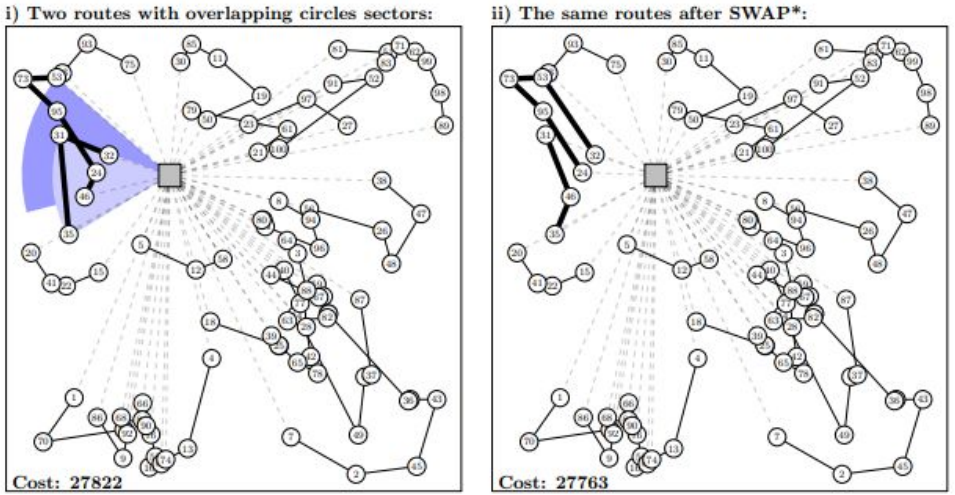
- Local search intensification modification
- Genetic crossover modifications



Hvattum, L. M. (2022). Adjusting the order crossover operator for capacitated vehicle routing problems. Computers & Operations Research, 148, 105986.

Local search intensification modification

- Swap* and Relocate* are computationally expensive neighborhoods.
- Reduce the intensification probability from 15% to 3%.
- This accelerates the convergence towards lower cost solutions

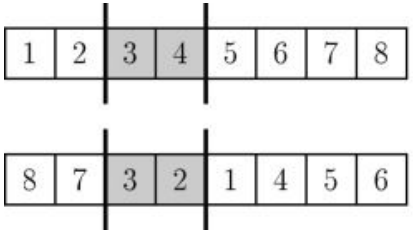


Vidal, T. (2022). Hybrid genetic search for the CVRP: Open-source implementation and SWAP* neighborhood. Computers & Operations Research, 140, 105643.

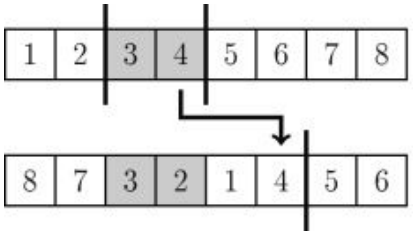
Genetic crossover modifications

- Baselines solver uses 2 crossover operators:
  - OX → Order crossover
  - SREX → Selective Route Exchange
- We implemented an additional crossover operator:
  - AOX → Adjusted Order Crossover Hvattum (2022)
- To create 1 new individual → 6 offspring generated instead of 4

OX



AOX



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Dynamic variant

Strategy based on 2 main phases:

- Adding non-obligatory neighbors
- Postponement of neighbors that worsen the solution

Dynamic variant

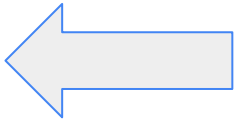
Strategy based on 2 main phases:

With 2 routing phases:

- Adding non-obligatory neighbors

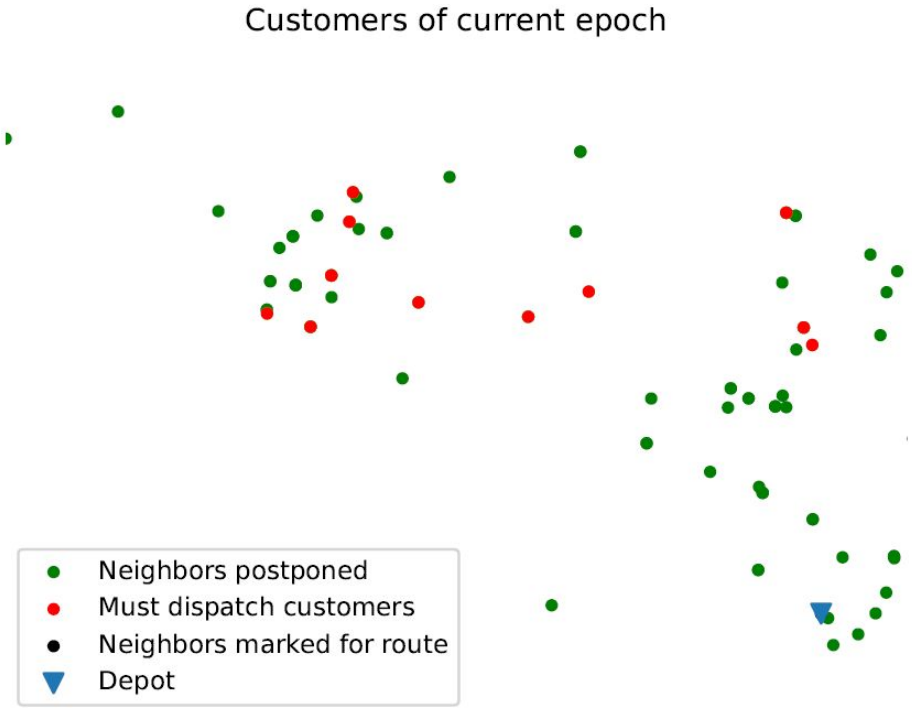
Intermediary routing of partial solution

- Postponement of neighbors that worsen the solution

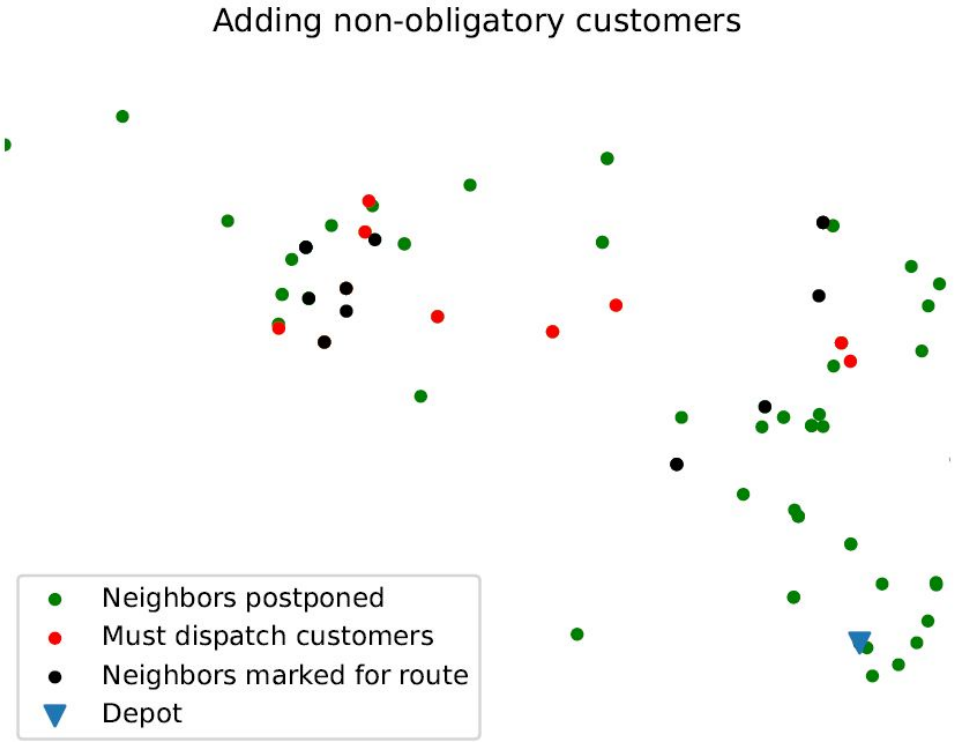


Routing of final solution

Adding non-obligatory neighbors

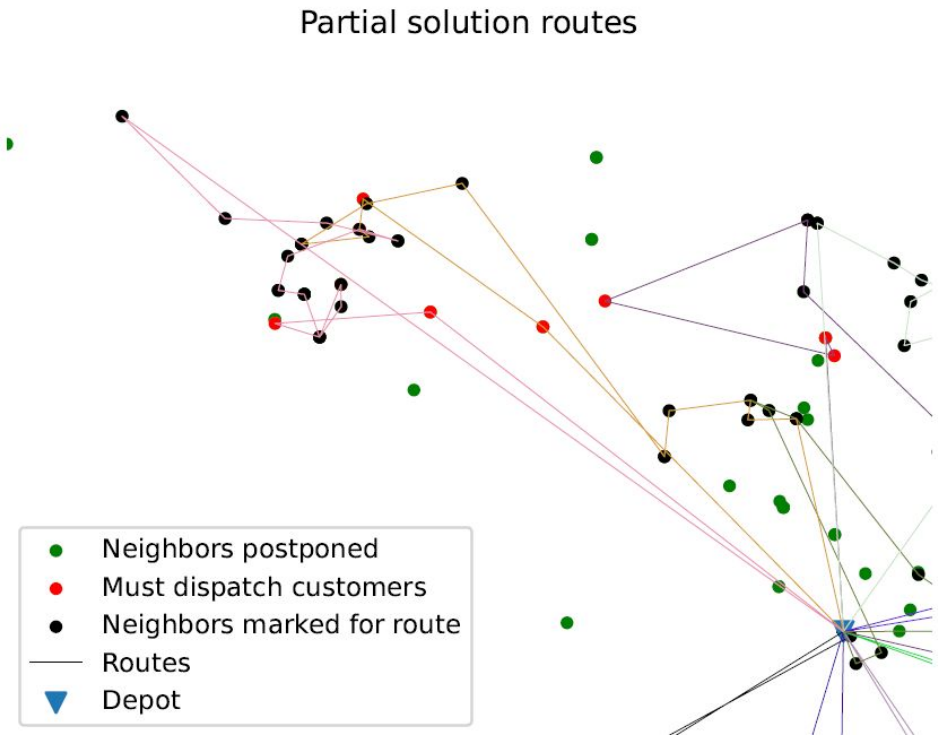


Adding non-obligatory neighbors

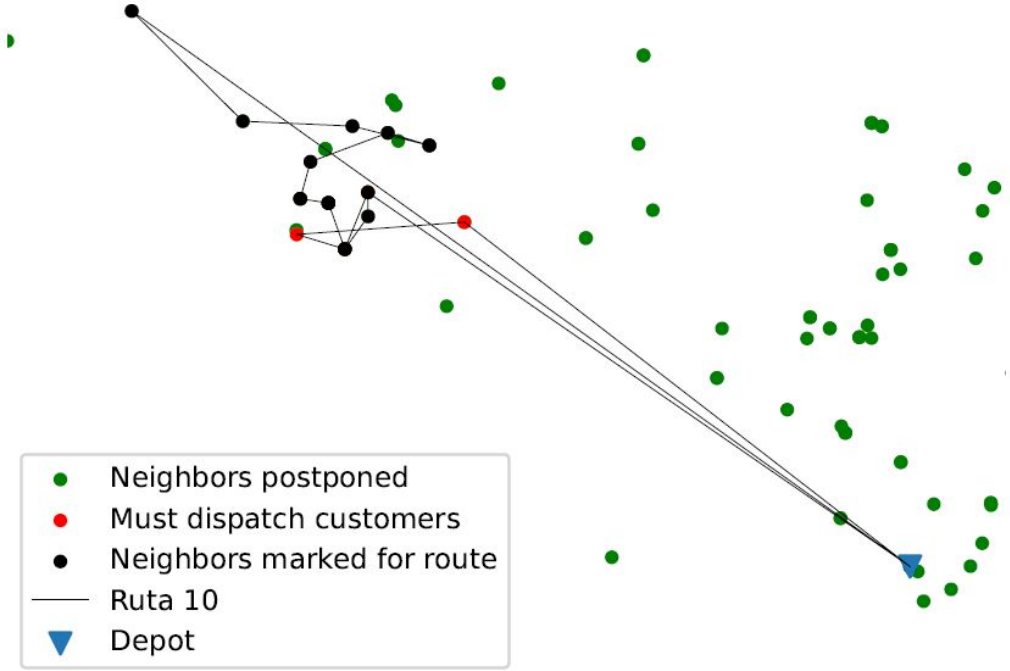


Adding non-obligatory neighbors

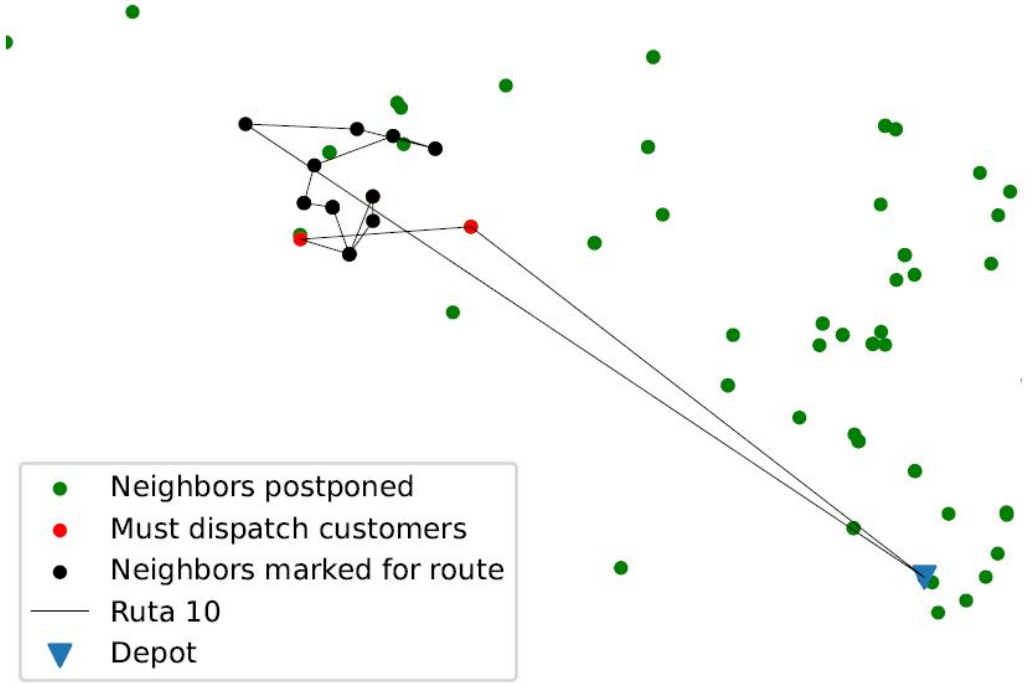
Partial solution routing



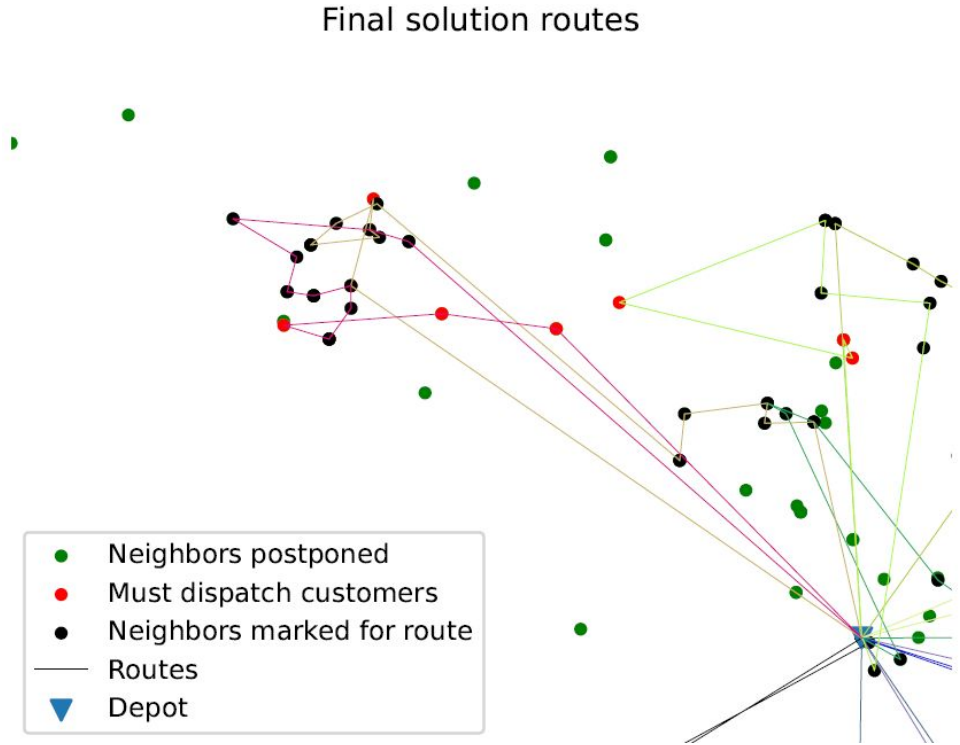
Postponement of neighbors that worsen the solution



Postponement of neighbors that worsen the solution



Routing of final solution



Thanks!

Any questions ?

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