Hybrid Genetic Search for the Dynamic Vehicle Routing Problem

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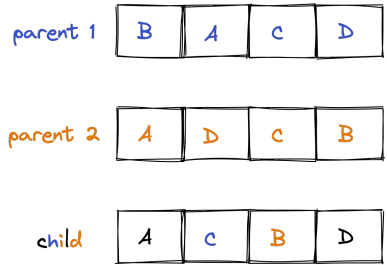
Static Solver

- Starting point: static baseline.
- New crossover operator HGreX [1]
  - Choose random node.
  - Choose best (unassigned) outgoing arc.
  - If all arcs assigned, choose random unassigned.



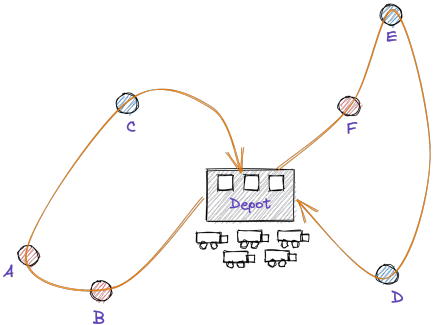
[1] K. Puljić and R. Manger (Nov. 2013). "Comparison of Eight Evolutionary Crossover Operators for the Vehicle Routing Problem". In: *Mathematical Communications* 18

Dynamic Solver

Goal: Adapt HGS for the dynamic variant.

Adapting HGS: Solution Representation

Giant-tour representation



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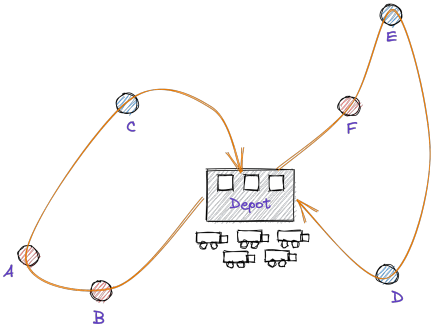

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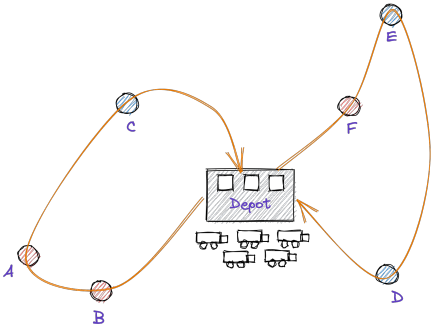
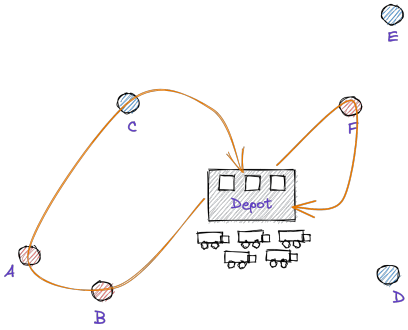
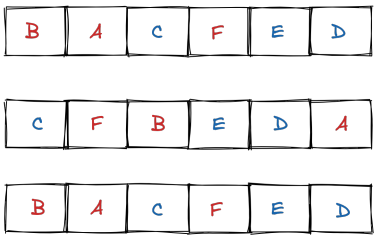


Allow “partial“ solutions



Adapting HGS: Initial Population

Random Solutions



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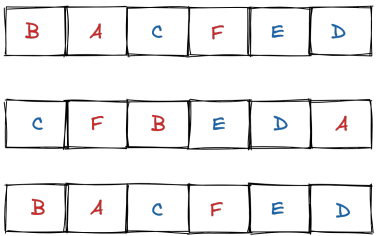

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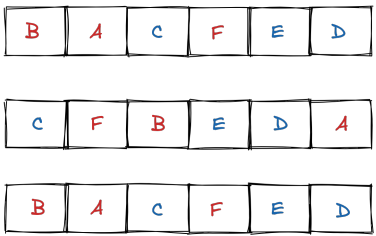
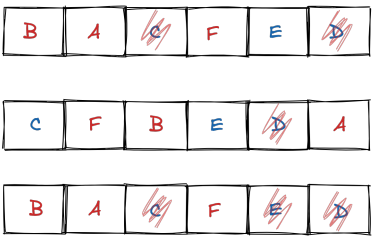
Random Solutions



Delete some optional nodes



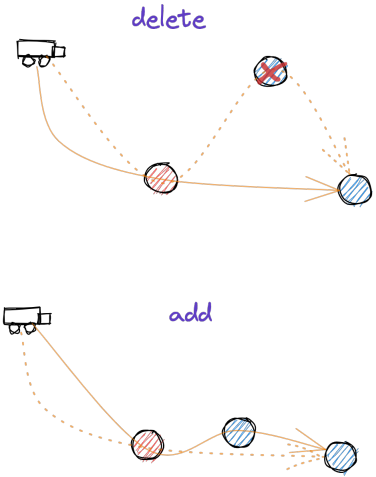
Adapting HGS: Fitness

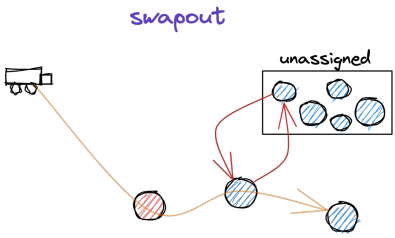
- Feasibility → Penalize missing must-go nodes.
- Comparability → Normalize by the number of nodes visited.
- Future flexibility → Lateness measure.

$$\begin{aligned} \textit{penalized cost} = {} & \textit{total distance} \\ & + \textit{total time warp} \\ & + \textit{total capacity violation} \\ & + \textit{no. of missed must dispatched nodes} \\ & + \textit{latest times of arrival} \end{aligned}$$

$$\textit{normalized penalized cost} = \frac{\textit{penalized cost}}{\textit{no. of nodes in solution}}$$

Adapting HGS: New Local Search Operators





Any Questions?

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