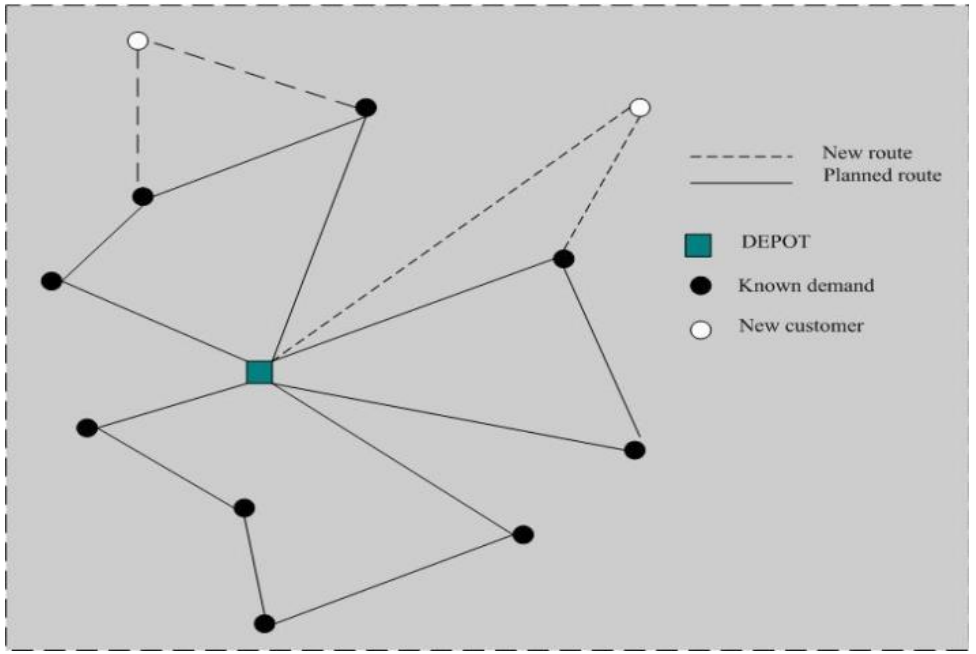
Dynamic pickup and delivery problem survey



Reference

[1] Berbeglia, Gerardo, Jean-François Cordeau, and Gilbert Laporte. "Dynamic pickup and delivery problems." European journal of operational research 202.1 (2010): 8-15.
[2] Psaraftis, Harilaos N., Min Wen, and Christos A. Kontovas. "Dynamic vehicle routing problems: Three decades and counting." Networks 67.1 (2016): 3-31.
[3] Gendreau, Michel, et al. "Neighborhood search heuristics for a dynamic vehicle dispatching problem with pick-ups and deliveries." Transportation Research Part C: Emerging Technologies 14.3 (2006): 157-174
[4] Goel, Asvin, and Volker Gruhn. "Large Neighborhood Search for rich VRP with multiple pickup and delivery locations." (2005).
[5] Euchi, Jalel, Adnan Yassine, and Habib Chabchoub. "The dynamic vehicle routing problem: Solution with hybrid metaheuristic approach." Swarm and Evolutionary Computation 21 (2015): 41-53.
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Dynamic pickup and delivery problem survey

Classfication：

- many-to-many（any vertex can serve as a source or as a destination for any commodity）
- one-to-many-to-one（eg. milk run）
- one-to-one(every commodity has a origin-destination pair)

Dynamic pickup and delivery problem survey

Objective function：

1、dynamic, such as average per unit time serviced customers, average per unit time cost, average demand rejections per unit time, or similar

2、static, such as route cost, total lateness, route distance

Dynamic pickup and delivery problem survey

Solution method

- Re-optimization

1、restart optimization based the current information (time consuming!!)

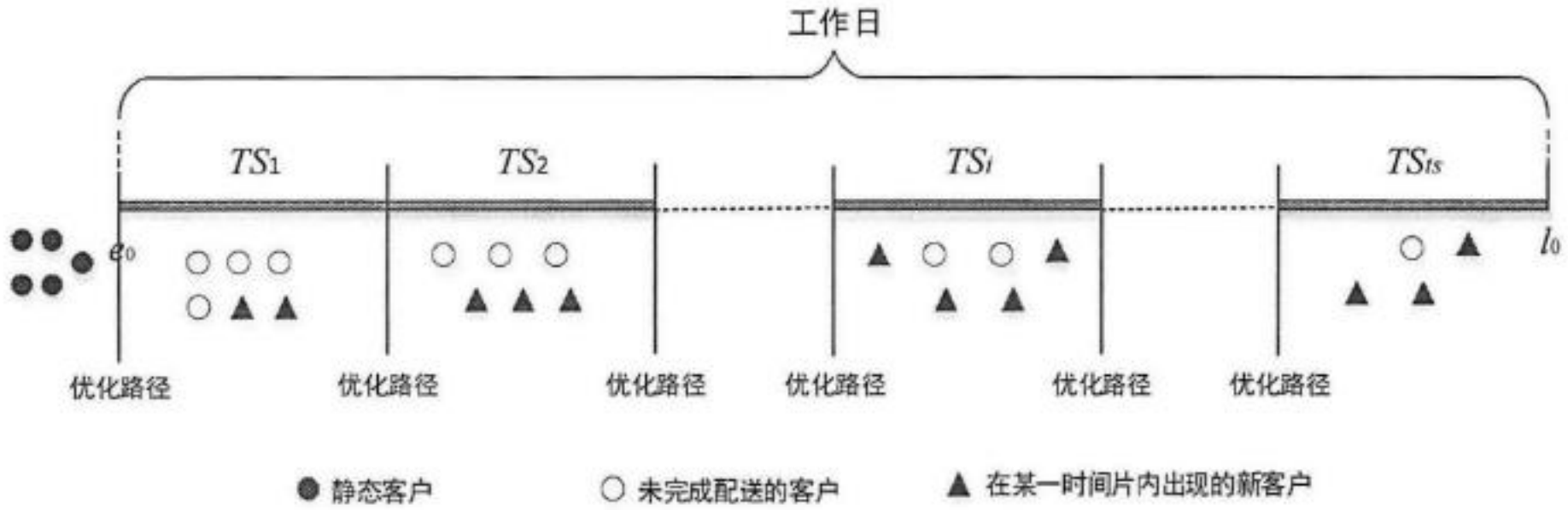
2、optimization based current solution(general, eg, insertion method)

Dynamic pickup and delivery problem survey

Solution method

- Strategy on dynamic request

1、periodic optimization strategy[4,5,6](general method, each time slice represent a static VRP)



Dynamic pickup and delivery problem survey

Solution method

- Strategy on dynamic demand

2、Event-driven optimization strategy[3](events such as new requests or requests cancellations , parallel computation)

1. while "no event" run the optimization procedure;
2. if "event" then
   (a) stop the optimization procedure;
   (b) if the event is "occurrence of a new request" then
      (i) update the solution found by the optimization procedure, as well as all solutions in the adaptive memory, through the insertion of the new request;
      (ii) add the updated solution found by the optimization procedure to the adaptive memory, if indicated;
      (iii) apply a local descent to the best solution in memory;
      otherwise ("end of service at a location")
      (i) add the solution found by the optimization procedure to the adaptive memory, if indicated;
      (ii) identify the driver's next destination, using the best solution stored in the adaptive memory;
      (iii) update all solutions in memory (see below);
   (c) restart the optimization procedure with a new solution generated from the adaptive memory.

Dynamic pickup and delivery problem survey

Operators of local search applied to PDP

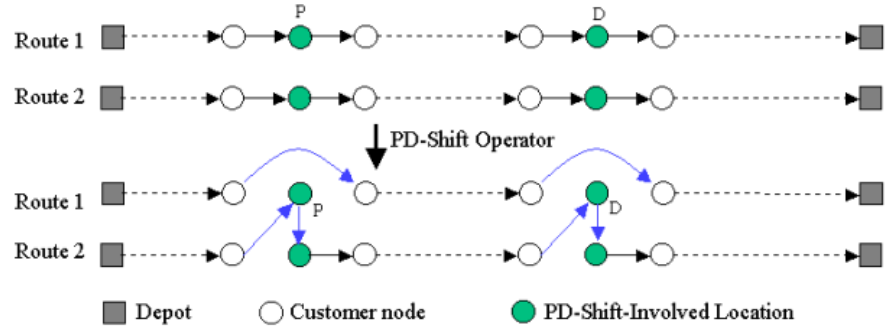


Figure 1. PD-Shift Operator

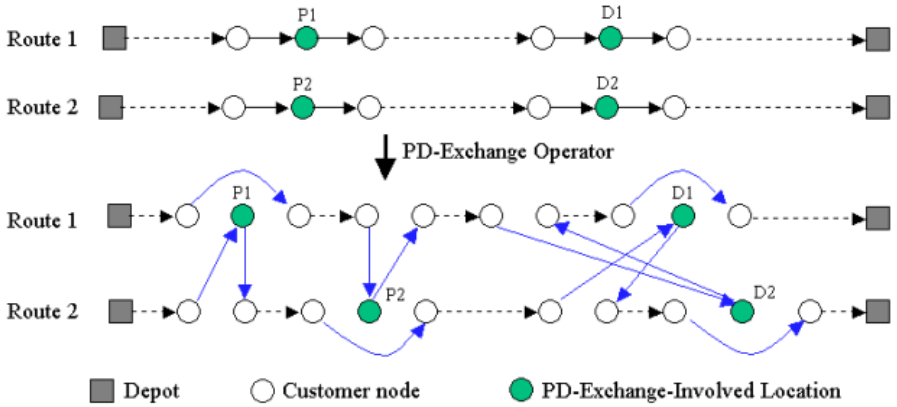


Figure 2. PD-Exchange Operator

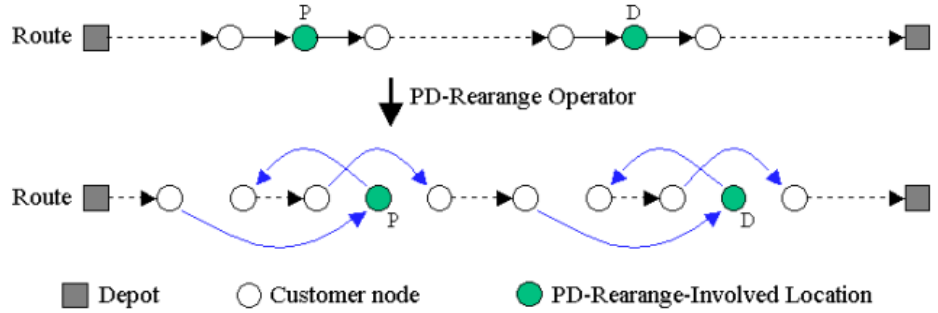


Figure 3. PD-Rearrange Operator

Li, Haibing, and Andrew Lim. "A metaheuristic for the pickup and delivery problem with time windows." International Journal on Artificial Intelligence Tools 12.02 (2003): 173-186.

Dynamic pickup and delivery problem survey

Operators of local search applied to PDP

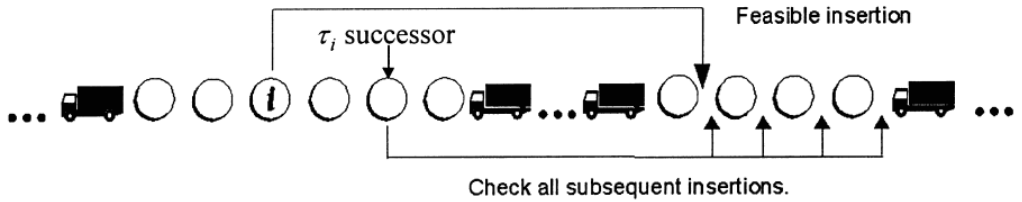


Fig. 1. The SPI neighborhood search.

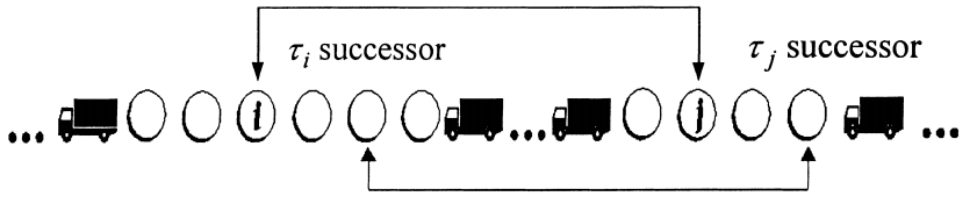


Fig. 2. The Swap pairs neighborhood search.

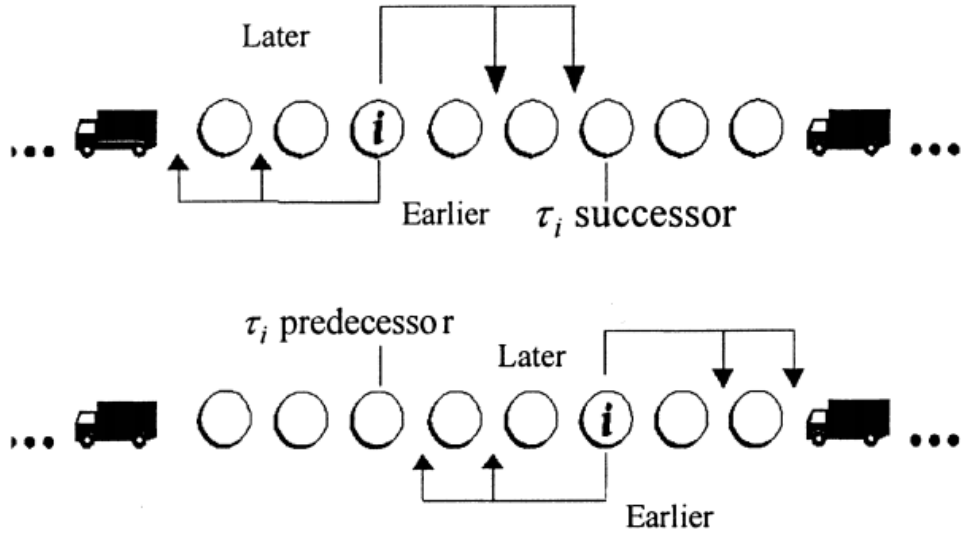
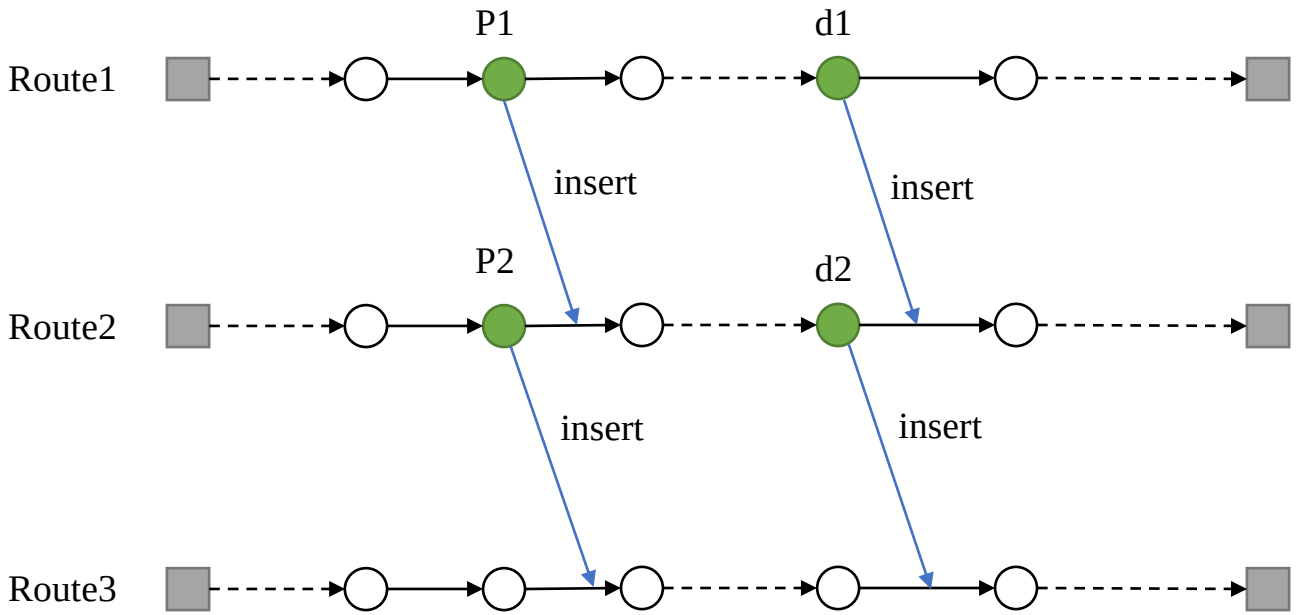


Fig. 3. The WRI neighborhood search.

Nanry, William P., and J. Wesley Barnes. "Solving the pickup and delivery problem with time windows using reactive tabu search." Transportation Research Part B: Methodological 34.2 (2000): 107-121.

Dynamic pickup and delivery problem survey

Operators of local search applied to PDP



Curtois, Timothy, et al. "Large neighbourhood search with adaptive guided ejection search for the pickup and delivery problem with time windows." EURO Journal on Transportation and Logistics 7.2 (2018): 151-192.