Intro to ACO <https://sci-hub.se/https://doi.org/10.1016/j.plrev.2005.10.001>

Probability of choosing a route:

A close up of text

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Calculation of Pheromone:

A black text on a white background

Description automatically generated

Some formulas for CRVP ACO:

* <https://www.researchgate.net/publication/200058853_Ant_Colony_Optimisation_for_vehicle_routing_problems_from_theory_to_applications>
* <https://web2.qatar.cmu.edu/~gdicaro/15382/additional/aco-book.pdf> [Basic about ACO]
* <https://sci-hub.se/https://doi.org/10.1109/MECHATRONIKA.2014.7018311> **[Good, follow this]**
* <https://sci-hub.se/https://doi.org/10.1016/B978-0-12-812707-0.00010-3> [Basic ACO]
* <https://www.slideshare.net/slideshow/ant-colony-system-with-saving-heuristic-for-capacitated-vehicle-routing-problem/173646414#2> [got saving measure]

ACO Best for VRP:

* <https://www.ijert.org/research/solving-vehicle-routing-problem-using-ant-colony-optimization-with-nodal-demand-IJERTV4IS090635.pdf>

Points:

* Ant chooses path based on the probability
* In each iteration, one ant builds a complete solution

Improved saving heuristics:

A math equations and symbols

Description automatically generated with medium confidence

* <https://sci-hub.se/https://doi.org/10.1016/0377-2217(88)90154-3> [Reference above]
* <https://www.slideshare.net/slideshow/ant-colony-system-with-saving-heuristic-for-capacitated-vehicle-routing-problem/173646414#2> [Reference above]

Formula of influence of load:A close-up of a paper

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* <https://sci-hub.se/https://doi.org/10.1007/978-1-4615-5775-3_20> [reference above]
* <https://induraj2020.medium.com/implementation-of-ant-colony-optimization-using-python-solve-traveling-salesman-problem-9c14d3114475> [Useful for implementation idea]

Heterogeneous VRP

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Background of HVRP

A math equations and formulas

Description automatically generated with medium confidence

* State transition rule to allocate the customer to each fleet

A math equations and formulas

Description automatically generated

* Ratio of the capacity of the vehicle type k, and fixed cost
* Shortest distance among all edges between the customer i and customer l who has been assigned to vehicle type k.

Local Pheromone Update for Customer Allocation Stage

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Global Pheromone Update for Customer Allocation Stage

A white text with black text

Description automatically generated with medium confidence

For route construction, use back what we got now. Or you can use the one from the journal below:

* <https://sci-hub.se/http://dx.doi.org/10.1080/10170660609509001>

A close-up of a text

Description automatically generated

<https://www.jstage.jst.go.jp/article/easts/9/0/9_0_631/_pdf>