

Vehicle Routing Version 1.0

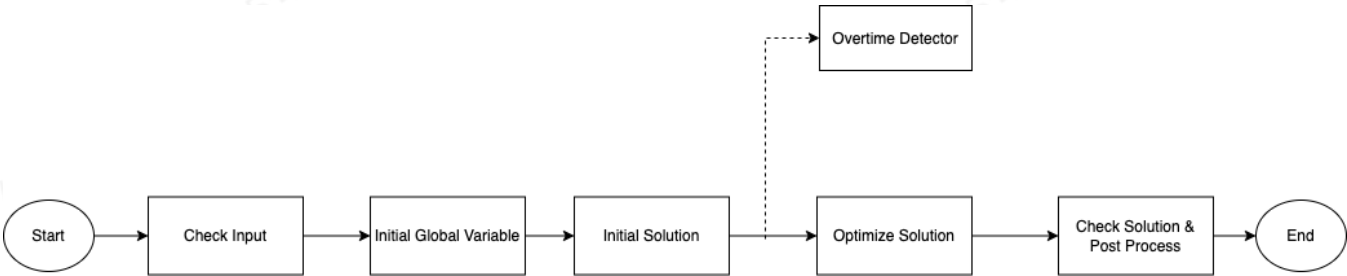
- 1. Scenario
- 2. Routing Solver Framework
- 3. Optimization Part

1、Scenario

Problem: CVRP Problem – Resources with limited carrying capacity need to deliver items at various locations.

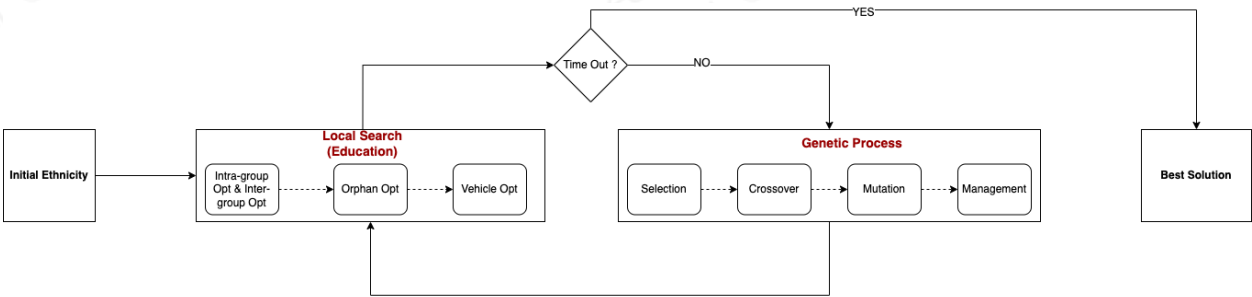
Type	Detail
Global Variable	Necessary Information (Obj, Nodes, CapTasks, CapRes, Cost matrix)
Decision	Sequence, Assignment, Unassigned Tasks
Objective	Minimize Total Distance/ Minimize Total Cost
Constrain	Distance/ Parcel/ Weight/ Duration/ Vehicle Num

2、Routing Solver Framework



Module	Desc
Check Input	Data dimension accuracy
Initial Global Variable	Initial necessary information for problem
Initial Solution	Initial with different parameters and generate different initial solutions, the solution shape can be adjusted by parameters.
Optimize Solution	GA + LS strategy is used to optimize the initial solution entering the iteration through optimization operators, such as inter-group optimization, intra-group optimization, insertion, resource optimization operators.
Check Solution & Post Process	Check final constrain and format.

3、Optimization Part



Route Improvement Phase includes several local-search procedures based on neighborhoods for the VRP.

- Let v be a neighbor of u , and x and y the successors of u in $r(u)$ and v in $r(v)$, respectively. The Route Improvement phase iterates in order (greedy)/ in random order(weighted random), over vertex u and each of its neighbors v , and evaluate the following moves:

Module	Method	Operator Type	Operator	Desc
Local Search	Intra-Group & Inter-Group Opt	Insertions	M1	Remove u and place it after v .
			M2	Remove u and x , then place u and x after v .
			M3	Remove u and x , then place x and u after v .
		Swaps	M4	Swap u and v .
			M5	Swap u and x with v .
			M6	Swap u and x with v and y .
		2-opt	M7	If $r(u) = r(v)$, replace (u, x) and (v, y) by (u, v) and (x, y) .
		2-opt*	M8	If $r(u) \neq r(v)$, replace (u, x) and (v, y) by (u, v) and (x, y) .
			M9	If $r(u) \neq r(v)$, replace (u, x) and (v, y) by (u, y) and (x, v) .
	Orphan Opt	Insertions	-	If orphans, try to search and insert.
	Resource Opt	Insertions	-	Try to search the chance of reducing or replacing resource.
Genetic Process	Selection	-	-	Parent selection is performed through a weighted random from the feasible population, the individual with good performance has a high probability.
	Crossover	-	-	The offspring inherit genetic material from its parents by copying or random insert each segment.
	Mutation	-	-	If $r(u) \neq r(v)$, move segment of $r(u)$ to $r(v)$.
	Management	-	-	Remain the top <i>MaxPopulation</i> individuals.