

Report 7

Large-scale neighborhood search Evolutionary Computation

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Algorithm

As the primary algorithm, I utilized steepest local search starting from a random solution with internal edge exchange without employing candidate moves. During experiments, it was found that with such significant changes to random vertices or edges, candidate moves were not effective, and the results were much worse. Therefore, I decided to stick with the basic local search strategy.

Destroy and repair

In the implementation, we remove 30% of the nodes from the cycle. Then we use the greedy cycle algorithm to replenish the reduced cycle to 100 nodes as initially. Depending on the method, we either repeat the destroy and repair cycle or add an additional local search before it.

Results

The results are obtained by aggregating the total cost of algorithms started from random solutions.

No-ils: the time is the sum of these 200 algorithm runs for a given configuration in seconds. The table presents the previous (not fixed experiments), random_steepest_edges without applying candidate moves and after applying.

ils: the time is the sum of 20 runs of the MSLS algorithm that contains 200 runs of basic local search. The ILS stopping criteria was the time of the average run of MSLS, which was around 45s, so the time of 20 of those runs is strongly correlated to the time of MSLS.

In comparison to multiple starts with 200 repetitions of local search, both adding perturbation or the destroy and repair method doubled the number of local searches (441, 486). This solution (destroy and repair) achieved the best result so far.

main_key	min	max	mean	time
random_greedy_nodes	53256,00	72111,00	61635,20	207,82
random_greedy_edges	71202,00	88144,00	77969,92	133,70
random_steepest_nodes	57938,00	74022,00	63986,65	1866,64
random_steepest_edges	47715,00	65163,00	52822,70	952,11
best_greedy_nodes	50008,00	59918,00	54477,65	420,45
best_greedy_edges	49588,00	59456,00	54431,23	435,60
best_steepest_nodes	49980,00	59544,00	54213,37	589,86
best_steepest_edges	50117,00	59952,00	54524,07	445,73
r_s_e_no_candidate	45782,00	52750,00	48324,61	633,37
r_s_e_candidate	46684,00	53727,00	50063,02	47,33
multiple_start	46271,00	47438,00	46884,00	924,48
perturbation	45454,00	47143,00	46491,20	920,99
repair_and_ls	44449,00	45556,00	45268,15	902,93
repair_without_ls	45901,00	50732,00	48249,85	902,13

Repository link: <https://github.com/Zinath09/EC-course/tree/lab7>