

Combinatorial Optimization

Find algorithm which performs computations in polynomial order for combinatorial polynomial explosions.

Wikipedia https://en.wikipedia.org/wiki/Combinatorial_optimization

Traveling Salesman Problem

For 100 cities, the size of combinations of all possible paths among cities.

99 !

933 262 154 439 441 526 816 992 388 562 667 004 907 159 682 643 816 214 685 929 638 952 175
999 932 299 156 089 414 639 761 565 182 862 536 979 208 272 237 582 511 852 109 168 640 000
000 000 000 000 000 000

polynomial order:

{99², 99¹⁰}

{9801, 90 438 207 500 880 449 001}

Optimization Algorithms

Traveling Salesman Problem Visualization

<https://www.youtube.com/watch?v=SC5CX8drAtU>

- greedy algorithm
- 2-Opt Swap
- Local Search
- Simulating Annealing ex. Simulated Annealing and Sudoku

Boltzmann Distribution

With {newscore = 30, oldscore = 40, T = 200},

$$e^{\frac{-(\text{newscore} - \text{oldscore})}{T}} // N$$

1.05127

Wikipedia https://en.wikipedia.org/wiki/Travelling_salesman_problem

Vehicle routing problem

wikipedia https://en.wikipedia.org/wiki/Vehicle_routing_problem

How to solve Vehicle Routing Problem <https://www.youtube.com/watch?v=OKMssWdC0I0>

Vehicle Routing Optimisation https://www.youtube.com/watch?v=DyS_1rM-6KE

Optimization Algorithms

- Genetic Algorithm (GA) <https://www.youtube.com/watch?v=cEg6m1sTRL4>
- Genetic Algorithm Example
- VRP Optimization Animation for A-n33-k6 <https://www.youtube.com/watch?v=tKCJ9V8tEd4>
- Vehicle Routing Problem Animation (iterated tabu search algorithm)
<https://www.youtube.com/watch?v=rKEVbC9qIYM>

Assignment

There are six VRP variants listed in VRP wiki. Describe what correspond to vertexes, what do to edges, what do to costs, and what do to constraints for each VRP variant.