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DM86 Local Search Methods – Weekly Notes

Week 3, Spring 2006

Lecture February 16

We described solution representations and neighborhoods for the three toy problems. In particular we introduced permutations to represent solutions and neighborhoods. We finally focused on implementation of iterative improvements for Traveling Salesman Problem mentioning speed up techniques.

We then moved to the Search Landscape Analysis. We defined the concept of distance between solutions and gave an overview of results for each of the permutation neighborhood introduced. To review the content of this part we refer to the paper of Schiavinotto and Stuetzle (2005) (see section Literature). We discussed search space properties which have an impact on perturbative search and we defined the concept of search landscape and the typical search landscape positions. We reviewed the analyses that are used to determining the features of the search landscape. These are local minima localization, fitness-distance correlation, autocorrelation function.

Exercises

Exercise 1

Which are the four possible different ways to reconstruct a feasible tour in a 3-edge-exchange once three vertices have been selected?

Exercise 2

Implement a 2-opt iterative improvement for the Traveling Salesman Problem and test it on the instances mentioned in the Exercise 1 of Week 2. In particular, implement the following variants:

- first-improvement
- best-improvement
- least-improvement

For each test instance report the average result out of 30 runs, the average computation time, and the average number of 2-edge-exchanges that occur with the three pivot rules. Use both a random tour and a nearest neighbor heuristic as starting tours and report results in both cases. Compare your results with those of the 2-opt local search implemented by T. Stützle and available with the C package code.