1 Zachariasen-Dam Tabu Search

These results are obtained using the original implementation described in "Tabu Search on the Geometric Traveling Salesman Problem", M. Zachariasen and M. Dam, Meta-heuristics: Theory and Applications (editors I.H. Osman and J.P. Kelly), Kluwer Academic Publishers, Boston, pp. 571-587, 1996 (ftp://ftp.diku.dk/pub/diku/users/martinz/MIC95.ps).

The tabu search algorithm is tested with several move classes such as 2-Opt, Double-Bridge (D-B) and Lin-Kernighan (L-K). In addition, a new move type, the *Flower* move, which generalizes the L-K move, is evaluated. The Flower move is described in the paper; see Figure 2 in the paper for a comparison between the Lin-Kernighan and Flower move.

In order to limit the search in the neighborhood, a so-called variable candidate set is used when selecting the best move in every iteration. The size of this candidate set depends on the search history and on whether the search is in *descending* or *ascending* mode. In descending mode a dive towards a local optimum is performed (which respects the tabu conditions); in ascending mode non-improving moves are accepted. The size of the candidate set is always 200 (or more) neighbors.

In this study we report results for 6 runs, each with different combinations of moves in descending and ascending mode, respectively:

- 2-Opt/2-Opt
- 2-Opt/D-B
- L-K/L-K
- L-K/D-B
- Flower/Flower
- Flower/D-B

All tabu search search parameters were fixed (as reported in the above mentioned paper). As stopping criterion we used the number of visited local optima: for all runs exactly 100 local optima were visited.

It should be noted that the implementation uses kd-trees for performing nearest neighbor and fixed radius searches; however, no pre-computed neighbor lists are generated. The concept of don't-look bits is used. All distances are computed on demand. Finally, the nearest-neighbor heuristic is used to construct the initial tour.

Since the implementation uses kd-trees, no runs were made on si1032 and the random instances with prefix M. Also, due to excessive running times, no runs were made on instances larger than 100,000 cities; for the L-K and Flower runs, random instances with more than 10,000 cities were not considered.