# Walk

Statt 2-opt, 3-opt. 3-opt gives the best results considering runtime (<https://de.wikipedia.org/wiki/K-Opt-Heuristik>) .

Algorithm use the 2-opt heuristic as a local search. However, the authors use a modified version, in which the offset delta, denoting at which distance from the first opened edge the second edge the tour is opened. The delta is calculated as follows:

First a random city k is taken, the outgoing edge from k is the first point where the tour is opened. Then, another random bird j is taken and delta’ is calculated as the difference between the position of the same city k for bird j and the position of the, for the current bird previous city of k, k-1 is taken. If between city k and previous city k-1, in the tour of i, are at are at least two other cities, then the number of cities between city k and k-1 in j is taken as the offset l. Based on the city k, we then jump l cities forward and open the tour at the city k+l. We then connect cities k and k+l.

To the process of finding the right offset through delta’ is done 100 times: Either we find a delta’ that is at least 2 or we select a random offset between 2 and the number of cities -1, to avoid that we open the tour at the same edge, which would equal no change.

Because the probability that we don’t find another bird for which abs(delta’) is 1 or |T|-1, which would mean that “l” would be the exact city before city “j”, on the first try, we decide to remove the loop and only do the local similarity computation one time. If delta turn out to be 0, we, as described in the algorithm, also draw a random integer between 2 and n-1.

This actually improves the results (TopN(0.01) + Fast Density).

As the prior simplification yielded better results, the next logical step is completely removing the similarity computation. This yields similar results (TopN(0.01) + Faster Density) to the prior adjustment, which is why we decide to use our new approach.

We also, instead of the 2-opt approach, test a 3-opt variant for the walk. (Careful, as each birds performs this -> Will increase the computational effort by a large margin!)

(The question is, why this is done. The authors argue is to “account for the local similarity of the bird’s position with another random bird“. However, then don’t explain what practical use this has.)