## SW 14 ##

Ant Colony Optimization in Traveling Sales Person Problem:

$$Pr(X_{ij}) = \begin{cases} \frac{T_{ij}^{\alpha} \cdot n_{ij}^{\beta}}{\sum_{i \in N} T_{ij}^{\alpha} \cdot n_{ij}^{\beta}} & , j \in N \\ 0 & , j \notin N \end{cases}$$

In TSP: $n_{ji} = \frac{1}{d_{ij}}$, where $d_{ij}$ is the distance between cities $i$ and $j$.

$\alpha = 0$, $\beta = 1$ → random greedy algorithm

$\alpha = 1$, $\beta = 0$ → with naive pheromone replacement we obtain a purely random algorithm.

// if $\alpha$ is lower, you do a better exploration of the solution space, if $H$ is higher, you do a better exploit.

The new pheromone level from $i$ to $j$ is computed according to

$$T_{ji}^{new} = (1-p) \cdot T_{ij}^{old} + \Delta T_{ij},$$

where $p \in (0,1)$ is the evaporation factor and $\Delta T_{ij}$ the increase in pheremon level according to the choosen update rule.

$$T_{ij}^{new} = \begin{cases} (1-p) \cdot T_{ij}^{old} + \frac{P}{f(x)}, & \text{if edge } x_{ij} \text{ has been used} \\ (1-p) \cdot T_{ij}^{old}, & \text{else} \end{cases}$$