# Bitonic TSP

Intuition - Scanning from left to right you connect each point to its closest neighbor. As the scan of the graph occurs you pick up a new point and connect it to the vertex closest to the point that is already in the bitonic tour.

If $Z$ represents the cost of the shortest bitonic path from $i$, through all verticies, and $1 \leq i \leq n$, $j > i$ then

$$Z_{i,j} = d(i, i+1) + Z_{i+1,j} \text{ where } j \neq i+1$$

which represents the addition of a new point to the tour, and

$$Z_{i,i+1} = \min_{k>i+1} d(i,k) + Z_{i+1,k}$$

It takes $\mathrm{O}(i)$ to compute $Z_{i,j}$.

Time complexity is $\Theta(\sum_{i=1}^{n} i)$ which is $\Theta(n^2)$.