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Parameters

N -> Holes/Points

C_{ij} -> Manhattan distance between i^{th} and j^{th} points $i \in N$ and $j \in N$

B_{ij} -> : 1 if there is no block on way from point i^{th} point to j^{th} point
: 0 otherwise

Decision Variables

X_{ij} -> : 1 if the head of the drill goes from point i^{th} point to j^{th} point
: 0 otherwise

U_i -> Auxiliary variable for solving sub-tour elimination where $i \in N$

Model

Objective

$$\min \sum_i^N \sum_j^N C_{ij} * X_{ij}$$

s.t.

Constraints

$$\sum_i^N X_{ij} = 1 \quad \forall j \in N$$

$$\sum_j^N X_{ij} = 1 \quad \forall i \in N$$

$$X_{ii} = 0 \quad \forall i \in N$$

$$(Subtour \quad U_i - U_j + (N - 1) * X_{ij} \leq N - 2 \quad \forall i, j \in N$$

Elimination)

(Block $B_{ij} \geq X_{ij}$ $\forall i,j \in N$
Constraint)

Optimal solution is given as 382 units of distance. An example path is given below:

0 -> 13 -> 34 -> 21 -> 10 -> 11 -> 18 -> 3 -> 37 -> 7 -> 8 -> 1 -> 22 -> 16 -> 24 -> 35
-> 23 -> 39 -> 12 -> 30 -> 20 -> 14 -> 28 -> 5 -> 9 -> 43 -> 2 -> 32 -> 38 -> 33 -> 31
-> 45 -> 26 -> 48 -> 36 -> 15 -> 40 -> 6 -> 42 -> 29 -> 41 -> 47 -> 27 -> 4 -> 46 -> 19
-> 44 -> 49 -> 25 -> 17 -> 0

The example path is given below as a plot.

