Base model

Variables

x_{id}: [binary] equal to 1 if the traveller is in city i on day d.
y_i: [binary] equal to 1 if the traveller ever visits city i.
m_{ijd}: [binary] equal to 1 if the traveller moves from city i to city j on day d.

Parameters

D: the total number of days.
$\mathcal{C}$: the set of cities available for visiting.
μ_{ij}: the cost to move from city i to city j.
δ_i: the daily cost of city i.
α: the minimum number of days allowed in a city.
ω: the maximum number of days allowed in a city.

$$\text{Min} \sum_{d=1}^{D} \sum_{i \in \mathcal{C}} \delta_i \cdot x_{id} + \sum_{d=1}^{D-1} \sum_{i \in \mathcal{C}} \sum_{j \in \mathcal{C}} \mu_{ij} \cdot m_{ijd}$$

$$\begin{aligned}
\text{s.t.} \quad & \sum_{d=1}^{D} x_{id} \geq \alpha \cdot y_i && \forall i \in \mathcal{C} && (1) \\
& \sum_{d=1}^{D} x_{id} \leq \omega \cdot y_i && \forall i \in \mathcal{C} && (2) \\
& x_{id} + x_{j(d+1)} \leq 1 + m_{ijd} && \forall i, j \in \mathcal{C}, d = 1..D-1 && (3) \\
& \sum_{i \in \mathcal{C}} x_{id} = 1 && d = 1..D && (4) \\
& \sum_{i \in \mathcal{C}} \sum_{j \in \mathcal{C}} m_{ijd} = 1 && d = 1..D-1 && (5) \\
& \sum_{d=1}^{D} \sum_{j \in \mathcal{C}} m_{ijd} \leq 1 + \sum_{d=1}^{D} m_{iid} && \forall i \in \mathcal{C} && (6) \\
& x_{j1} + \sum_{d=1}^{D} \sum_{i \in \mathcal{C}} m_{ijd} \leq 1 + \sum_{d=1}^{D} m_{jjd} && \forall j \in \mathcal{C} && (7) \\
& x_{id}, y_i, m_{ijd} \in \{0, 1\} && \forall i, j \in \mathcal{C}, d = 1..D && (8)
\end{aligned}$$