Let A_1,A_2,...,A_n be airports, and let A_0 denote the air.

Let B_1,...,B_m represent airplanes, and C_1,...,C_p represent passenger transportation needs.

1 Encoding airplane flights

Let the binary variable P_{t_1,A_j,B_k} encode in 0-1 values (1-true, 0-false) whether airplane B_k is at state A_j at time t_1. More precisely, if j=0, then the airplane is in the air; if $j\in\{1,...,n\}$, it is at airport A_j.

The condition $\sum_j^{\{0,...,n\}} P_{t_1,A_j,B_k}=1$ for each time point $t_1\in\{0,...\}$ and airplane number $k\in\{1,...,m\}$ ensures that each airplane is in only one state at each time.

Let $d(a_1,a_2)$ represent the time required for a flight from airport A_{a_1} to A_{a_2}, where $a_1,a_2\in\{1,...,n\},a_1\neq a_2$ (for $a_1=a_2$, we assume 0). We have noted that the distance (time in minutes) between airports does not need to be the same in both directions.

The condition $P_{t_1,A_i,B_k}\cdot P_{t_2,Aj,B_k}=0$ for $|t_1-t_2|<d(i,j)$, where $t_1,t_2\in\{0,...\}$ and $k\in\{1,...,m\}$ and $i,j\in\{1,...,n\},i\neq j$, ensures that the time between the airplane's presence at two airports is greater than or equal to the minimum possible travel time.

2 Encoding passengers

Let L_{C_r,t_1,A_j,B_k} be a binary variable that encodes by 1 the situation where passenger C_r, where $r\in\{1,...,p\}$ is at time $t_1\in\{0,...\}$ in state A_j, $j\in\{0,1,...,n\}$ and in airplane B_k, where $k\in\{1,....,m\}$.

Let A_{x_r} denote the destination airport of the r-th passenger. Additionally, we add the airplane B_{m+1}, which "stands" at every airport A_j, meaning $P_{t_1,A_j,B_{m+1}}=1$ for $j\in\{1,...,n\}$ and $P_{t_1,A_0,B_{m+1}}=0$ for every $t_1\in\{0,...\}$. Furthermore, we assume $L_{C_r,t_1,A_0,B_{m+1}}=0$ for each C_r and t_1.

We impose the condition $\sum_{j,k} L_{C_{r,t_1,A_j,B_k}}=1$ for each t_1,C_r.

We maximize the sum of the following expressions:

(1) $\sum_k \sum_j^{\{0,1,...,n\}} L_{C_r,t_1,A_j,B_k} P_{t_1,A_j,B_k}$ - the passenger is where the airplane is.

(2) $\sum_k \sum_j^{\{0\}\cup\{1,...,n\}} L_{C_r,t_1,A_0,B_k} L_{C_r,t_1+1,A_j,B_k}$ - if the passenger is in the air in a given airplane, then in the next moment, they are also in the same airplane.

(3) $\sum_{u,k} \sum_j^{\{1,...,n\}\setminus\{x_r\}} L_{C_r,t_1,A_j,B_u} L_{C_r,t_1+1,A_j,B_k}$ - the passenger at a given airport can change airplanes, unless they are at the destination airport.

(4) $\sum_u \sum_j^{\{1,...,n\}\setminus\{x_r\}} L_{C_r,t_1,A_j,B_u} L_{C_r,t_1+1,A_0,B_u}$ - the passenger follows the departing airplane, unless they have already arrived at their destination.

(5) $\sum_{u,k} L_{C_r,t_1,A_{x_r},B_u} L_{C_r,t_1+1,A_{x_r},B_k}$ - the passenger remains at the destination airport.

Regarding the above constraints:

(1) is always equal to 1 for each C_r,t_1

(2)+(3)+(4)+(5) is always equal to 1 for each C_r,t_1