Topic → Robust Scheduling for the Bay and Gate Assignment

Bay: Parking stand of the aircraft

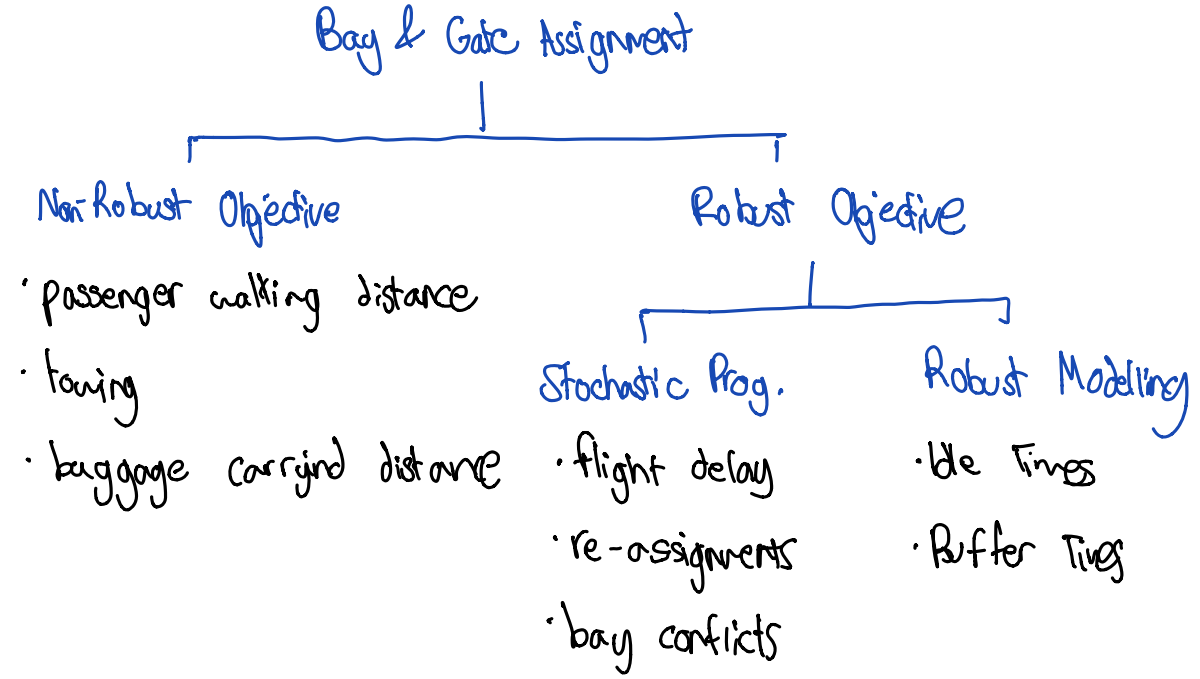
Gate: Position where passengers board the plane

Sensitivity analysed for various delay cases

Four optimization objectives:

1. Minimization of aircraft repositioning
2. Maximization of airline preferences
3. Maximization of passenger transport distance
4. Maximizing the robustness of the schedule

Static Model vs. Stochastic Model



Optimization Methods: Primal-Dual Simplex, LD Relaxation & Branch and Bound

Stakeholders: Passengers, Airlines, Airport / Ground Personnel

Specific Airport Gate Constraints

Bay Assignment → Gate Assignment

- reduce index of control variables
- extra terms in objective value

Bay Model

Objective Function (JKIA Oriented)

1. Min: Passenger Walking Distance ⇒ (Departure & Arrival)

$$z1 = \sum_{i=0}^{i_{MAX}} \sum_{k=1}^{k_{max}} P_i \times x_{i,k} \times D_{term,k}$$

2. Airline Preferences

$$z2 = \sum_{i=0}^{i_{MAX}} \sum_{k=1}^{k_{MAX}} x_{i,k} \times PREF_{i,k}$$

3. Penalty Value for Aircraft Repositioning

$$z4 = \alpha z1 + \beta z_2 + (u+v+w) \cdot \gamma \cdot z_3$$

Preference: $2 > 3 > 1$

Decision Variables: Binary $x_{i,j}$ (i = Flight, j = Bay)

Constraints

Single time-slot constraint (one flight per bay)

$$x_{i,k} + x_{j,k} \leq 1$$

Bay Compliance Constraint

$$BC(i) = \sum_{k=0}^{k_{max}} x_{i,k} = 1 \quad \forall i,k$$

Single Bay per Aircraft Constraint

Prevent Double Scheduling Flights

Long Stay Flights are separated into (Arrival, Parking, Departure)

$$SB(i) = \sum_{k=0}^{k_{max}} x_{i,k} = 1 \quad \forall i$$

Fuelling Constraint

Only for departing flights

Non-Dosmetic or "Full" Domestic : $F(i) : \sum_{k}^{k_{max}} x_{i,k} = 1$

Long Stay Domestic : $F(i) : \sum_{k}^{k_{max}} x_{i,k} + \sum_{k}^{k_{max}} x_{i-1,k} \geq 1$