Improving Air Transportation Performance through Collaborative Decision Making

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Collaborative Decision-Making

- Instead of an assignment of flights to slots, the CDM philosophy considers the allocation of capacity to be an allocation of slots to airlines.
- The Ration by Schedule algorithm generates an initial allocation of slots to airlines, based on the recognition that airlines (rather than the actual flights) have claims on the arrival capacity through the original flight schedules.
- Once arrival slots have been allocated, the RBS (Rationing by Schedule) algorithm performs schedule updates by an inter-airline slot exchange, which aims to provide airlines with an incentive to report cancellations and delays.

Modeling Uncertainty

- It outputs the aggregate number of flights that should be assigned CTAs for each hour.
- This allows for the individual flight CTA assignments to be done through a CDM technique.
- The constraint matrix of the IP is totally unimodular.

Modeling Equity

Charles Glover, Robert Hoffman, Thomas Vossen

RBS Equitable?

- RBS closely relates to well-established equitable allocation concepts:
  - RBS heuristically minimizes the vector giving the distribution of flight delays.
  - Also, for any flight ki, the only way to decrease the amount of delay it receives from RBS is to increase the amount of delay given to another flight kj, by a value greater than the amount of delay that ki receives.

Consider:

- Flights departing from outside the circle are exempt from delay.
- Flights originating further from the GDP airport must serve their ground delay several hours in advance.
- Overall delays can be reduced, based on new arrival weather forecasts.

Ration-by-Distance (RBD)

For each slot in order of increasing slot time:

- Calculations for flights that have not yet been assigned, choose flight with longest distance time from destination airport.
- RBD minimizes total expected delay.

Theorem: The (integer) output of the RBD Algorithm is an optimal solution to the LP relaxation of this formulation.