1. The costs of allocating owned and long term leased aircraft to mission categories.

Minimize:

Stage 1

Modeling Approach

- Coarse Grained Computations
  - Desired time to solution is typically fixed
  - Form fundamental grain of computation
  - LPs are delegated to numeric library

- Linear Programs cannot be broken down trivially
- Need to evaluate multiple independent scenarios

Coarse Grained Computations

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- Need to evaluate multiple independent scenarios

Problem Context

- Task: Allocate aircraft to cargo and crew delivery missions.
- Target: Minimize operating costs in the face of uncertain demands.

The US air fleet is responsible for moving cargo all over the world, often in the face of natural disasters, conflict, etc. The penalty for late or missed deliveries is very expensive. The objective is to minimize operating costs by assigning aircraft and personnel to different cargo delivery missions while allowing flexibility to respond to sudden events like natural disasters, conflict, etc.

Task:

Minimize operating costs

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Task:

Minimize operating costs

Two Stage Stochastic Program

- Stage 2: If stage 1 solution is feasible, then solve LP
- If not, then run EM

Objective Functions

Minimize:

1. The costs of allocating owned and long term leased aircraft to mission categories.
2. The expected costs of storing aircraft, leasing aircraft, operating and fuel and related expenses (stage 2).

Two Stage Stochastic Program

- Stage 1: Determine the allocation of owned and long term leased aircraft to mission categories.
- Stage 2: Based on the stage 1 solution, determine the allocation of personnel and cargo to different cargo delivery missions.

Stage 1

- Coarse Grained Computations
  - Form fundamental grain of computation
  - LPs are delegated to numeric library

Stage 2

- Linear Programs cannot be broken down trivially
- Need to evaluate multiple independent scenarios

Solving the resulting Stochastic Program

(Method's Method)

Stage 1: Solve as linear program with branching on fractional variables. Keep stage 1 variables must be integers. Large solve times for stage 1 IP prohibits large solve times for stage 2. Stage 2 variables can be relaxed in later stage.

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