

Airport Demand/ Capacity Model

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FAA/MOIE

The logo for the MITRE Technology Program, featuring a stylized graphic of stacked blocks in yellow, orange, and blue to the left of the text.

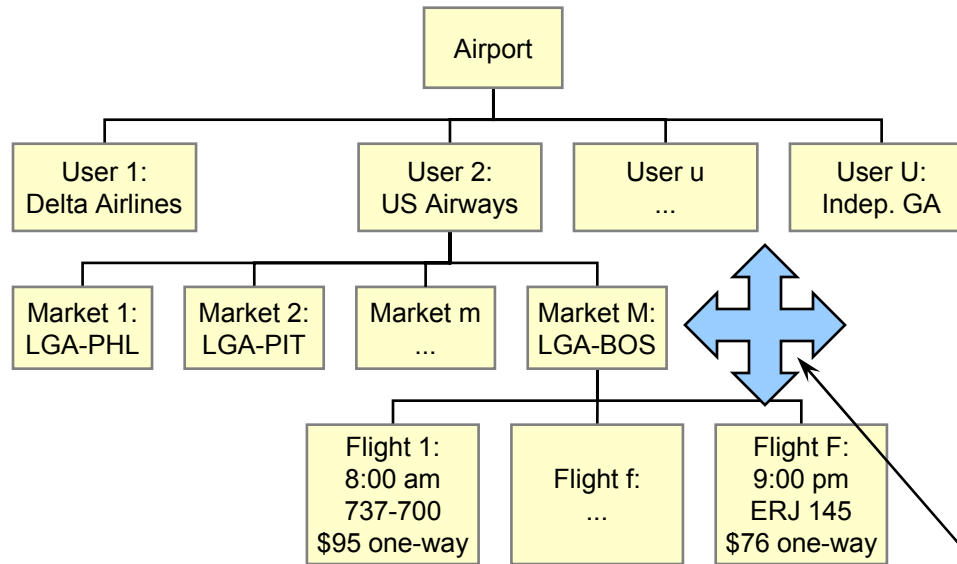
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Problem

- **At many large airports, demand far exceeds capacity, resulting in costly delays and unpredictable operations. The FAA is examining new policies for allocating limited airport capacity.**
- **How can the FAA be sure that a new resource allocation policy will have the intended effects without substantial side effects?**
- **To date, solutions to this problem have been either too generalized for policy decisions or too simplistic in their assumptions.**

Background

Hierarchy of Decision-Making



Vertical & Horizontal Interdependencies

An airport sets resource allocation policy affecting all potential users.

Each user makes decisions affecting all other users and its own markets.

Market-level decisions affect the number of connecting passengers and minimum patterns of service.

Segment-level decisions satisfy passenger demand for transportation, but in turn create demand for airport capacity at different times of day.

Multiple feedback loops and autonomous decision makers point to *Agent-based Modeling*.

Decisions by one “individual” affect others on the same level, as well as others on different levels of the hierarchy.

Objective

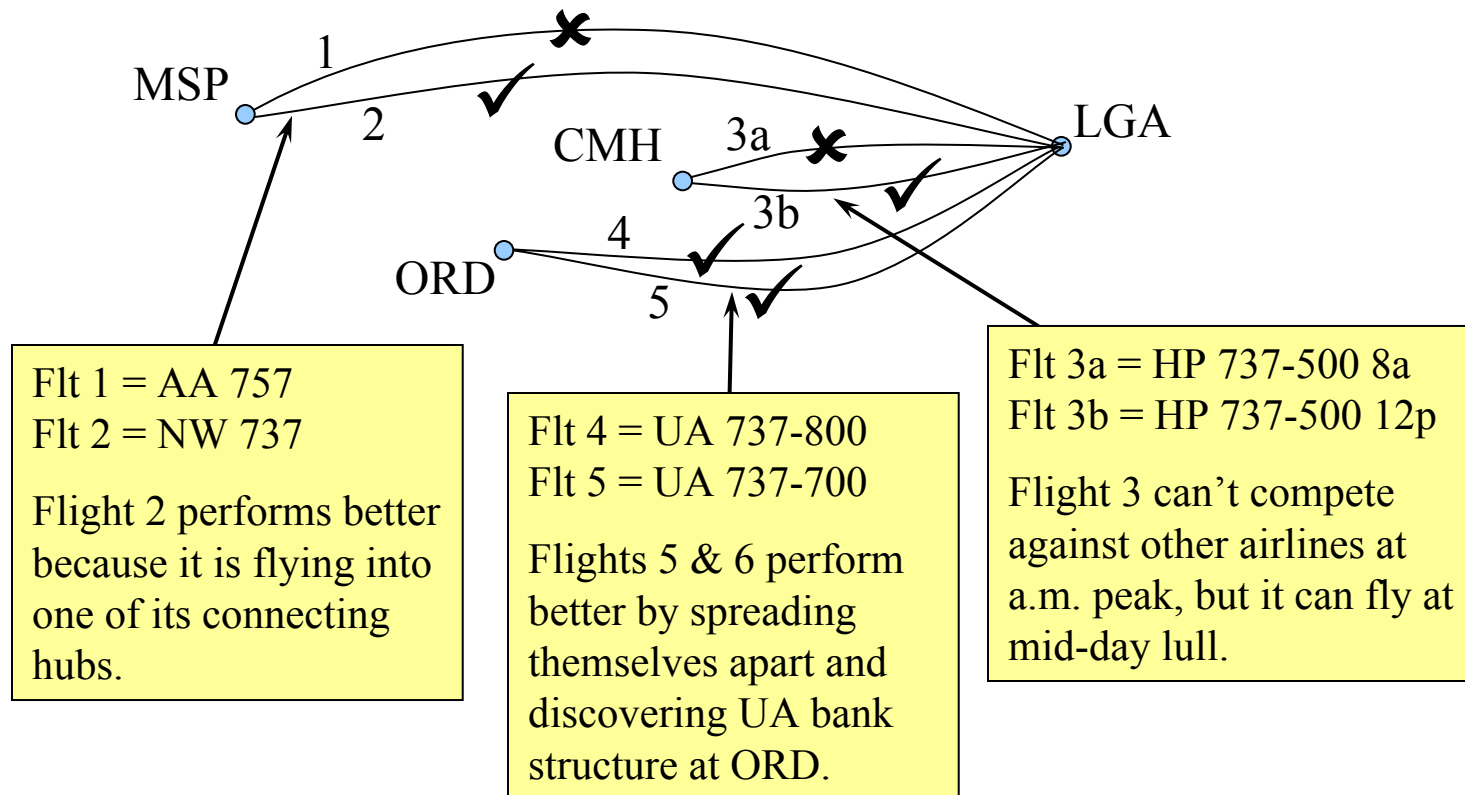
- Develop new methodology for operational analysis of airport policy changes that **incorporates responses from all key users** based on their private motivations (usually profit), subject to their individual operational and structural constraints
- Build a model that **predicts changes** in demand patterns *internally*, rather than requiring analysts to assume arbitrary changes *externally*, and thereby provide an opportunity for **novel solutions**

Activities

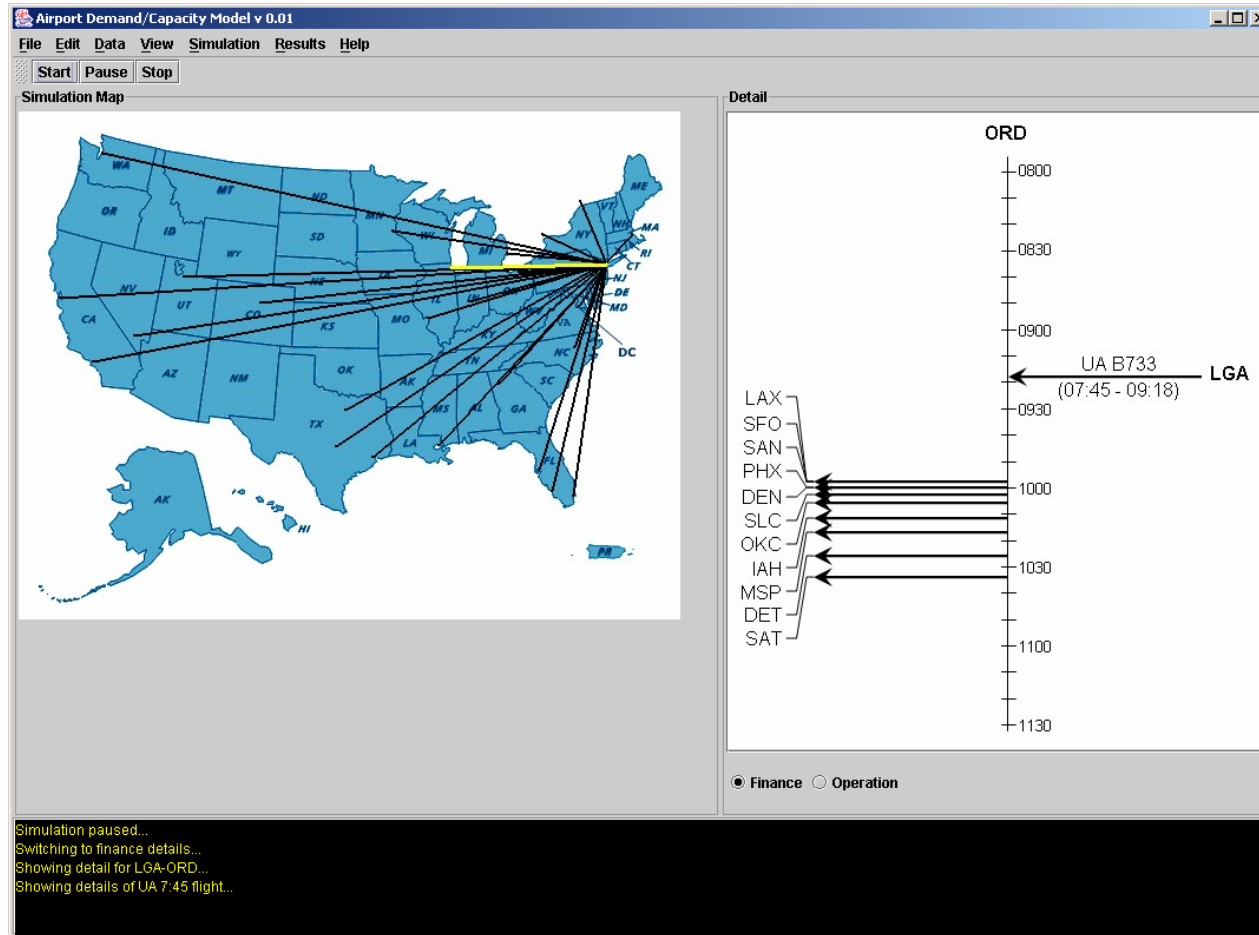
- **Building agent-based model of airport airside environment**
- **Developing state-of-the-art machine learning models for autonomous agents**
- **Conducting operational analyses of airport pricing policies for New York, LaGuardia and Chicago, O'Hare airports**
- **Building Java[®]-based graphical user interface to facilitate remote operation and interactive analysis via the World Wide Web**

Highlight

■ Agents learn good strategies over time



Demonstration



Impacts

- **Relevant knowledge capture and dissemination**
- **Customer operational mission**
- **Developing work program**
- **Academic/R&D community**

Future Plans

- Modular agent-based models that can be used individually or in a network of models depending on the question to be answered

