Modelling and Understanding Airport Operations
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Key aims: Understanding and Modelling the Real Airport Operations
Understand the real systems, bridging the gap between the simplified academic models of the past and the real problems at the airports. Develop the underlying theory for the real problems, adapting existing theory as appropriate.

Using projects to develop integrated simulation and optimisation algorithms to take into account the real constraints upon arrival and departure runway sequencing, ground movement, stand allocation, and the associated resource allocation for stand operations.

Arrival Scheduling (2009-)
Aim: Obtain good, easily achievable landing sequences
Objectives:
- Reduce overall delay, inequality and missed time-slots
Constraints:
- Sequence dependent landing separations
- Landing time windows
- Limitations of stacks
- Cost to take from other than bottom
- Incoming flight paths
- Interaction between arriving flights
- And other flights?
- Use Standard flight paths or not?

Ground Movement (2009-)
Aim: Reduce environment effect of airports by considering ground movement
Objectives:
- Route aircraft around an airport
- Sequence aircraft at points of contention
- Improve taxi time predictions
- Reduce fuel burn
Constraints:
- Taxiway structure limits movement
- Minimum inter-aircraft separations are required
- Time-windows for source and destination

Stand Operations (2009-)
Aim: Model the operations which occur at the stands in order to improve completion time predictions and improve operational efficiency
Problem structures:
- Similar to stand allocation and production or project scheduling problems
- With additional problem-specific constraints
Examples:
- Baggage sorting station allocation
- Reuse sorting stations for destinations
- Pushback tug allocation
- Limit bug travel-distances between stands
- Stand allocation to reduce fuel burn during pushback or startup
- Stand allocation to avoid congestion at stands
Constraints:
- Stand allocation restrictions for airlines or aircraft size/type
- Shadowing constraints upon nearby stand occupancy
- Inter-stand pushback or arrival time constraints – scarce taxiway resources

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