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Description of Research Seminar:  
Aircraft Stand Allocation with  
Associated Resource Scheduling

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Participants: UGOE  
UNIKL  
DTU  
UOA  
UC

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# Research Seminar

offered by Tor Fog Justesen (DTU)

in February 2012,

in Auckland, New Zealand

Subject: Aircraft Stand Allocation with Associated Resource Scheduling

Abstract: When a passenger aircraft has landed in an airport, it typically taxis directly from the runway to a pre-allocated aircraft stand (a parking area for an aircraft). Once the aircraft has parked, the arrival process is started (passenger deplaning, unloading of baggage/cargo, cleaning). After the arrival process, the aircraft might be idle for a while before the departure process is started (fueling, loading of baggage/cargo, catering, passenger boarding). When the aircraft is ready to leave the airport again, a push back tractor pushes the aircraft back from its stand to a startup mark where the aircraft then starts up its engines. Finally, the aircraft taxis out to the runway to take-off.

Handling an aircraft turnaround is complicated because it requires many different resources. From the time from the aircraft lands at an airport until it departs again different ground handling resources are required at different times; during taxiing in and out the aircraft requires a free taxiway between the apron and the runways, while parked it requires an available aircraft stand, during the arrival and departure it requires available gates and gate facilities as well as equipment for handling unloading/loading of baggage/cargo, during push back it requires a push back tractor, etc. Each resource can be claimed by at most one turnaround at a time and in most airports, all of these ground handling resources are scarce.

It is typically either very expensive or sometimes even impossible to add ground handling resources, thus it is crucial for an airport that the usage of the available ground handling resources is optimized. In this

project we develop a set partitioning model formulation of the Aircraft Stand Allocation Problem with Associated Resource Scheduling and we develop an optimization based solution algorithm in which "practical infeasibility" and knowledge about the structure of the problem is exploited to generate good feasible solutions.

The idea of the solution approach is to add a null column with a dominating cost (artificial variable) to the limited set of perfect columns, i.e. columns that are known to be considered good by both the airlines and the airport, and then solve the LP relaxation of the problem using a standard LP solver. If for a given turnaround the null column is chosen, a tailored column generator analyses the "infeasibility" and intelligently adds more columns for the non-allocated turnaround as well as for the turnarounds preventing it from being allocated and the problem is re-solved. By solving the LP relaxation of the problem we are guaranteed of finding a feasible solution if one exists and by exploring the "infeasibility" and using the tailored column generator, we are sure that only columns which are considered good are in the model as well as the number of variables in the model is kept small. Fractionality is handled by branching, however the structure of the model has strong integer properties and it is therefore likely that the LP solutions generated are in fact integer solutions (work in progress).

Participants: Students and researchers from Department of Engineering Science, The University of Auckland.

Publication: Nothing published yet.