Fakultät für Wirtschaftswissenschaften

Technische Universität München

The **Chair of Operations Management** of **TUM School of Management** is looking for an interested and qualified student to conduct his/her

Master's Thesis

on the topic

A Novel Approach to Airport Runway Capacity Management

Description:

Runway capacity is one of the main bottlenecks at major airports. Efficient runway capacity management (RCM) enables airports to serve more aircrafts with the resources already existing. In times of growing air traffic this is an essential factor to keep pace with competitors. Current practice at many airports is to schedule aircrafts on a first come first serve basis which is often very far from optimal. Numerous approaches have been developed to generate better schedules. However, so far there is no algorithm that can generate optimal solutions in tenable time.
The problem of assigning starting and landing aircrafts to runways can be seen as a variant of the Constrained Shortest Path Problem (CSP). Generally CSPs are solved by Dynamic Programming which was already applied to RCM. Another very recent and promising approach to solve the CSP is the so called Pulse Algorithm which was developed by Lozano and Medaglia (2013).
Their idea is to perform a cunning depth first search that employs pruning strategies such that only a subset of the solution space has to be searched.
The aim of this thesis is to adapt the idea of the Pulse Algorithm to RCM, implement the algorithm (preferable Java) and compare the new algorithm to existing approaches. Depending on the results there will be the possibility to publish this work in an international scientific journal.

Scope of work:

- Literature review to gain knowledge about RCM and approaches to solve it.
- Development of a Pulse-based algorithm for RCM.
- Implementation of the algorithm in an object oriented programming language.
- Evaluation of the applicability of the algorithm using benchmark instances and real-world data.

Prerequisites:

The student must have knowledge in mathematical modeling and in an object orientated programming language (preferable Java).

Begin: as soon as possible

Supervisor: Dipl.-Inf. Ferdinand Kiermaier (Ferdinand.Kiermaier@wi.tum.de)

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Literature:

Farhadi, F.; Ghoniem, A.; Al-Salem, M. (2014) Runway Capacity Management – An Empirical Study with Application to Doha International Airport. *Transportation Research Part E.* **68**, 53-63.

Lozano, L.; Medaglia, A. L. (2013) On an Exact Method for the Constrained Shortest Path Problem. *Computers & Operations Research*, **40**, 378-384.

Any interested student, please send by email your application together with your curriculum vitae and transcripts of records.