Master Thesis:

Solving Conflicts in the Air Traffic Flow Management with Genetic Algorithms

Task-Description:

The European airspace is one of the most congested airspaces in the world. Subsequently, there are many potential conflicts between planned trajectories. Potential conflicts could be prevented by adaptions to the flight scheduling. In this context of Air Traffic Flow Management, schedules must observe network capacity constraints. The conflict cost function is nonlinear; hence conventional solvers take a long time to find solutions for scenarios with full days of continental traffic. In this work, a Genetic Algorithm should be applied to solve the conflicts more efficiently. The Institute of Air Transportation Systems provides a research model for the European ATFM, the Network Flow Environment (NFE). The NFE contains network capacity constraints and all planned trajectories for each day. The Genetic Algorithm has to be customized to exploit the problem structure of the deconfliction in ATFM to enable an efficient solution process. Following tasks should be worked on:

- Become acquainted with the Network Flow Environment (NFE)
- Choose a suitable Genetic Algorithm framework (e.g. EO, Matlab, HL, DEAP, …)
- Design Fitness Function, Genetic Operators and Selection Strategies for solving-efficiency
- Integration and Implementation of a customized Genetic Algorithm
- Evaluate the performance for deconfliction the European Air Traffic Flow Management
- Discussion and documentation

Requirements:

- Studies in Engineering / Computer Science / Applied Mathematics / Logistics / Etc.
- Motivation and ability to work independently and collaboratively
- High working knowledge of English or German
- Interest for Optimization and Genetic Algorithms
- Good programming skills (e.g. C/C++, Matlab, Python or Java)
- Accurate and reliable working style

Begin and duration:

From now on, for approximately 6 month.

Contact:

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