ILT
Institut für
Lufttransportsysteme

TUHH
Hamburg University of Technology

Master Thesis/ Project Arbeit:

Estimate the theoretical potential of reducing CO_2 emissions by introducing Intermediate Stop Operations (ISO) and reducing flight frequency

Description:

Airlines offer long-haul flights and high frequencies of flights with aircraft designed for much longer ranges to improve customer choice and increase market shares. Among other things, this goes at the expense of increased fuel use and consequently, CO_2 emissions. This leads to the question as to what extent range-optimised aircraft and fuel-optimised flight legs can reduce CO_2 emissions at the air transport system level. The Clean Sky 2 project REIVON (Reduction of the Environmental Impact of aviation via Optimisation of aircraft size/range and flight Network) is dedicated to answer this question.

The main objective of REIVON is to investigate to what extent the CO_2 emissions of global aviation can be reduced via an optimisation of aircraft size/range and flight network. The project will first identify the theoretical potentials for reducing CO_2 emissions via optimised aircraft, network and frequency reductions. Hereby, three alternatives for an optimised global air transport system will be considered:

1. splitting long-haul flights into shorter legs;
2. reducing frequencies to the necessary minimum; and
3. a combination of 1 and 2

Tasks:

The goal of this master thesis to perform the network optimization for the REIVON alternatives and estimate the potential reduction in CO_2 emissions.

- Firstly, familiarise with the existing optimization setup and algorithm for solving the optimization problem.
- Improve the existing network optimization setup to include visualisation, to allow better representation of the results.
- Filter the air traffic data for the base year (2014) and forecasted years (2020-2050), relevant to the optimization scenarios 1,2 and 3. These data sets will serve as the input for the optimization.

- Perform the network optimization for the base year and forecasted year with new aircraft types. Run different scenarios for all alternatives to accommodate different stakeholder requirements and to incorporate requirements from Clean Sky 2.
- Calculate the theoretical potential and present the results with publication quality.
- Potential opportunity to publish in journals and scientific conferences.
- Contribute in project meetings and present findings.

Preconditions:

- Strong background and understanding of the air transportation system, previous experience with optimization in general and at network level is a plus.
- Motivation and ability to work independently.
- Strong analytical skills and can work in a team.
- Fluent in English.
- Able to work with python, experience with Gurobi is a plus.

Begin and Duration

Start date: Immediately.

Duration: for about 6 months

Contact

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