

Diploma Thesis Proposal — Diplomarbeitsthema

MPC for Gust Load Alleviation

AIRBUS Operations Hamburg and the group of Prof. Findeisen are looking for a motivated diploma/masters student from engineering cybernetics, mechatronics, electrical engineering or related fields of study.



When an aircraft flies through patches of air turbulence, a response of flight mechanical and elastic degrees of freedom can be observed. Both come from the loads exerted on the airframe due to the disturbed atmosphere. As disturbances are commonly disliked by passengers and crew, any reasonable reduction will improve passenger comfort. Loads due to gust and aircraft response may be significant and must be sustained by the structure (statically and for fatigue). Reduction of loads levels could lead to weight savings during the design phase or could reveal potential for development of new aircraft versions.

In this Diploma thesis we want exploit the potential of modern, optimization-based control strategies - namely Model Predictive Control - for the development of GLA controllers. The following main items should be covered:

- 1) Literature research and familiarization with aero-servo-elastic aircraft modelling.
- 2) Derivation of reduced linear and nonlinear models suitable for design of model predictive controllers.
- 3) Development of an MPC controller for the derived model in order to minimizing loads at selected stations while respecting passengers comfort and requirements and system performance data (e.g. limits on control surface deflections, rates of -, flight parameter).
- 4) Evaluation of MPC controller performance via simulations.

This diploma topic is collaboration between AIRBUS Operations Hamburg and the Chair for Systems Theory and Automatic Control (Prof. Findeisen). The project start-up should be carried out at the Institute for Automation Engineering at the University of Magdeburg. The main part of the project will take place at the facilities of AIRBUS Operations, Hamburg.

Scope systems theory, predictive control

Preknowledge

lectures: systems & control theory (nonlinear control, optimal control)
software: MATLAB, basic knowledge of C/C++

Requirements

controller design $\approx 40\%$
simulation /MATLAB $\approx 40\%$
literature search & modelling: $\approx 15 - 20\%$

Project Start

immediate start until end of 2010 is possible

Contact and Further Information

If you are interested in further information about this project, please don't hesitate to contact:

Prof. Rolf Findeisen rolf.findeisen@ovgu.de
Timm Faulwasser timm.faulwasser@ovgu.de