

Master Thesis Informatik/ESE/MST/MSE/SSE

# Nonlinear Embedded MPC for Wind Turbine Control



Recent developments on construction of wind turbines have led to units that can generate up to 8 MW of power. Such advancements imply that the performance of the embedded controllers, whose task it to maximize the harvested energy and minimize the mechanical loads is of utmost importance.

This thesis is part of a larger project where a consortium of universities and companies will work together to implement innovative control techniques for wind turbines. Main goal is to develop good prediction models and take into account their intrinsic nonlinearities in optimization-based control schemes in order to improve the performance of the controller and make an impact on the field of green energy.

**Your tasks:** You will be the main responsible for bringing state-of-the-art online optimization algorithms developed in the group to the embedded hardware of the wind turbines (a powerful controller, equipped with an intel i7 processor, 4 cores and running embedded windows). Moreover, you will be part of our software development team with the task to implement tailored numerical integration schemes that will help us make the overall optimization algorithms real-time feasible.

**Your skills:** You are an experienced programmer with good knowledge of C as well as Simulink/Matlab. You have followed courses on systems theory and control. Experience with visual studio is favorable.

**Note:** A job student contract related to the work of the thesis is available. Travel costs to northern Germany for training on the hardware are covered by the chair. Interested students should send an email to [dimitris.kouzoupis@imtek.uni-freiburg.de](mailto:dimitris.kouzoupis@imtek.uni-freiburg.de) with their transcript of records and a short CV. This thesis is suited for one student.

**Keywords:** Nonlinear MPC, embedded control, programming, structure-exploiting integration methods, applied mathematics, optimal control.

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