hybr2d Theory of Hybrid Systems Informatik 2 | RWTH AACHEN UNIVERSITY

Bachelor / Master Thesis

Robust Predictive Control in Network of Tubes in Parabolic Trough Solar Thermal Power Plants

Course of study:	Mathematics, Computer Science, Computational Engineering
Kind of thesis:	Programming, Simulation, and Optimization
Programming language:	Matlab
Start:	Winter term 2019/20

Topic The principle of concentrating solar thermal power plants seems to be very simple: Large mirrors are used to concentrate rays of sunlight on an absorber tube where a fluid is being heated up. Today's receiver types use thermal oil, water/steam, air or molten salt to transport the heat. The heat of the fluid is exchanged into steam which powers a turbine to generate electricity. To operate the solar power plant in an efficient way, at the end of the heating process (in the tubes) the temperature of the fluid must stay within a certain interval defined by the fluid properties.

Tasks Within this project, the increase of the overall efficiency of a solar thermal power plant is investigated. This is achieved by extending the dynamic control of the solar field for the inlet valves for each absorber tube. The aim of this innovative control strategy is to reduce the defocusing time in the solar field. To give optimal results also for difficult cloud situations, the state of the art closed-loop control will be extended with a closed-loop control. This approach is finally tested in a feasibility study.

- Implement a *state-of-the-art dynamic closed-loop control*.
- Design a *multiple-input-multiple-output closed-loop* by considering projected dynamics inside the tubes and by considering a distributed control across the absorber tubes.
- Implement a *cascaded controller structure* for the disturbance rejecting feedforward temperature control. Thus, a prediction of the cloud passage needs to be considered as uncertainty.
- Test the approach in a *feasibility study*.

Contact This project is offered by the *Theory of Hybrid Systems* (i2) research group headed by Prof. Dr. Erika Ábrahám and will be co-supervised by Dr. rer. nat. Pascal Richter. For further questions please contact us via email:

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