hybr2d Theory of Hybrid Systems Informatik 2 | RWTH AACHEN UNIVERSITY

Bachelor / Master Thesis

Heuristic Layout Optimization for Solar Tower Power Plants

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

Topic

In this project we are looking at solar tower power plants. The principle of concentrating solar thermal power plants seems to be very simple: Large mirrors are used to concentrate rays of sunlight on an receiver where a fluid (e.g. molten salt) is being heated up. The heat of the fluid is exchanged into steam which powers a turbine to generate electricity.

The placement of the mirrors may lead to individual mirrors being blocked and shaded; this affects the efficiency of the power plant. The model is later used for an optimization process which finds the most efficient arrangement of mirrors.

Solar tower power plant PS10 in Spain.

Preliminary work

There exists already a fast implementation of the solar tower model in C++.

Tasks

So far, patterns are used for the layout optimization of heliostats in solar tower plants. The following tasks have to be solved:

- Develop patterns for Cornfield, Hexagonal Grid, Radial Staggered Grid, Biomimetic (Spiral), Contracted Honeycomb and Dense Packing.
- Extend the existing methods with elliptic stretching parameters.
- Accelerate the interface between the model and the optimizer.
- Compare the solutions of all patterns.
- Set up a multi-step optimization approach by using patterns in a first step, and local search in a last step (for refinement).

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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