Numerical Energy Analysis of PV Modules as Adaptive Building Shading Systems

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This thesis developed a methodology to simultaneously calculate the building energy demand and the PV electricity production of a building with PV modules as adaptive building shading systems. A parametric model was built for dynamic evaluations and optimizations of such a system. A case study was then performed on a model representing the prototype of the ASF at the House of Natural Resources at ETH Zurich.

It was possible to find the optimizing configurations of the described system as well as the corresponding building energy demand. Furthermore, various influences were evaluated including sensitivities on the building orientation, the geographic location, the control strategy, and the building system parameters. For the chosen base case evaluation, energy benefits of 9% were obtained when compared to a fixed solar facade at the most beneficial angle. The corresponding PV electricity output is able to compensate for 41% of the total building energy demand.



