Optimal Design of Semiconductor Devices

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In this talk we give a survey of our approaches to optimal semiconductor design and present recent results on the asymptotic analysis of optimization problems for some semiconductor models. In the first part, we introduce first and second order optimization algorithms using derivative information calculated from the adjoint variables. Further, we present a globally convergent Gummel mapping which allows for a very fast optimization and we show how the semiconductor model hierarchy can be exploited in the space-mapping approach. In the second part, we present recent results on the convergence of optimal solutions in various asymptotic limits, like the semiclassical limit in the quantum drift diffusion model or the small Debye length limit in the classical drift diffusion model.