Optimal Control of Traveling Waves

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Abstract: Wave type solutions are characteristic for some nonlinear parabolic reaction diffusion equations. For instance, traveling wave fronts solve the Schlögl model (also known as Nagumo equation), while spiral waves are solutions to the FitzHugh-Nagumo equations.

The talk surveys results on associated optimal control problems. Basic facts on the analysis of the Schlögl and FitzHugh-Nagumo equations and on first and second order optimality conditions for related control problems are explained. Optimality conditions are also sketched in the context of sparse optimal controls, where the objective functional is non-differentiable with respect to the control. Remarkable numerical advantages of sparse controls are demonstrated by various numerical examples.

[1] E. Casas, C. Ryll, and F. Tröltzsch, *Sparse optimal control of the Schlögl and FitzHugh-Nagumo systems.* Computational Methods in Applied Mathematics 13 (2013), 415-442, published online Doi:10.1515/cmam-2013-001.

[2] E. Casas, C. Ryll, and F. Tröltzsch, *Second Order and Stability Analysis for Optimal Sparse Control of the FitzHugh-Nagumo Equations.* Submitted 2014

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