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Multi-point augmented Lagrangian optimization for chaotic flows[1] SEUNG WHAN CHUNG, JONATHAN FREUND, University of Illinois at Urbana-Champaign, XPACC TEAM[2] — Equipped with the adjoint method based on optimal control theory, gradient-based optimization can be a powerful tool for various flow problems. However, its utility is strongly limited in chaotic flows, as the objective functionals becomes irregular in time such as can be described by the horseshoe mapping of the chaotic dynamics. Regularization methods to compute a usefully smooth gradient in ergodic limit are not always applicable, and their computational costs can be comparable to that of the optimization problem itself. Hence, the optimization of chaotic flows is often viable only for short time periods. We propose an augmented Lagrangian method that directly tackles the degrading mechanism of a horseshoe mapping. The computational framework is demonstrated for chaotic Kolmogorov flows, which shows its efficacy for optimization problems with strong controllability.

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