Goal-oriented Estimation for Nonlinear Optimal Control Problems

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Abstract: In optimal control problems with elliptic PDE constraints,

$$\min J(y, u) \quad \text{s.t.} \quad c(y, u) = 0,$$

the value of the cost functional is a natural quantity of interest for goal-oriented error estimation and mesh refinement. The talk will discuss the difference between the all-at-once error quantity $J(y^h, u^h) - J_{\mathsf{opt}}$ introduced by Becker/Kapp/Rannacher and the black-box error quantity $J(y(u^h), u^h) - J_{\mathrm{opt}}$. Both qualitative and quantitative differences will be addressed for linear-quadratic problems.

In the second part, the black-box approach will be extended to smooth nonlinear problems and will result in a novel accuracy matching for inexact Newton methods. Quantitative aspects are illustrated on numerical examples.

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