Sequential Linear Equality Constrained Programming Methods and Applications in Nonlinear Model Predictive Control

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Abstract: In Mixed-Integer Nonlinear Model Predictive Control Applications a sequence of similar Mathematical Programs with Equilibrium Constraints (MPEC) has to be solved. MPECs do not satisfy Linear Independence Constraint Qualifications. As a consequence state of the art solution methods for Nonlinear Programs as Sequential Programming Methods typically are very inefficient when applied to these problems.

Sequential Linear Equality Constrained Programming (SLEQP) Methods are Active Set Methods using a Trust Region Constrained Linear Program to determine the active set and subsequently solve a Trust Region Equality Constrained Quadratic Program to obtain a step. Replacing the Linear Program by a Linear Program with Equality Constraints (LPEC), this method can also be applied to MPECs.

In this talk a preliminary SLEQP Algorithm will be presented and its performance on the CUTEst Problem Set and Example Problems arising in Nonlinear Model Predictive Control assessed. It turns out that the choice of the Trust Region plays a crucial role. A variant using Parametric Linear Programming (PALP) to choose the Trust Region will be discussed.

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