Real–Time Optimization of perturbed DAE Control Systems

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We consider parameter perturbed optimal control problems with DAE systems ($OCP_{DAE}(p)$). In recent years *direct methods* have been favoured for solving optimal control problems. These approaches reduce the *infinite-dimensional* optimization problem to a *finite-dimensional* optimization problem by approximating the control and the state over a fixed mesh. Though these direct methods have multitude advantages, they are not able to solve the problems in real–time.

Hence a new real–time optimization algorithm is proposed, which is based on a parametric sensitivity analysis of the underlying perturbed nonlinear optimization problem. An *open–loop* optimization approach is used to develop a *closed–loop* optimal feedback technique, which can be understood as a gradient free, self correcting method of higher order convergence rate. Computational times can be reduced down to a few nanoseconds on a normal one processor workstation.

Several illustrative examples from DAE optimal control are discussed which show the efficiency and robustness of the proposed method.