

Sensitivity Analysis for Differential-Algebraic Equations and Partial Differential-Algebraic Equations: The Adjoint DAE System and its Numerical Solution

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Sensitivity analysis generates essential information for design optimization, parameter estimation, optimal control, model reduction, process sensitivity and experimental design. Recent work on methods and software for sensitivity analysis of DAE systems has demonstrated that forward sensitivities can be computed reliably and efficiently. However, for problems which require the sensitivities with respect to a large number of parameters, the forward sensitivity approach is intractable and the adjoint (reverse) method is advantageous. In this talk we give the adjoint system for general DAEs and investigate some of its fundamental analytical and numerical properties. We describe our new adjoint DAE software and outline some of the issues which are critical to the implementation. We discuss some problems and solutions in the implementation of adjoint sensitivity analysis for PDAEs.