

COMPUTING DERIVATIVES OF A DAE SOLUTION IN PARALLEL

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ABSTRACT

We use Pryce's Σ -method for structural analysis of differential-algebraic equation systems (DAEs). The equation and variable offsets it computes often give the correct index of a DAE. They also prescribe a stage by stage solution scheme for computing derivatives of a solution, strictly from lower order to higher. This solution scheme can naturally develop into a Taylor series method, such as the Nedialkov-Pryce DAETS code. We observe the parallelism of the derivative computations from a DAE's block triangular form, which is based on the sparsity pattern of a Jacobian matrix. We illustrate this parallel computing idea with the chemical Akzo Nobel DAE, and seek to develop efficient algorithms for solving large and sparse problems.

REFERENCES

- [1] Nedialkov, N.S., Tan, G., and Pryce, J.D.: Exploiting fine block triangularization and quasilinearity in differential-algebraic equation systems. Tech. rep. CAS-14-08-NN, Department of Computing and Software, McMaster University (2014)
- [2] Pryce, J.D., Nedialkov, N.S., Tan, G.: DAESA—a Matlab tool for structural analysis of differential-algebraic equations: Theory, *ACM Trans. Math. Softw.*, **41**(2), pp. 9:1–9:20 (2015)
- [3] Pryce, J.D.: A simple structural analysis method for DAEs. *BIT Numerical Mathematics* **41**(2), 364–394 (2001)

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