Algebraic Variables in Higher Index DAEs

Claus Führer (Lund University)

Higher index differential algebraic equations are ill-posed problems [3, 426]. Nevertheless one is attempted to solve them with DAE software like Sundial's BDF code IDA, [2]. In the index-3 case the application of variable step-size variable order codes requires a special treatment of algebraic variables. In the talk we review the definition of these variables and the problems which arise, when these variables are not treated separately in the error control. Numerical tests of various implementation alternatives within the ODE software wrapper Assimulo [1] will be presented.

References

[1] ANDERSSON, C., FÜHRER, C., AND ÅKESSON, J. Assimulo: A unified framework for ODE solvers. *Mathematics and Computers in Simulation 116* (2015), 26 – 43.

[2] HINDMARSH, A. C., BROWN, P. N., GRANT, K. E., LEE, S. L., SERBAN, R., SHUMAKER, D. E., AND WOODWARD, C. S. Sundials: Suite of nonlinear and differential/algebraic equation solvers. *ACM Transactions on Mathematical Software (TOMS) 31*, 3 (2005), 363–396.

[3] LAMOUR, R., MÄRZ, R., AND TISCHENDORF, C. *Differential-Algebraic Equations: A projector based Analysis*. Heidelberg: Springer, 2013.