CVODES: An ODE solver with sensitivity analysis capabilities
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This paper describes a stiff and nonstiff ODE IVP solver with forward and adjoint sensitivity analysis capabilities. The presented software, which is a part of SUNDIALS software suite, is an updated version of the VODE solver written in C and extended to sensitivity analysis capabilities. All the algorithms presented have been published elsewhere by other workers, and cannot be seen as novel contributions of the current paper. Therefore the first 10 pages of the paper can be summarized with appropriate citations. The rest of the paper describes the code organization and its usage briefly. There are no numerical examples demonstrating any advantages of using this particular software. There is no mention of existing forward/adjoint sensitivity analysis tool(s) with virtually identical capabilities, i.e., DASPKADJOINT.

Considering the editorial charter which states that "..., papers that are essentially user manuals for a computer program are also not acceptable" and noting that most of the material presented in the paper can be found in [1], a significant rewrite of the paper is recommended emphasizing the advantages and novelties of the software with specific examples. However, it is not clear to this reviewer that there are sufficient advantages and novelties in the software to satisfy the requirements of the editorial charter.

Detailed Comments

- p. 7 paragraph 3: while it is indeed an important observation that the staggered corrector method combined with an iterative linear solver is equivalent to the staggered direct method, this observation has already been made in [2].
- p. 14 paragraph 3 from bottom of the page: SPGMR is not a direct linear solver.
- p. 15 paragraph 2:"sensitvity" should be "sensitivity".
- the Maly and Petzold reference is from 1996.

Experience with the Code

The code is user friendly and has obvious advantages inherited from the usage of the C programming language. We did not undertake performance comparisons.

References

[1] A. C. Hindmarsh and R. Serban. User documentation for CVODES: An ODE solver with sensitivity analysis capabilities. Technical Report UCRL-MA-148813, LLNL, July 2002.

[2] M. D. Tocci. Sensitivity analysis of large-scale time dependent PDEs. *Applied Numerical Mathematics*, 37:109–125, 2001.