Recent advances in the numerical solution of second order differential equations by finite differences

Pierluigi Amodio, Giuseppina Settanni

Dipartimento di Matematica, Università di Bari (Italy)

Abstract

In this talk we will examine some recent results obtained in the solution of Sturm-Liouville problems and singularly perturbed BVPs. In both cases the original problem is a second order ODE which is discretized approximating each derivative by means of different high order finite difference schemes. Several numerical tests will be proposed to show the effectiveness of the proposed approach.

References

- P. Amodio and G. Settanni, Variable step/order generalized upwind methods for the numerical solution of second order singular perturbation problems, JNAIAM J. Numer. Anal. Ind. Appl. Math. 4, 65–76 (2009).
- [2] P. Amodio and G. Settanni, A deferred correction approach to the solution of singularly perturbed BVPs by high order upwind methods: implementation details, AIP Conf. Proc. 1168, issue 1 (2009), Numerical analysis and applied mathematics - ICNAAM 2009, T.E. Simos, G. Psihoyios and Ch. Tsitouras (eds.), 711–714.
- [3] P. Amodio and G. Settanni, High order finite difference schemes for the numerical solution of eigenvalue problems for IVPs in ODEs, AIP Conf. Proc. 1281 (2010), Numerical analysis and applied mathematics - IC-NAAM 2010. T.E. Simos, G. Psihoyios and Ch. Tsitouras (eds.), 202–204.
- [4] P. Amodio and G. Settanni, A matrix method for the solution of Sturm-Liouville problems, JNAIAM J. Numer. Anal. Ind. Appl. Math. (2011), in press.
- [5] P. Amodio, I. Sgura, High Order Finite Difference Schemes for the Solution of Second Order BVPs, J. Comput. Appl. Math. 176 (2005), 59–76.
- [6] P. Amodio, I. Sgura, High Order Generalized Upwind Schemes and the Numerical Solution of Singular Perturbation Problems, BIT Numer. Math. 47 (2007), 241-257.