***Numerical investigation of stability of coarse grid discretisations for dissipative systems***

**Denise Tumiotto** (Martin-Luther-Universität Halle-Wittenberg), Martin Arnold

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Numeric methods of Newmark family are well known and largely used when solving stiff problems, [2]. Some examples include the Newmark-$\beta$, the HHT-$\alpha$ method, and the generalized-$\alpha$ [1]. The latter is of much interest because of its unconditional stability and second order convergence, proved only for linear problems. Moreover, the generalized-$\alpha$ scheme has optimal user-defined numerical dissipation.
Another family of numerical integrators is the family of variational integrators [3]. In particular, the present work introduces as an example the implicit midpoint rule. The implicit midpoint rule is a symplectic method with second order convergence.

Introducing the dissipation in the formulation of the system, we obtain a nonlinear dissipative system. We investigate the stability of the numerical methods for the resulting system. In order to perform the study, we introduce the model of an elastic pendulum in two different configurations: the floating frame of reference, [4], and the finite segment. The analysis proceeds through the comparison in the energy trend both for conservative and dissipative systems.

# References

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