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AN EXTENDED SPEED RESTART CRITERIA FOR A CONTINUOUS DYNAMICS WITH HESSIAN-DRIVEN DAMPING

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Restart schemes are a popular technique for acceleration and stabilization of optimization algorithms. These routines stop the execution of the algorithm when some convergence rule is not satisfied, to restart the computations from a new starting point. Building on the continuous-time framework introduced in [1], we study a speed restart mechanism for the system

$$\ddot{x}(t) + \frac{\alpha}{t}\dot{x}(t) + \nabla\phi(x(t)) + \beta\nabla^2\phi(x(t))\dot{x}(t) = 0,$$

where $\alpha, \beta > 0$. In particular, we propose an extended speed-based restart scheme that generalizes previous approaches ([1, 2]) and prove a linear convergence rate for the objective function along the restarted trajectories. Numerical results demonstrate improved convergence for the continuous system and its discretizations.

References

[1] W. Su, S. Boyd,E. Candès: *A differential equation for modeling Nesterov's accelerated gradient method: Theory and insights*, Journal of Machine Learning Research, 17(153), 1-43, 2016.

[2] J. Maulén, J. Peypouquet: *A speed restart scheme for a dynamics with Hessian-Driven damping*, Journal of Optimization Theory and Applications, 199(2), 831-855, 2023.

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