A second order system attached to a monotone inclusion problem

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In the setting of a real Hilbert space, we investigate the asymptotic properties of the trajectories generated by a second order dynamical system. As the time variable approaches infinity, a fast rate of convergence of order $\mathcal{O}\left(\frac{1}{t^\tau \beta(t)}\right)$ is exhibited by $\|V(z(t))\|$, where $z(t)$ denotes the generated trajectory, τ is a nonnegative number and $\beta(t)$ is a nondecreasing function which fulfills a growth condition. At least in one case, we are able to show the weak convergence of $z(t)$ to a zero of V.

Our approach combines features of two systems already present in the literature. On the one hand, by combining a vanishing damping term with the time derivative of V along the trajectory, it bears resemblance with the fast OGDA system (Bot, Csetnek & Nguyen 2022). At the same time, by introducing two parameters r and s in $[0, 1]$, our system admits, through a particular choice for V, similar dynamics to those developed for a linear constrained convex optimization problem in (He, Hu & Fang 2022).

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