Hybrid viscous damper with filtered integral force feedback control

In hybrid damper systems active control devices are usually introduced to enhance the performance of otherwise passive dampers. In the present paper a hybrid damper concept is comprised of a passive viscous damper placed in series with an active actuator and a force sensor. The actuator motion is controlled by a filtered integral force feedback strategy, where the main feature is the filter, which is designed to render a damper force that in a phase-plane representation operates in front of the corresponding damper velocity. It is demonstrated that in the specific parameter regime where the damper force leads velocity the control is stable and yields a significant improvement in damping performance compared to the pure viscous damper.