Filtering for distributed mechanical systems using position measurements: Perspectives in medical imaging

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We propose an effective filtering methodology designed to perform estimation in a distributed mechanical system using position measurements. As in a previously introduced method, the filter is inspired from robust control feedback, but here we take full advantage of the estimation specificity to choose a feedback law that can act on displacements instead of velocities and still retain the same kind of dissipativity property which guarantees robustness. This is very valuable in many applications for which positions are more readily available than velocities, as in medical imaging. We provide an in-depth analysis of the proposed procedure, as well as detailed numerical assessments using a test problem inspired from cardiac biomechanics, as medical diagnosis assistance is an important perspective for this approach. The method is formulated first for measurements based on Lagrangian displacements, but we then derive a nonlinear extension allowing to instead consider segmented images, which of course is even more relevant in medical applications.

Références
