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Analysis of Signal Propagation in an Elastic-Tube Flow Model SCOTT WAGGY, University of Colorado at Boulder, OZGUR AKMAN, The University of Edinburgh, SEDAT BIRINGEN, University of Colorado at Boulder — We combine linear and nonlinear signal analysis techniques to investigate the transmission of pressure signals along a one-dimensional model of fluid flow in an elastic tube. We derive a simple measure for the robustness of a simulated vessel against in vivo fluctuations in the pressure, based on quantifying the degree of synchronization between proximal and distal pressure pulses. The practical use of this measure will be in its application to simulated pulses generated in response to a stochastic forcing term mimicking biological variations of root pressure in arterial blood flow. Using spectral analysis methods based on synchronization theory, we introduce a novel nonlinear index for measuring the robustness of the model against fluctuations in the forcing signal, based on a general scheme for deriving low-dimensional measures of (biological) performance from higher-dimensional systems of equations.

Sedat Biringen University of Colorado at Boulder

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