

# Multiscale port-Hamiltonian formulation of diffusive systems

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The aim of this talk is to show how the port Hamiltonian framework can be used for the modelling of a conservative wave equation coupled to a diffusion equation. This coupled system naturally arises in musical acoustics when viscous and thermal effects at the wall of the duct of a wind instrument are taken into account. The resulting equation, known as Webster-Lokshin model, has variable coefficients in space, and a fractional derivative in time. This equation will be recast into the port Hamiltonian framework by using the diffusive representation of the fractional derivative in time and a multiscale state space representation. The port-Hamiltonian formalism proves adequate to reformulate this coupled system, and could enable another well-posedness analysis, using classical results from port-Hamiltonian systems theory.