

# A Toolbox for the Automatic Generation of Port-Hamiltonian Models for Mechanical Structures

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Adaptive structures are ultra-lightweight structures with actuation distributed among the structural elements. They enable material savings in high-rise construction of about 50%. Energy-based methods offer advantages in modeling for coupling the mechanical structure with actuators from another domain, such as hydraulic, and also for the design of an energy-based controller or state estimator. However, these high-dimensional structures are typically modelled using a finite element (FE) approach. To combine the advantages of energy-based modeling and of the FE-approach, we provide a toolbox utilizing our results from discretizing distributed PH-models of structural elements using the partitioned finite element method (PFEM). This talk will illustrate these mathematical basics on a simple example and showcase the application of the toolbox for the adaptive high-rise demonstrator D1244 on the campus of the University of Stuttgart. The toolbox is available at [https://github.com/awarsewa/ph\\_fem/](https://github.com/awarsewa/ph_fem/).

**Author:** ZELLER, Amelie

**Co-authors:** Dr BÖHM, Michael; Prof. SAWODNY, Oliver

**Presenter:** ZELLER, Amelie

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