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Coupling DAE's and PDE's for simulating the interaction of pantograph and catenary. - Mathematical and Computer Modelling of Dynamical Systems 6:129-144. - 2000.

Abstract. Recently, the dynamical simulation of pantograph and catenary in high speed trains has found much interest. The equations of motion form a coupled system of partial differential equations (PDE's) for the catenary and differential-algebraic equations (DAE's) for the pantograph. Standard approaches intertwine modelling and numerical solution by first discretizing some parts in space and then setting up the overall model. The alternative we propose is a descriptor form model which comprises all equations and coupling conditions before discretization. This descriptor form represents also an example for a certain class of mechanical systems with constraints that can be subsumed under the term partial differential-algebraic equation (PDAE).

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