

# Kinetic Boundary Conditions for the Wave and Beam Equations

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Of concern are the wave equation and the beam equation with kinetic boundary conditions; these are boundary conditions which arise from incorporating the effects of kinetic energy and potential energy on the boundary as well as inside the region. A derivation via classical methods of the calculus of variations and the physical interpretation of the kinetic boundary conditions will be given. Connections between kinetic and general Wentzell boundary conditions will be discussed (cf. [1], [2]).

We shall also consider the operator

$$Au = u''''$$

on  $[0, 1]$  with one general Wentzell and one general boundary condition at each endpoint. Necessary and sufficient conditions will be given to say when  $A$  is symmetric, quasiacretive and satisfies  $R(\lambda I - A)$  is dense in  $L^2[0, 1]$  when  $A$  is defined on a suitable domain. Thus, we are able to classify the general Wentzell boundary conditions which lead to a well-posed problem for the beam equation in one space dimension. The results in this section are joint with A. Favini, J.A. Goldstein, and S. Romanelli [3].

## REFERENCES

1. G.R. Goldstein, *Derivation and physical interpretation of general boundary conditions*, preprint.
2. G.R. Goldstein, *Kinetic boundary conditions for the beam equation*, in preparation.
3. A. Favini, J.A. Goldstein, and S. Romanelli, *Classification of general Wentzell boundary conditions for fourth order operators in one space dimension*, preprint.