Optimal control of fractional Sturm–Liouville wave equations on a star graph

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In the present work, we are concerned with a fractional wave equation of Sturm–Liouville type in a general star graph. We first give several existence, uniqueness and regularity results of weak solutions for the one-dimensional case using the spectral theory ; we prove the existence and uniqueness of solutions to a quadratic boundary optimal control problem and provide a characterization of the optimal control via the Euler–Lagrange first-order optimality conditions. We then investigate the analogous problems for a fractional Sturm–Liouville problem in a general star graph with mixed Dirichlet and Neumann boundary conditions and controls of the velocity. We show the existence and uniqueness of minimizers, and by using the firstorder optimality conditions with the Lagrange multipliers, we are able to characterize the optimal controls.

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