

Telegraph systems on networks and port-Hamiltonians

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In this talk we consider a system of linear hyperbolic differential equations on a network coupled through general transmission conditions of Kirchhoff's type at the nodes. We discuss the reduction of such a problem to a system of 1-dimensional hyperbolic problems, also called port-Hamiltonian, for the associated Riemann invariants and provide a semigroup theoretic proof of its well-posedness in any L_p .

In the second part of the talk we consider a reverse question, that is, we derive conditions under which such a port-Hamiltonian with general linear Kirchhoff's boundary conditions can be written as a system of 2×2 hyperbolic equations on a metric graph Γ . This is achieved by interpreting the matrix of the boundary conditions as a potential map of vertex connections of Γ and then showing that, under the derived assumptions, that matrix can be used to determine the adjacency matrix of Γ .