Stability for an inverse problem for a two speed hyperbolic system in one space dimension

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Suppose $B(x)$ is a 2×2 matrix, $0 < \lambda < \mu$ and $C = \begin{bmatrix} \lambda^2 & 0 \\ 0 & \mu^2 \end{bmatrix}$. Consider the initial boundary value problem

$$\begin{aligned} C\mathbf{u}_{tt} - \mathbf{u}_{xx} - B\mathbf{u} &= 0, && (x,t) \in [0,\infty) \times \mathbb{R} \\ \mathbf{u}(0,t) &= [\delta(t), 0] \text{ or } [0, \delta(t)], && t \in \mathbb{R} \\ \mathbf{u}(x,t) &= 0, && t < 0. \end{aligned}$$

Given $\mathbf{u}_x(0,t)$ for both solutions, the goal is the recovery of $B(x)$. We have shown that there is uniqueness and stability for this inverse problem.

We will discuss the motivation for this problem, earlier results, and give an idea of the proof of the result. This is based on work done with Paul Sacks of Iowa State University.