A note on the Resolvent Estimates of the damped wave equation via Observability Estimate

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Abstract

In my talk the main object of study is the following observability estimate

$$(-\Delta - \lambda)u = f \Longrightarrow \|u\|_{L^2(\mathbb{R}^n)} \leq C \left(\langle \lambda \rangle^{\alpha} \|f\|_{L^2(\mathbb{R}^n)} + \|u\|_{L^2(\Omega)} \right), \tag{1}$$

where $\Omega \in \mathbb{R}^n$ be nonempty set and $\lambda \in \mathbb{R}$.

In one-dimension case, we proved this estimate hold for $\alpha = -\frac{1}{2}$ with Ω as 2π periodic set. In higher dimensions this estimate is true for $\alpha = 0$ with Ω as 2π periodic set (which is certainly not optimal).

I will also show that using the above observability estimates, we can derive resolvent estimate for damped wave types equations. The resolvent estimate gives the energy decay rate of the underline equation.