Functional parameter estimation in partial diferential equations

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Abstract

In this work we present a methodology of estimation of functional parameters that appear in models that are described by partial differential equations. We will focus on the following model:

$$f\frac{\partial^2 u}{\partial t^2} + g\frac{\partial u}{\partial t} + hu = \frac{\partial}{\partial x}\left[\mathcal{K}\frac{\partial u}{\partial x}\right],$$

where the parameters f, g, h and $\mathcal{K}$ are real valued functions of the real variable x. We assume that we know N functions $v_1(x,t), ..., v_N(x,t)$ that satisfy, for each i, $1 \leq i \leq N$, $v_i = u_i + \epsilon_i$, where u_i is a solution of the PDE and ϵ_i is small amplitude i.i.d. noise.

Keywords: Estimation of functional parameters, Dynamical systems, Partial Differential Equations.