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Rod A Freed* (raf12@cox.net), 25832 Empresa, Mission Viejo, CA 92691. *Solving the inverse problem for a wave equation.*

The function which solves the diffusion PDE describes a wave that is dissipated by diffusion. The direct problem here is to find the solution function, given the initial condition. The inverse problem is to find the initial condition, given observations on the solution function. To solve the inverse problem we first show that the solution function is equivalent to the conditional mean function of a diffusion process. We then show that observations on the solution function can be considered to be observations which have been randomly disturbed away from the aforementioned conditional mean function. This allows us to estimate the solution function by using nonparapetric kernel regression. This approach does not require us to choose the form of the conditional mean function (as we would have to do if we used nonlinear regression or other such techniques). We use the estimated conditional mean function (which can be made arbitrarily close to the true function by choice of sample size) to solve the inverse problem (i.e., find the initial condition) (Received December 14, 2006)