Electrical & Computer Engineering

S E M I N A R

Louisiana State University

Inversion and Simulation of the Wave Equation

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Abstract—The inverse of a dynamical system is intuitively understood to be a second dynamical system which when cascaded with the original system, produces as its output the input to the original system. This may be simply related to the exact tracking problem. Solutions have been obtained for certain cases but it is extremely difficult, in general, to extend these results to linear distributed parameter systems.

We consider a model for the approximate inverse of an input-output system represented by the wave equation in ¡i¿n¡/i¿ dimensions, with a boundary input and distributed output. We develop two models: In the first model, we approximate the system and invert it calling this model the inverse of the approximated system. In the second, we invert the system first, then approximate, calling this model the approximated inverse of the system.

We also establish the input-output relation of the inverse system using Fourier series. By truncation of the transfer function, an approximation is obtained. To demonstrate the relative accuracy of the approximations, simulation examples are presented.

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