URN etd-0407109-183711-875
Author Ting-wei Hsu
Author's Email Address No Public.
Statistics This thesis had been viewed 54 times. Download 14 times.
Department
Year 2005
Semester 1
Degree Master
Type of Document Master's Thesis
Language zh-TW.Big5 Chinese
Title The Learning Algorithm NARX-RNN and its Application to the Modeling of Piezoelectric Actuator’s Hysteresis
Date of Defense 0000-00-00
Page Count 67
Keyword
hysteresis
recurrent neural network
piezoelectric actuator

Abstract
Piezoelectric actuators are versatilely used in ultra-precision positioning systems for their high stiffness, rapid response, and nano-precision resolution. However, the inherent hysteresis of piezoelectric materials might adversely affect the achievable precision. If a model can be built to effectively identify the hysteresis, it may be used to alleviate the aroused problems and improve the actuator’s positioning ability. This thesis establishes the modeling algorithm of Nonlinear AutoRegressive with eXogeneous input type Recurrent Neural Networks (NARX-RNN), and uses it to model the hysteresis of piezoelectric materials.
An experiment is used to verify the proposed method. A Tektronix function generator generates sinusoidal wave as input signals. They are amplified to drive the piezoelectric actuator in a positioning stage via Physik Instrumente. The movement of the stage is measured by Optodyne laser interferometer and output using LabWindows. The input/output data are then used to train the parameters of the proposed neural network. And the trained network is then cross-validated using different data to demonstrate that the proposed RNN can effectively simulate the hysteresis of piezoelectric actuators.
Advisory Committee Tung-Yung Huang - advisor

Files etd-0407109-183711-875-001.pdf

indicate access worldwide
Date of Submission 2006-08-18