Article Abstract

Title:	Fast predictive control for air-fuel ratio of SI engines using a nonlinear internal model
Author(s):	Y.J. Zhai[1]*, D.L. Yu[2], Reza Tafreshi[1], Yasser Al-Hamidi[1]
Address(es):	[1*] Mechanical Engineering Program, Texas A&M University at Qatar, Education City, Doha, QATAR [2] Control Systems Research Group, Liverpool John Moores University, UK [*]Corresponding Author: e-mail: yujia.zhai@qatar.tamu.edu, Tel +974-4423-0558, Fax.+974-4423-0011
Journal:	*International Journal of Engineering, Science and Technology*, Vol. 3, No. 6, 2011, pp. 1-17.
Abstract:	With development of fast modern computers, it has become possible to extend model predictive control (MPC) method to automotive engine control systems, which is traditionally applied to plants with dynamics slow enough to allow computations between samples. In this paper MPC based on an adaptive neural network model is attempted for air fuel ratio (AFR), in which the model is adapted on-line to cope with nonlinear dynamics and parameter uncertainties. A radial basis function (RBF) network is employed and the recursive least squares (RLS) algorithm is used for weight updating. Based on the adaptive model, a MPC strategy for controlling air-fuel ratio is realized to a nonlinear simulation of the engines. Finally, both single-variable and multi-variable optimizations algorithms are used to find the optimal solution of MPC problems and are compared in term of their control performance and time consumption.
Keywords:	Air-fuel ratio control, SI engine, Adaptive neural networks, Nonlinear programming, Model predictive control