LINEAR-WAVELET NETWORKS

Roberto K.H. Galvão[a], Victor M. Becerra[b], P.M. Silva[c] and J.M.F. Calado[c]

[a]Div. Engenharia Electrónica ,Instituto Tecnológico de Aeronáutica, São José dos Campos, Brazil, *E-mail: kawakami@ele.ita.br*

[b]Department of Cybernetics, University of Reading, , Reading, United Kigdom, E-mail: v.m.becerra@reading.ac.uk

[c]Departamento de Engenharia Mecânica, ISEL, Lisboa, Portugal E-mail: {psilva, jcalado}@dem.isel.ipl.pt

Publicado em: *International Journal of Applied Mathematics and Computer Science, 2004, Vol.14, No. 2, 221-232.*

This paper proposes a nonlinear regression structure comprising a wavelet network and a linear term. The introduction of linear term is aimed at providing a more parsimonious interpolation in high-dimensional spaces when the modelling samples are sparse. A constructive procedure for building such structures, termed linear-wavelet networks, is described. For illustration, the proposed procedure is employed in the frame dynamic system identification. In an example involving a simulated fermentation process, it is shown that a linear-wavelet network yields a smaller approximation error when compared with a wavelet network with the same number of regressions. The proposed technique is also applied to the identification of a pressure plant from experimental data. In this case, the results show that the introduction of wavelets considerably improves the prediction ability of a linear model. Standard errors on the estimated model coefficients are also calculated to the numerical conditioning of the identification process.

Keywords: wavelet networks, nonlinear models, regression analysis, system identification.