Learning in Cellular Recurrent Networks with Applications to Image Processing and Nonlinear Optimization

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Abstract

Cellular Simultaneous Recurrent Neural Network (SRN) has been shown to be a function approximator more powerful than the feed-forward multilayer perceptron (MLP) architectures. This means that the complexity of MLP would be prohibitively large for some problems while SRN could realize the desired mapping with acceptable computational constraints. Cellular network architectures are especially efficient in hardware implementation and have widespread applications in image processing.

The speed of training of complex recurrent networks is crucial to their successful application. The present work improves the previous results by training the network with Extended Kalman Filter (EKF). We implemented a generic Cellular SRN toolbox and applied it for solving two challenging problems: a subset of the connectedness problem relevant to image processing applications and the 2D maze navigation. The implications of the results are discussed.

This is a join work with Robert Kozma (UoM) and Paul J. Werbos (NSF).