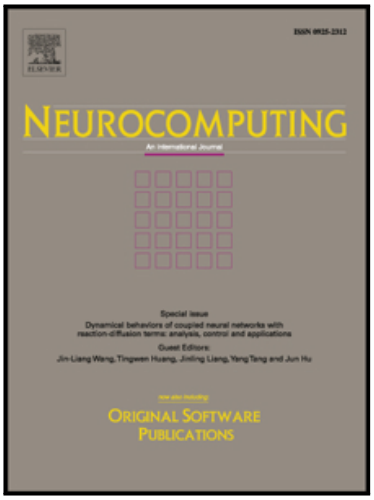
Communicated by Prof. Duan Shukai

Accepted Manuscript



A New Class of Neural Networks and its Applications

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PII: S0925-2312(17)30487-3
DOI: 10.1016/j.neucom.2017.03.006
Reference: NEUCOM 18226

To appear in: *Neurocomputing*

Received date: 27 April 2016
Revised date: 19 July 2016
Accepted date: 2 March 2017

Please cite this article as: Kais Bouallegue, A New Class of Neural Networks and its Applications, *Neurocomputing* (2017), doi: 10.1016/j.neucom.2017.03.006

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A New Class of Neural Networks and its Applications

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Abstract

We present a new class of neural network using a variable structure model of neuron (VSMN). From this structure, we generate four models of neurons. For each model, we study different behaviors such as stable or equilibrium , degraded, hole, alternated, oscillator, harmonic, fractal, and chaos behaviors. Then we design different topologies and architectures of neural networks. These architectures are different from the classical ones; each layer of network contains different models of neurons, neurons can take four models by configuration of VSMN. We also present a numerical study describing the behavior of some models of neuron. We illustrate some results to show the efficiency of this new class of neural networks. We show that these neurons put tracks on their stimulators such as: signal track and half bounded region track with two high and low directions. Two applications in chaos and robotic are also given.

Keywords:
`Variable structure model of neuron, neural networks, chaos, harmonic, oscillator, fractal, signature of neuron.`

1. Introduction

After decades, many artificial neural networks have been proposed to develop tools that may lead to a better understanding of the behavior of brain. Their various versions have also been intensively and extensively studied in many aspects and successfully applied to many fields such as identifying pattern, recognizing voice, controlling system, processing signal systems, treating static image, and solving nonlinear algebraic system, etc. ,[21],[17], [12], [15],[7],[20],[3],[8], [1].

Hopfield's neural network is a model of artificial neural network which appears to be a powerful tool for modeling biological neural networks [9]. It is known that the human brain has 10^{10} neurons, and each neuron has 10^3 to 10^4 connections with other neurons. Each neuron controls and drives the dynamical behavior of organs. Some neurons work all the time, others work only when

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