

A Programmable Analog Neural Computer and Simulator

Authors: Paul Mueller, Jan Van der Spiegel, David Blackman, Timothy Chiu, Thomas Clare, Joseph Dao, Christopher Donham, Tzu-pu Hsieh, Marc Loinaz

Abstract: This report describes the design of a programmable general purpose analog neural computer and simulator. It is intended primarily for real-world real-time computations such as analysis of visual or acoustical patterns, robotics and the development of special purpose neural nets. The machine is scalable and composed of interconnected modules containing arrays of neurons, modifiable synapses and switches. It runs entirely in analog mode but connection architecture, synaptic gains and time constants as well as neuron parameters are set digitally. Each neuron has a limited number of inputs and can be connected to any but not all other neurons. For the determination of synaptic gains and the implementation of learning algorithms the neuron outputs are multiplexed, A/D converted and stored in digital memory. Even at moderate size of 10³ to 10⁵ neurons computational speed is expected to exceed that of any current digital computer.