Abstract

Chaos provides many interesting properties that can be used to achieve computational tasks. Such properties are sensitivity to initial conditions, space filling, control and synchronization. Chaotic neural models have been devised to exploit such properties. In this paper, a chaotic spiking neuron model is investigated experimentally. This investigation is performed to understand the dynamic behaviours of the model. The aim of this research is to investigate the dynamics of the nonlinear dynamic state neuron (NDS) experimentally. The experimental approach has revealed some quantitative and qualitative properties of the NDS model such as the control mechanism, the reset mechanism, and the way the model may exhibit dynamic behaviours in phase space. It is shown experimentally in this paper that both the reset mechanism and the self-feed back control mechanism are important for the NDS model to work and to stabilise to one of the large number of available unstable periodic orbits (UPOs) that are embedded in its attractor. The experimental investigation suggests that the internal dynamics of the NDS neuron provide a rich set of dynamic behaviours that can be controlled and stabilised. These wide range of dynamic behaviours may be exploited to carry out information processing tasks.
Investigation of a Chaotic Spiking Neuron Model

References

- F. Pasemann and N. Stollenwerk. Attractor switching by neural control of chaotic

Index Terms

Computer Science
Artificial Intelligence

Keywords
R¨ossler Attractor, Chaotic Spiking Neural Model, Nonlinear Dynamics

Investigation