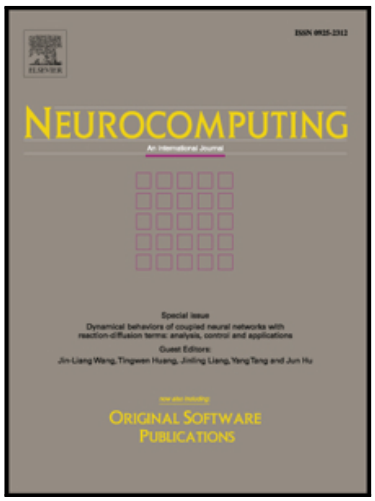


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# A General Memristor Model and Its Applications in Programmable Analog Circuits

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**Abstract**

This paper focuses on presenting a new memristor model with a general window function. Three adjustable parameters are introduced such that it is more flexible. It is seen that several well-known window functions are the special cases of the general window function. Some issues (e.g., the boundary lock and limited scalability) encountered in previously-reported memristor models are thus efficiently resolved. Furthermore, fine-resolution programmable resistance is achieved by controlling the parameters of the general memristor model. The programmable analog filter and gain amplifier are finally implemented to illustrate the applications of the developed memristor model.

*Keywords:* Memristor, general window function, adjustable parameters, fine-resolution, programmable analog circuits.

## 1. Introduction

For a traditional circuit, once the structure is determined, it is hard to change the value of resistor. However, the so-called memristive device is able to deal with this issue easily and effectively because of the changeable value of its resistance. Since the discovery of memristor behavior at the nanoscale by HP Labs in 2008 [1], a great deal of efforts have paid to establish appropriate mathematical models to capture nonlinear dynamics of the nanoscale structure. As a result, many interesting memristor models have been proposed in the literature (see, e.g., [2, 3, 4, 5, 6, 7, 8]).

Until now, besides the theoretical investigation, more and more successful applications have been found for memristive devices in many fields [9]. For example, when applied in programmable analog circuits [10, 11, 12], the memristive device can be

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