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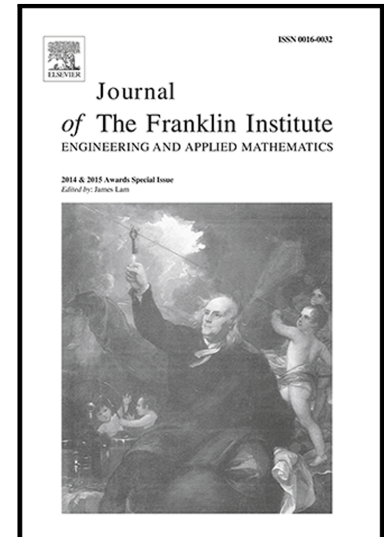
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# A new approach based on discrete-time high-order neural networks with delays and impulses

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**Abstract:** This paper is concerned with the stability of discrete-time high-order neural networks (HONNs) with delays and impulses. Without applying the Lyapunov function, some sufficient conditions, which ensure the exponential stability and asymptotic stability of considered networks involving delays and impulses, are derived based on the fixed point theory. Finally, several numerical examples are given to demonstrate the effectiveness of the obtained results.

**Keywords:** High-order neural networks; Discrete-time; Stability; Fixed point theory; Delay; Impulse

## 1 Introduction

As an important neural processing topology, high-order neural networks (HONNs) not only have widespread applications in speech synthesis, signal processing and combinatorial optimization, but also have specific properties, such as faster convergence rate, bigger approximation property and higher fault tolerance in relation to low-order neural networks (NNs) [1–4]. Recently, more and more monographs' attention of NNs shifts from low-order systems to high-order systems in an effort to overcome the limitations of conventional NNs. Basically, NNs are often classified into two categories of continuous-time and discrete-time. Regardless of the fact that

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