

一种脉冲卷积神经网络 VLSI 硬件架构设计

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摘 要: 本文设计了一种识别手写体数字的脉冲卷积神经网络数字电路, 使用脉冲神经元代替卷积核, 并分别对卷积层和池化层设计相应的电路结构, 实现全流水线并行. 相比于传统的卷积神经网络, 在识别 MNIST 数据集时, 卷积神经网络的精确度为 98.61% 时, 脉冲卷积神经网络的精度能达到 98.04%. 与相同流水线结构的卷积神经网络相比, 脉冲神经网络平均能耗减少约 50%.

关键词: 脉冲卷积神经网络电路; 手写体识别; 数字集成电路

A hardware implementation of a spiking convolutional neural network

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Abstract: This paper designed a digital circuit of spiking convolutional neural network for recognizing handwriting number. Spiking neurons are used to replace the convolution kernels in CNN. Corresponding circuit structures are designed for convolution layer and pooling layer respectively to achieve full pipeline parallelism. Compared with the traditional convolutional neural network, when recognizing the MNIST dataset, the accuracy of the two is 98.61% and 98.04% respectively. Compared with CNN that has similar pipeline architecture, spiking convolutional neural network has a 50% reduction in average energy consumption.

Key words: spiking neural network; handwriting recognition; Digital IC

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