基于 FPGA 的卷积神经网络浮点激励函数实现

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摘　要：卷积神经网络因深度学习概念的提出再一次被研究人员所重视.激励函数是卷积神经网络的一个重要组成部分，选取了 sigmoid 函数作为实验对象.讨论了当前几种可行的逼近方法，最终采用分段四阶多项式拟合 sigmoid 函数.在 FPGA 上使用 Verilog 硬件描述语言设计了并行电路，并采集了数据集进行 FPGA 与 CPU 版本 caffe 库进行运算效率对比.实验结果表明，此种方法误差小效率高，FPGA 在深度学习领域有着广阔的应用前景.

关键词：卷积神经网络；激励函数；FPGA；多项式逼近

The Implementation of Activation Function of CNN Based on

FPGA Using Single Precision Floating-Point-Unit

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Abstract：Convolutional Neural Network (CNN) was gotten attention because of the presentation of Deep-Learning. It has large research value for Deep-Learning in using FPGAs. The activation function is the most necessary part of CNN. In this paper, Sigmoid function was chosen as the experiment object. The approximation ways of Sigmoid Function were listed and analysed, the piecewise forth-order approximation was the best way to fit Sigmoid Function. Parallel calculation circuit was designed by Verilog HDL on FPGAs, collecting dataset and inputing them to FPGA Platform and CPU Platform. The experiment result set forth that this solution had high efficiency and low error with rosy prospect about Deep-Learning and FPGA.

Key words：convolutional neural network; activation function; FPGA; polynomial approximation

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