Accepted Manuscript

High accuracy FPGA activation function implementation for neural networks

Zbigniew Hajduk

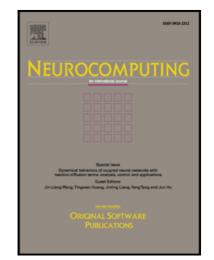
 PII:
 S0925-2312(17)30559-3

 DOI:
 10.1016/j.neucom.2017.03.044

 Reference:
 NEUCOM 18272

To appear in: Neurocomputing

Received date:8 August 2016Revised date:26 February 2017Accepted date:17 March 2017



Please cite this article as: Zbigniew Hajduk, High accuracy FPGA activation function implementation for neural networks, *Neurocomputing* (2017), doi: 10.1016/j.neucom.2017.03.044

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

High accuracy FPGA activation function implementation for neural networks

Zbigniew Hajduk

Rzeszów University of Technology, ul. Powstańców Warszawy 12, 35-959 Rzeszów, Poland.

e-mail address: zhajduk@kia.prz.edu.pl

Abstract This letter shortly presents an FPGA implementation method of the hyperbolic tangent and sigmoid activation functions for artificial neural networks. A kind of a direct implementation of the functions is proposed. The implementation results show that the obtained accuracy of the method is relatively high compared to other published solutions.

1. Introduction

The most important, expensive and hard to implement part of any hardware realization of artificial neural networks (ANNs) is a neuron's non-linear activation function [1]. A number of papers consider different field programmable gate arrays (FPGAs) implementation methods of the most commonly used hyperbolic tangent and sigmoid activation functions. For example, the piece-wise linear (PWL) interpolation is presented in [2, 3]. A look-up table (LUT) with a linear interpolation between the LUT's points is exercised in [4]. A study of polynomial approximation exercising Lagrange, Chebyshev and least square method is presented in [5]. The usage of the coordinate rotation digital computer (CORDIC) algorithm is featured in [1]. In this letter a kind of a direct implementation of the hyperbolic tangent and sigmoid activation functions. Applying a LUT with either the McLaurin series or Padé polynomials is proposed for the approximation realization. Instead of fixed point arithmetic, a single precision floating point (FP) arithmetic is used. The main goal of the proposed implementation method is to attain as high of an accuracy as possible.

2. FPGA implementation

Download English Version:

https://daneshyari.com/en/article/4947411

Download Persian Version:

https://daneshyari.com/article/4947411

Daneshyari.com