Journal of Advanced Research in Embedded System
Volume 7, Issue 2 - 2020, Pg. No. 11-13
Peer Reviewed Journal

Article

A Review on: Neuromorphic Computing

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How to cite this article:
Sharma AK, Rathore M, Kishore I et al. A Review on: Neuromorphic Computing. *J Adv Res Embed Sys* 2020; 7(2):11-13.

Date of Submission: 2020-05-01
Date of Acceptance: 2020-05-24

A B S T R A C T

New approaches new algorithms helps to form a good bond between the human brain and with the world. Artificial Intelligence mainly depends upon data analysis, as we know still our modern science computers are inefficient in fulfilling the three task analysing, classifying and recognizing the information. Neuromorphic computing is a new way to cover this gap by emulating certain aspects of brain function. The structure of brain is a combination of both computation and memory emulating neurons and synapses has the potential to achieve all requirements of next generation.

This new technology uses algorithms to support real-time learning with structure built on novel computing hardware to access specific user application. The main promise of this technology is to create a brain that has ability to learn and adapt in any atmosphere like human brain do. Neuromorphic structure is a combination of heteromorphic structure which shows the connection of chip and wires in the form of logic gates like our brain have neurons so the involvement of this structure give rise of neuromorphic structure .

Mainly the neuromorphic computing focus on matching a human brain flexibility, efficency and ability to learn and grab the things from physical environment with the energy efficiency of human brain. The computational building blocks within neuromorphic computing system are logically analogous to neurons. Spiking neural networks (SNNs) are a model for arranging those elements to emulate natural networks that exists in biological brains. The first generation of AI was rules base and emulated conventional judgment to draw reasoned wrapping up within a specific closely defined domain. It was well suited for monitor procedure and increase the competence and the second generation is principally focus on sensing and perception such as deep learning network to appraise the content of video frame. So principally we achieve that neuromorphic computing is helpful in making machine that is as much as competent like human brain. They are as early payment as human brain in all aspects.

Keywords: Neuromorphic,Spiking neural networks,algorithms

Introduction

This paper gives a complete view of the neuromorphic computing. This is founded on the principle that asynchronous systems can work in parallel-mimicking the efficiency of neuro-biological structures like human brain.[1]

Devising a machine that can collect info faster than human has been a powerful forces in computing for decades and von Neumann architecture plays a vital role in neuromorphic computing because it highlight the difference in structure and the power that is require for processing capabilities.[2]

For periods, computer scientists have doing lot of efforts to build machine as complex and efficient as the human brain.[3-4] world's most fastest supercomputer may compute four times faster than human brain and hold 10 times more data but it also sucks up enough electricity to power 10,000 homes . On the other hand human essential less liquid than a dim light bulb and the beauty is it convulsions agreeably within our skull. So we use von-Neumann architecture, a powerful logic core operates sequentially on data fetched from memory.[5] This system is very powerful as we know it scale to systems with 3,120,000 cores and 1.35 pebibyte of memory, this memory contain both data and instruction and CPU can fetch memory and perform operation on data but it can't do both at the same time but if you have multiple CPU you can perform this operation in parallel, but in case of human brain we have no idea how it works when the situation comes. The neuromorphic computing is quite large including researchers from variety of fields such as material science, neuro-science, electrical engineering, computer engineering, computer science engineering. Finally we conclude with a presumptuous looking perspective for neuromorphic computing and there are many more hurdles that are very hard to manage and solve.[6]

Neuromorphic system with spiking neural network (SNNs)

The neuromorphic computing includes the expansion of machineries whose function is analogous to part of the brain. Living nerve cells of the human brain have four major functional mechanisms that are:

- Synapses: electrochemical pulse enter the cell through tiny interface points called synapses.
- Dendrites: the synapses are scattered over the surfaces of tree root like fibres.
- Cell Body: the dendrites reach out into the surrounding nerve tissue,
- Gather pulse from the synapses, and conduct the pulse back to the heart of the neuron call cell body.
- Axon: a tree like fibre that conduct output pulses from the cell body into the nervous tissue, ending at synapses on other cells dendrites.

Neuromorphic devices compete with these functional of the human brain. The most basic modification between artificial neural network and biological brain is how information is transmitted to human brain. neuromorphic nodes send pulse sometimes it send string of pulse.[7] The main purpose of SNNs model is to draw intervention between spikes as if an image or data prototype triggers a memory cell.

Market Trends and Drivers

It can be explained in a table form as follows

Market Trend	Applic-ation	Capablities	NC as a GAP Filler
By 2018 one third part of world start projecting their own smart phone	Mobile comp-uting	Increased performance so that it can perform certain task	It enables edge computing
It will an economic impact up to $11.1	Auto-nomous sensing	Decreased power so that work can perform without internet	It enable intelligent decision
It expands in 2016 over 20.2% over the forecast period. Increased demand for AI for language processing and translation for non-linear control and robotics	Increased demand for AI	Increased performance at constant power density especially by thermal management.	It augments traditional processing with more power efficient computing capabilities.

Neuromorphic Computing: Innvoters and Leaders

Algorithms of neuromorphic can used in variety of hardware platform. They can be ranged from variety of digital and analog conventional processor optimised for machine learning. In present environment whole market exist for high performance computing applications.[7-8] So it suggests that the user in the market has to justify the capital investment of domain specific NC development.

It is reasonable to except the general consumer market for

high performance eventually NC blaze the trail on niche level market such as high performance.[8-11]

Neuromorphic Computing in Engineering

It is an various disciplinary topic that receipts data from biology, physics, mathematics, computer science and electronic engineering to artificial neural system such as vision system , head eye system , auditory computer and self-directed robots whose architecture and designs are grounded on individuals biological nervous system.[12-14]

Conclusion

Neuromorphic inspired or it aimed to meet the needs or demands of next generation as it is smarter, autonomous, power efficient and it is fruitful for every human being in storing every data and it is helpful in providing every information. Neuromorphic computing is a trending one and its growth rate is kept increasing day by day as human mostly depends on machine and neuromorphic is as fast as human brain .

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