

Artificial Brain Using Wetware Technology and Fuzzy Logic

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Abstract-- The Blue Brain Project is that the initial created comprehensive attempt to reverse engineer the brain of mammalian, so through elaborated simulations the perform of brain are often understood. BLUE BRAIN is that the name of the world's initial virtual brain which suggests, a machine that may perform as human brain. Today, scientists square measure in analysis to form a synthetic brain that may suppose, respond, take call, and store something in memory. the most aim of this analysis is to transfer human brain into machine. so man will suppose and take call with none effort. This technology is often used for the event of human society.

Keywords: Blue Brain, Artificial Neuron, Fuzzy Logic, Wetware Technology, Back Propagation.

I. INTRODUCTION

Technology has been progressing to a great extend such that even the human brains are being created artificially via the science of artificial intelligence. Intelligence refers to the ability to understand, think, react, interpret and predict the future to achieve and handle relationships, concepts etc. It helps in decision making, problem solving. Intelligence thus plays a very important role in survival and progress beyond the present. Artificial intelligence is the simulation of intelligence in machines which makes it behave like a human being. It is the research and design of intelligent agents where an intelligent agent is a system that perceives its environment and performs tasks that increase its chances of success.

The blue brain is created using the artificial neural network. On July 2005, the Brain Mind Institute and launched the Blue Brain Project. The aim of initiating this technology is to simulate the brains of mammals with a high level of biological accuracy and, ultimately, to study the procedures associated in the growth of biological intelligence. The Blue Brain Project plans to reverse engineer the human brain as a computer simulation. Researchers want to use this technology to develop new therapies for the brain diseases and new computer technologies. The concept of artificial neural network, fuzzy logic and the wetware technology is being used in the creation of the blue brain.

Organization: The paper is organized as follows. Related works is presented in section II. Our artificial neural network are in section III, followed by backpropogation algorithm in section IV. In section V, we discuss how wetware technology is helpful, followed by use of fuzzy logic in section VI. Section VII contains the blue brain technology implementation and results. In section VIII we discuss the applications of blue brain, followed by benefits and limitations of blue brain in section IX. We conclude at section X.

II. RELATED WORK

The Blue Brain System is a trial to reverse engineer the human brain and recreate it at the cellular level within a computer simulation in [5]. The project was supported in may 2005 by Henry-Markram at the EPFL in Lausanne, Switzerland [7]. Goals of the project are to achieve a whole understanding of the brain and to alter higher and quicker development of neurological disease treatments. The analysis involves finding out slices of living brain tissue using microscopes and patch clamp electrodes. Information is collected regarding all the various totally different neuron varieties. This information is employed to create biologically realistic models of neurons and networks of neurons within the cerebral cortex. The simulations are distributed on a Blue gene supercomputer engineered by IBM, therefore the name "Blue Brain". The simulation software package relies on Michael Hines's neuron, along with different customized elements. As of August 2012 the biggest simulations are of micro circuits containing around one hundred cortical columns such simulations involve close to one million neurons and one billion synapses. This can be regarding an equivalent scale as that of a honey bee brain. Hoped that a rat brain neo-cortical simulation are going to be achieved by the tip of 2014.

III. ARTIFICIAL NEURAL NETWORKS

It is an simplified brain model. The building blocks of neural networks are known as neurons as used in [8]. An artificial neuron may be a machine model impressed within the natural neurons. How does this artificial neural networks look is shown in Fig. 1. Natural neurons receive signals through synapses situated on the membrane of the neuron. once the signals received are sturdy enough, surpass a certain point, the neuron is activated and emits a signal though the axon. This signal may be sent to a different synapse, and would possibly activate different neurons.

every neuron receives inputs from several different neurons, changes its position base on the present input and send one output signal to many different neurons. The complexness of real neurons is extremely abstracted when modeling artificial neurons. These primarily contains inputs (like synapses), that are multiplied by weights (strength of the various signals), then computed by a mathematical relation that finds the activation of the neuron. Another function computes the output of the artificial neuron. ANNs combine artificial neurons in order to method info. Information is transmitted as a series of electric impulses, so-called spikes. The periodic and phase of these spikes encodes the information. In biological systems, one neuron is connected to as several as 10,000 different neurons. Usually, a neuron receives its info from different neurons in an exceedingly confined space, its alleged receptive field. The higher a weight of an artificial neuron is, the stronger the input that is multiplied by it'll be. Weights may be negative; therefore we are able to say that the signal is restrained by the negative weight. Looking on the weights, the computation of the neuron are totally different. By adjusting the weights of an artificial neuron we are able to acquire the output we want for specific inputs. However once we have an ANN of lots of or thousands of neurons, it'd be quite difficult to seek out by hand all the required weights. However we are able to notice algorithms which might alter the weights of the ANN in order to get the required output from the network. This method of adjusting the weights is named learning or training.

The number of kinds of ANN and their uses is extremely high. ANN uses back propagation algorithm to learn the weights. There are a large type of ANN that are used to model real neural networks, and study behavior and control in animals and machines, however additionally there are ANN that are used for engineering functions, like pattern recognition,

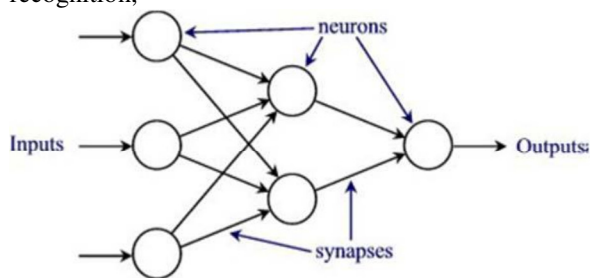


Fig. 1 Artificial Neural Network

There are six characteristics of Artificial Neural Network that are basic and necessary for this technology.

- 1) The Network Structure
- 2) parallel processing Ability
- 3) Distributed Memory
- 4) Fault Tolerance Ability
- 5) Collective solution

6) learning ability

IV. THE BACKPROPAGATION ALGORITHM

The backpropagation algorithm is employed in layered feed-forward ANNs. this implies that the artificial neurons are organized in layers, and send their Signals forward, then the errors are propagated backwards. The network receives inputs by neurons within the input layer, and therefore the output of the network is given by the neurons on an output layer. There could also be one or additional intermediate hidden layers.

The backpropagation algorithm uses supervised learning, which suggests that we provide the algorithm with samples of the inputs and outputs we want the network to compute, then the error is calculated. The aim of back propagation algorithm is to minimize this error, till the ANN learns the training information. The training begins with random weights, and therefore the goal is to adjust them so the error is minimal.

For practical reasons, ANNs implementing the backpropagation algorithm doesn't have too several layers, since the time for training the networks grows exponentially. Also, there are refreshment to the backpropagation algorithm which permit a quicker learning. The output isn't equal to or larger than the edge, the back propagation occurs and therefore the given are modified till we get the required output. Therefore artificial neural network plays a very necessary role in building the neurons and controlling the knowledge transmission among the neurons within the Blue Brain.

V. THE WETWARE TECHNOLOGY

Wetware is a term drawn from the computer-related plan of hardware or software package, however applied to biological life forms. Here the prefix "wet" may be a respect to the water found in living creatures. Wetware is employed to explain the elements like hardware and software package found in a person, specifically the central nervous system (CNS) and also the human mind.

The "hardware" part of wetware concerns the bioelectric and biochemical properties of the CNS, specifically the brain. If the sequences of impulses traveling across the varied neurons are thought of symbolically as software package, then the physical neurons would be the hardware.

A wetware computer is an organic computer (also referred to as an artificial organic brain or a neuro-computer) engineered from living neurons.

Wetware technology is just an interface between the natural neurons and also the artificial neurons. In the Blue Brain, the wetware used is a software package known as "Neuron". it's also been instructed that, within 10 years, individuals could also be able to purchase their own living

technology.

VI. FUZZY LOGIC

The method that people understand the world is frequently changing and can't continuously be defined in true or false statements. Consider example the set of all the apples and every one the apple cores within the world. Currently take one amongst those apples; it belongs to the set of all apples. Currently take a let out of that apple; it's still an apple right? If thus, it still belongs to the set of apples. When many additional bites are taken and you're left with an apple core and it belongs to the set of apple cores. At what point did the apple cross over from being an apple to being an apple core? What if you may get an additional let out of that apple core, will that move it into a distinct set?

The definition of the apple and apple core sets are too strictly defined once observing the method of eating an apple. The area between the 2 sets isn't clearly defined since the item cannot belong to the set of apples and apple cores as a result of, by definition; an apple core isn't an apple. The sets process apples and apple cores got to be redefined as fuzzy sets.

Fuzzy logic has some impressive applications in engineering. The most application of fuzzy logic in engineering is within the area of management systems. The definition of a control system, given by Richard Dorf in modern control Systems is: "An interconnection of elements forming a system configuration which will offer a desired response." this means that a control system must know the desired input and it needs to process this input and attempt to reach it.

A fuzzy controller may be counteracted into 3 main processes. the primary of those is that the fuzzification, this uses defined membership functions to method the inputs and to fuzzify them. These fuzzified inputs area unit then employed in the second half, the rule-based reasoning system. this method uses previously outlined linguistic rules to generate a fuzzy response. The fuzzy response is then defuzzified within the final process: defuzzification. This method can offer a true number as an output.

In Blue Brain, the fuzzy logic is what helps the human brain to take the choice. it's the logic that helps human to perform an action at the desired time. The choice is formed through the past experiences.

VII. THE BLUE BRAIN

Blue Brain is the world's 1st virtual brain to be developed. It can think like brain, take decisions based on past expertise and respond like natural brain. Consciousness is a part of natural world. we tend to believe that consciousness depends on arithmetic and logic, laws of physics and chemistry and biology; its not magical. The

concept of mind uploading is based on this mechanical view of the mind. It denies the pattern read of human life and consciousness. Eminent computer geniuses and neuro scientists have predicted that specially programmed machines are capable of thought and even reach some level of consciousness. Such machine intelligence ability would possibly provide a computational substrate necessary for uploading.

A. WHY DO WE WANT AN ARTIFICIAL BRAIN?

The brain and intelligence are alive even when the death. we frequently face difficulties in remembering things like individuals names, their birthdays, and therefore the spellings of words, correct grammar, necessary dates, history facts, and etcetera. within the busy life everybody desires to be relaxed. Can't we tend to use any machine to help for all these? Virtual brain is also a much better solution for it.

B. HOW IS IT POSSIBLE?

It is useful to explain the fundamental manners within which an individual may be uploaded into a computer. Raymond Kurzweil recently provided a remarkable paper on this subject. In it, he describes both invasive and noninvasive techniques. the foremost promising is that the use of terribly small robots, or nanobots. These robots are small enough to travel throughout our circulatory systems. Traveling into the spine and brain, they'll be able to monitor the activity and structure of our central nervous system. They'll be able to offer associate interface with computers that's as shut as our mind may be whereas we tend to still reside in our biological kind. All that's needed is a computer with massive enough storage space and process power.

C. HOW TO BUILD A BLUE BRAIN?

It involves the subsequent steps:

- Information collection

It involves grouping brain parts, taking them beneath a microscope, and gauging the form and electrical behavior of neurons individually. Capture the neurons by their form, electrical and physiological activity, website inside the cerebral cortex, and their population density. These observations ar translated into precise algorithms that describe the method, function, and positioning strategies of neurons. These algorithms are used to generate biologically-real looking virtual neurons prepared for simulation.

- Information Simulation

The simulation step involves synthesizing virtual cells using the algorithms that were found to describe real neurons. The algorithms and parameters are adjusted for the age, species, and disease stage of the animal being simulated. Each single protein is simulated, and there are a few billion of those in one cell. 1st a network skeleton is made from all the various styles of synthesized neurons. Then the cells are connected along consistent with the principles that are found by experimentation. Finally the neurons are functionalized and therefore the simulation

delivered to life. The patterns of emerging behavior are viewed with visualization software package. Example however the neuron look in visualization software package is shown in Fig. 2.

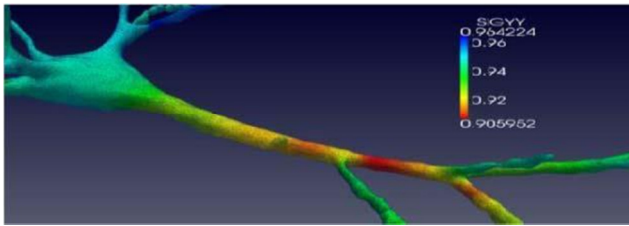


Fig. 2 Visualization of NEURON

VIII. APPLICATIONS

- Gathering and Testing 100 Years of Data.
- Cracking the Neural Code
- Understanding Neocortical Information Processing
- A Novel Tool for Drug Discovery for Brain Disorders
- A Global Facility
- A Foundation for Whole Brain Simulations
- A Foundation for Molecular Modeling of Brain Function.

IX. ADVANTAGES AND DISADVANTAGES

A. ADVANTAGES

- We can remember things without any effort.
- Making decision without the presence of a person is possible.
- We can Use the intelligence of a person after his/her death.
- Understanding the activities of animals is possible.
- Allowing the deaf to hear via direct nerve stimulation is achievable.

B. DISADVANTAGES

- We become dependent on the Computer.
- Others may use technical knowledge against us.
- Another fear is found today with respect to human Cloning.
- In addition there seem to be power constraints. The brain consumes about 20W of power whereas supercomputers may use as much as 1MW or an order of 100,000 more (Note: Landauer limit is 3.5×10^{20} op/sec/watt, at room temp.).

X. CONCLUSION

We believe that this is often right time to start assimilating the wealth of information that has been accumulated over past century and begin building the virtual

brain to grasp function and disfunction of brain. Finally we'll be able to transfer ourselves into a machine (computer) at some point. we tend to overcome the only drawback raised was combining biological and digital technologies. We believe that the connection with Blue Brain and Soul Catcher could exceed human intellectual capacity by around 2017, which it's seemingly that we'll be able to download the human brain at sometime around 2050.

XI. FUTURE WORK

Blue Brain technology may be utilized in totally paralyzed individuals to speak with the globe. Blue brain technology can be used in animal so as to search out their mental state and take precautions if any unfavorable or dangerous scenario happens. Blue Brain technology may be used to grasp the communication between the animals and to study additional regarding them.

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