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Survey on Artificial Life Brain

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Abstract: *Three components of a brain model operating on neuromolecular computing principles are described. The first component comprises neurons whose input-output behavior is controlled by significant internal dynamics. Models of discrete enzymatic neurons, reaction-diffusion neurons operating on the basis of the cyclic nucleotide cascade, and neurons controlled by cytoskeletal dynamics are described. The second component of the model is an evolutionary learning algorithm which is used to mold the behavior of enzyme-driven neurons or small networks of these neurons for specific function, usually pattern recognition or target seeking tasks.*

Keywords: *neuromolecular, cytoskeleton, perceptron,gyros,cortical.*

I. Introduction

An artificial brain (or artificial mind) is software and hardware with cognitive abilities similar to those of the animal or human brain.

Research investigating "artificial brains" and brain emulation plays three important roles in science:

1. An ongoing attempt by neuroscientists to understand how the human brain works, known as cognitive neuroscience.
2. A thought experiment in the philosophy of artificial intelligence, demonstrating that it is possible, at least in theory, to create a machine that has all the capabilities of a human being.
3. A long term project to create machines exhibiting behavior comparable to those of animals with complex central nervous system such as mammals and most particularly humans. The ultimate goal of creating a machine exhibiting human-like behavior or intelligence is sometimes called strong AI

The human brain is the central organ of the human nervous system, and with the spinal cord makes up the centralnervous system. The brain consists of the cerebrum, the brainstem and the cerebellum. It controls most of the activities of the body, processing, integrating, and coordinating the information it receives from the sense organs, and making decisions as to the instructions sent to the rest of the body. The brain is contained in, and protected by, the skull bones of the head.In the future, artificial intelligence will likely come from many sources, Nowozin says. "The ultimate question is whether there is a single type of intelligence that emerges under any substrate, or whether different substrates produce different outcomes.

This research produces insights into the fundamental questions of life, and yet it has very practical applications for robotics and other systems."Some critics of brain simulation believe that it is simpler to create general intelligent action directly without imitating nature. Some

Commentators have used the analogy that early attempts to construct flying machines modeled them after birds, but that modern aircraft do not look like birds. Although direct human brain emulation using artificial neural networks on a high-performance computing engine is a commonly discussed approach, there are other approaches. An alternative artificial brain implementation could be based on Holographic Neural Technology (HNeT) nonlinear phase coherence/ decoherence principles. The analogy has been made to quantum processes through the core synaptic algorithm which has strong similarities to the quantum mechanical wave equation.

The brain consists of millions of neurons and trillions of subsequent connections between them. In order to accomplish a particular task, each neuron fires either individually or as part of a group. According to the Connectionist model (McCulloch and Pitts, 1943) all neurons are connected to each other by synapses and renders a very logical explanation for the comportment of real neurons. But this model did not accommodate learning since the network formed by the interconnections was non-recurrent. To overcome such limitations, Frank Rosenblatt (1958) proposed a model called the Perceptron.

The perceptron is the basic unit of processing in a Neural Network and enables pattern recognition by accepting inputs in the form of associative units. These associative units select certain features on the basis of functions. Perceptron was meant for machines, but later on it evolved into programs and laid the foundation of neural network programming. The neural network has an inherent advantage of learning and adapting from its environment. This property makes it suitable for use in application of pattern recognition. Another property of

ANN is that it can build connectivity patterns based on error approximation. Their generalization property helps in identifying similar patterns in the test data.

This comprises of both supervised as well as unsupervised learning. Multilayer perceptron or feed forward net and radial basis function are the two main models and the rest of the models are their derivatives. Training algorithms developed into models are nothing but derivatives of approximation with the adaptation of weight values. According to benchmark methodologies. The data acquired 4 for each problem is categorized into three sets. The first is a training set which modifies the weight. The second is a validation set which stops the training process. It is used to improve the generalization performance as the validation error starts to increase, the training process comes to a halt.

The third is a testing set which is primarily used for prediction or pattern recognition. It uses the Jacobian matrix or the Hessian matrix with the gradient depending on the type of algorithm. The limitation of the Jacobian matrix lies in that it uses either the mean or the sum of squared error as its performance measure. The mean is a very generic measure of performance. A performance measure basically means a 'oneof-a-kind' distinguishing algorithm/mathematical index which effectively differentiates one entity from another. To understand variation of algorithms of ANN with an application, let's take an example.

The Back Propagation Algorithm (BPA) is commonly used in applications involving face recognition or face detection tasks. It is beneficial because it can train both the feed forward net and the recurrent net. It forms an arbitrary complex nonlinear mapping, though it fails to empirically understand the precise conditions to generate any arbitrary mapping procedure. The learning is slow and the number of hidden layers and neurons are unknown. Such disadvantages can be compensated for by using a second order derivative. It uses Hessian, δ 2E δω2 , of the error with respect to the weights to adapt the step size in the direction of the optimal weight update. To solve problem in computational and biological fields, ANN provides distinct training algorithms. For example, to classify Computed Tomography (CT) images there are three training algorithms. The first is a gradient descent algorithm which updates the weights and biases in the direction of the 5 negative gradient of performance function. Second, a conjugate gradient algorithm which adjusts the weights in the direction in which the performance function is decreasing very rapidly.

The third is the concept of the quasi-Newton algorithm that utilizes the fact that an objective function can be handled hurdled as a global variable, by the method of minimizing a sum of squares. There are multiple training functions and sub algorithms available in different algorithms for a specific function i.e. if at all a module requires higher convergence speed or if at all the paradigm lies within the realm of a pattern recognition problem. However, there are some causalities related to the function available, for instance, for the aforementioned criterion, the former will require a large storage and the later will fail miserably in the function approximation problem. Most of the learning algorithms are based on the gradient descent method while the others use a met heuristic approach.

This approach includes a global search strategy with a much more diverse solution. To resolve such problems, a novel hybrid approach is proposed. It joins the global met heuristic and local gradient based algorithms (Improved Opposition based Particle swarm optimization- Back Propagation algorithm (IOPSO-BPA)). The training time and accuracy of the proposed hybrid algorithm is calculated for eight benchmark problems and then compared with (BPA), (IOPSO) and IOPSO-GA (Genetic Algorithm). BPA needs more time and iterations to converge, but lesser number of dispersion solutions. IOPSP-BPA produces lesser number of dispersion solutions, but it is more stable in the case of variable starting conditions. In summary, in this section we introduced basic of ANN and its different training algorithms. In the upcoming sections, we will see ANN's contribution towards tremendous.

The cerebrum, consisting of the cerebral hemispheres, forms the largest part of the brain and overlies the other brain structures. The outer region of the hemispheres, the cerebral cortex, is grey matter, consisting of cortical layers of neurons. Each hemisphere is divided into four main lobes – the frontal lobe, parietal lobe, temporal lobe, and occipital lobe. Three other lobes are included by some sources which are a central lobe, a limbic lobe, and an insular lobe. The central lobe comprises the precentral gyros and the post central and is included since it forms a distinct functional role.

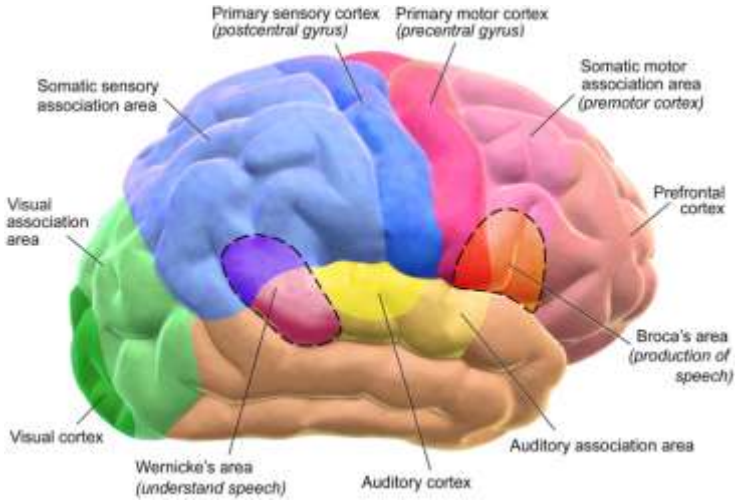

Figure1:- Brain

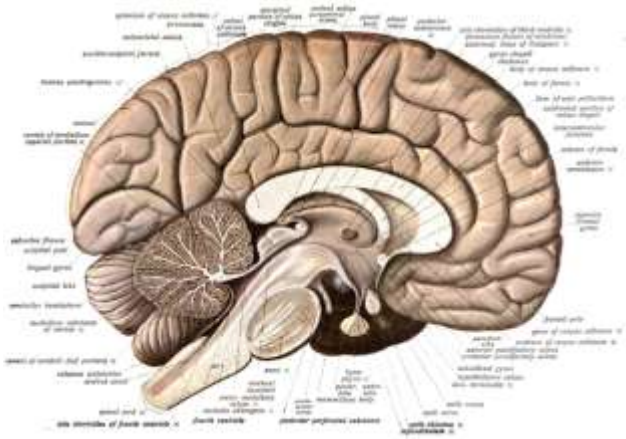

Figure 2: Brain Structure

II. Conclusion

To achieve this type of functioning, some agents, the agents of morphology, represent behaviors of aspectual agents that themselves represents the minimal elements of significance. The fact that the activity of a system is endowed of emotions founds finally on a strong coupling process between the computations that organize it and the representation of computations that permits the own-control of group of agents. The importance of such a process of coupling, binding the parts to the whole, binding groups of agents to their significance represented by agents of morphology, is strong. It is the fundamental principle of the functioning of systems that we called self-adaptive, and are to day the alone able to self-control complex systems. It generalizes the notion of feedback and systemic loop and go to the realizations of autonomous system essentially producing states by emergence.

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