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Blue Brain

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Abstract

Blue Brain – The name of the world's first virtual brain. That means a machine that can function as human brain. Today scientist are in research to create an artificial brain that can think, response, take decision, and keep anything in memory. The main aim is to upload human brain into machine. So that man can think, take decision without any effort. After the death of the body, the virtual brain will act as the man.

So, even after the death of a person we will not loose the knowledge, intelligence, personalities, feeling and memories of that man that can be used for the development of the human society. No one has ever understood the complexity of human brain. It is complex than any circuitry in the world. So, question may arise "Is it really possible to create a human brain?" The answer is "YES".

Because what ever man has created today always he has followed the nature. When man does not have a device called computer, it was a big question for all. But today it is possible due to the technology. Technology is growing faster than. very thing. IBM is now in research to create a virtual brain. It is called "Blue brain". If possible, this would be the first virtual brain of the world.

Keywords: Blue Brian,Technology.

1. Introduction

This BLUE BRAIN project was founded in May 2005 by Henry Mark ram at the EPFL in Lausanne, Switzerland. Goals of the project are to gain a complete understanding of the brain and to enable better and faster development of brain disease treatments. The research involves studying slices of living brain tissue using microscopes and patch clamp electrodes. Data is collected about all the many different neuron typesthis data is used to build biologically realistic models of neurons and networks of neurons in the cerebral cortex. The simulations are carried out on a Blue Gene supercomputer built by IBM, hence the name "Blue Brain". The simulation software is based on Michael Hines's NEURON, together with other custom-built components II. BLUE BRAIN The IBM is now developing a virtual brain known as the Blue brain. It would be the world's first virtual brain. Within 30 years, we will be able to scan ourselves into the computers. We can say it as Virtual Brain i.e. an artificial brain, which is not actually a natural brain, but can act as a brain. It can think like brain, take decisions based on the past experience, and respond as a natural brain. It is possible by using a super computer, with a huge amount of storage capacity, processing power and an interface between the human brain and artificial one. Through this interface the data stored in the natural brain can be up loaded into the computer. So the brain and the knowledge, intelligence of anyone can be kept and used for ever, even after the death of the person.

1.1. Why Do We Need A Virtual Brain:

Today we are developed because of our intelligence is the inborn quality that cannot be created. Some people have this quality so that they can think to such an extent where others cannot reach.Human society would always need such intelligence and such an intelligent brain. But the intelligence is lost along with the person after death. Virtual Brain is a solution to it. The brain and its intelligence can be alive even after death.

We often face difficulties in remembering things such as people's name, their birthday, and the spellings of words, proper grammer, important dates, history facts, and etcetera. A virtual brain can take away the extra stress we all face to remember things. It is a perfect technical solution to a very common human problem.

1.2. Working of Human Brain:

A. Sensory Input:

When our eyes see something or our hands touch a warm surface, the sensory cells, also known as Neurons, send a message straight to your brain. This action of getting information from your surrounding environment is called sensory input because we are putting things in your brain by way of your senses.

B. Integration:

Integration is best known as the interpretation of things we have felt, tasted, and touched with our sensory cells, also known as neurons, into responses that the body recognizes. This process is all accomplished in the brain where many, many neurons work together to understand the environment.

C. Motor Output:

Once our brain has interpreted all that we have learned, either by touching, tasting, or using any other sense, then our brain sends a message through neurons to effecter cells, muscle or gland cells, which actually work to perform our requests and act upon our environment.

2. Functioning Of Blue Brain

A. Sensory Input:

Receiving input such as sound, images, etc through sensory cell.

B. Interpretation:

Interpretation of the received input by the brain by defining states of neurons in the brain.

C. Motor Output:

Receiving of electric response from the brain to perform any action.

3. Need of Blue Brain:

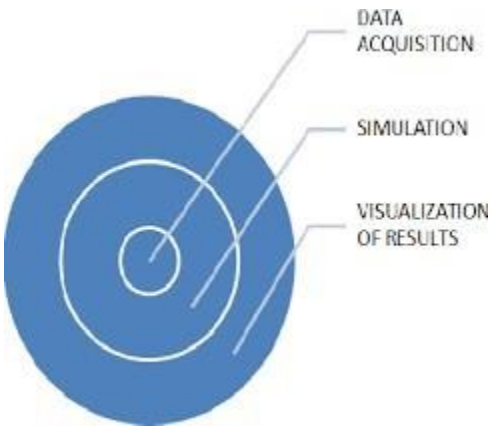
Human society is always in need of such intelligence and such an intelligent brain to have with. But the intelligence is lost along with the body after the death. The virtual brain is a solution to it. The brain and intelligence will be alive even after the death. We often face difficulties in remembering things such as people names, their birthdays, and the spellings of

words, proper grammar, important dates, history facts, and etcetera. In the busy life everyone wants to be relaxed. Virtual brain may be a better solution for it. Steps for Building A Blue Brain

A. Data acquisition

B. Data simulation

C. Visualization



A. Data acquisition:

It involves collecting brain portions, taking them under a microscope, and gauging the shape and electrical behavior of neurons individually. This method of studying and cataloguing neurons is very familiar and worldwide. The neurons are captured by their shape, electrical and physiological activity, site within the cerebral cortex, and their population density. These observations are translated into precise algorithms which describe the process, function, and positioning methods of neurons. Then, the algorithms are used to generate biologically-real looking virtual neurons ready for simulation.

B. Data simulation

It concerns with two major aspects: a. Simulation speed b.

Simulation workflow Simulation speed Simulations of one cortical column (more than 10,100 neurons) run about two hundred times slower than real time. It takes about five minutes to complete one second of stimulated time. The simulations display unevenly line scaling.

Presently the major seek is biological soundness rather than presentation.

After understanding biologically significant factors for a given effect it might be feasible to crop constituents that don't subsidize in order to advance performance. Simulation overflow making virtual cells using the algorithms, written to define and describe real neurons, is the major seek of this step. Algorithms and constraints are adapted according to the age, species, and disease stage of the animal being simulated. Each one of the protein is simulated. Note: there are hundreds of millions of proteins in one cell.

BBP-SDK:

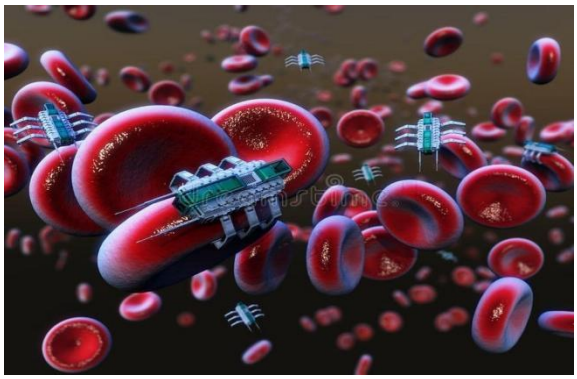
The Blue Brain Project - Software Development Kit, a set of Application Programming Interfaces allows the researchers to use and audit prototypes and simulations. The Blue Brain ProjectSDK is a C++ library wrapped in Java and Python. The primary software used by this for neural simulations is NEURON. Michael Hines of Yale University and John Moore at Duke University developed this in the starting of the 1990s. It uses C, C++, and FORTRAN. It is freely available open source software. The website makes everything available including the code and the binary data freely.

Michael Hines in cooperation with BBP team in 2005 ported the package into the massive and parallel Blue Gene.

C. Visualization of results

RT Neuron RT Neuron is the main application that Blue Brain Project uses for visualization of neural simulations. The BBP team developed this software internally. It is coded using C++ and OpenGL. RT Neuron is ad-hoc software written specifically for neural simulations, i.e. it can't generalize to other kinds of simulation. RT Neuron takes the output from Hodgkin-Huxley simulations as input in NEURON and delivers them in 3D. This allows the programmers and researchers to view as activation potentials propagate through or between neurons. The animations can be paused, stopped, started and zoomed, hence allowing the researchers to interact with the model. The visualizations are multi- scale (they can render individual neurons or a whole cortical column).

4. Uploading Human Brain:



The uploading is possible by the use of small robots known as the Nanobots .These robots are

small enough to travel throughout our circulatory system. Traveling into the spine and brain, they will be able to monitor the activity and structure of our central nervous system. They will

be able to provide an interface with computers that is as close as our mind can be while we still reside in our biological form. Nanobots could also carefully scan the structure of our brain, providing a complete readout of the connections. This information, when entered into a computer, could then continue to function as us. Thus the data stored in the entire brain will be uploaded into the computer.

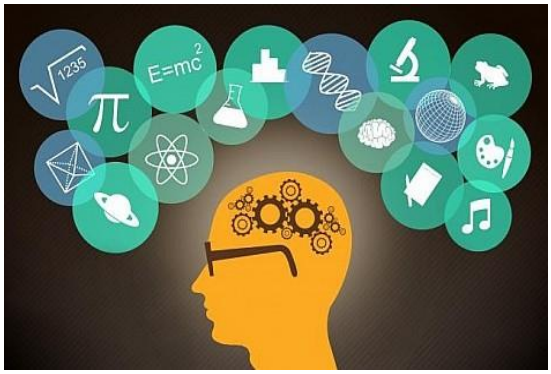
The "Blue Brain" & Human Consciousness:

- "Blue Brain"; offer a better understanding of human consciousness.
- It's an actual 'computer brain' that may eventually have the ability to think for itself.
- When it was first fed electric impulses, strange patterns began to appear with lightning - like flashes produced by 'cells' that the scientists recognized from living human and animal processes. "It happened entirely on it's own"
- This helped the scientists to understand the actual processing of the brain which arises the concepts of "Blue Brain".
- Blue brain acts as a computer that would operate at inconceivable speeds – something fast enough to simulate the human brain.
- A Blue brain aims to unlock the secrets of brain by using the brute power of a supercomputer.

5. Example of Blue Brain

- A very good example of utilization of blue brain is the case “short term memory”.
- In some movies we might have noticed that a person might be having short term memories.

- A another situation is when a person gets older, then he starts forgetting or takes a bit more time to recognize to a person.
- For the above reason we need a blue brain. It is a simple chip that can be installed into the human brain for which the short term memory and volatile memory at the old age can be avoided.



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.

Advantages of Blue Brain:

- Blue brain is an approach to store and utilize human intelligence and information present in the mind even after human demise.
- It is an important move towards self-decision making by the computer or machine that holds a Blue brain.
- Business analysis, attending conferences, reporting, etc. are very significant functions that an intelligent machine can do consistently.
- It can be used as an interface between human and animal minds. The BBP has become successful in rat and some other animals which is a sign of success.
- It a good remedy towards human disability like a deaf can get the information via direct nerve stimulation.

Disadvantage of Blue Brain:

- It increases the risk of human dependency on Blue Brain every time.
- Once a Blue Brain related to a particular person's neural schema is hacked, the brain could be used against the very person.
- Since it an approach to make machines intelligent and thoughtful it increases the risk of machines conducting war against human (like we have been watching in the movies like Terminator, Universal soldier, etc.)

6. Merits and Demerits

With the blue brain project the things can be remembered without any effort, decisions can be made without the presence of a person.

Even after the death of a man his intelligence can be used. The activity of different animals can be understood. That means by interpretation of the electric impulses from the brain of the animals, their thinking can be understood easily. It would allow the deaf to hear via direct nerve stimulation, and also be helpful for many psychological diseases. Due to blue brain system human beings will become dependent on the computer systems. Technical knowledge may be misused by hackers; Computer viruses will pose an increasingly critical threat. The real threat, however, is the fear that people will have of new technologies. That fear may culminate in a large resistance. Clear evidence of this type of fear is found today with respect to human cloning. What can we learn from Blue Brain? Detailed, biologically accurate brain simulations offer the opportunity to answer some fundamental questions about the brain that cannot be addressed with any current experimental or theoretical approaches. Understanding complexity at present, detailed, accurate brain simulations are the only approach that could

allow us to explain why the brain needs to use many different ion channels, neurons and synapses, a spectrum of receptors, and complex dendritic and axonal arborizations.

7. Future Prespective

The synthesis era in neuroscience started with the launch of human brain project and is inevitable phase triggered by a critical amount of fundamental data. The data set does not need to be complete before such a phase can begin.

Detailed models will probably become the final form of databases that are used to organize all knowledge of the brain and allow hypothesis testing, rapid diagnoses of brain malfunction as well as development of treatments for neurological disorders. In short, we can hope to learn a great deal about brain function and dysfunction from accurate models of the brain. A model of the entire human brain at the cellular level will probably take the next decade. As with deep blue, Blue Brain will allow us to challenge the foundations of our understanding of intelligence and generate new theories of consciousness.

8. Conclusion

In conclusion, we will be able to transfer ourselves into computers at some point. Most arguments against this outcome are seemingly easy to circumvent. They are either simple minded, or simply require further time for technology to increase. The only serious threats raised are also overcome as we note the combination of biological and digital technologies.

While the road ahead is long, already researches have been gaining great insights from their model. Using the Blue Gene supercomputers, up to 100 cortical columns, 1 million neurons,

and 1 billion synapses can be simulated at once. This is roughly equivalent to the brain power of a honey bee. Humans, by contrast, have about 2 million columns in their cortices. Despite the sheer complexity of such an endeavor, it is predicted that the project will be capable of this by the year 2023.

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