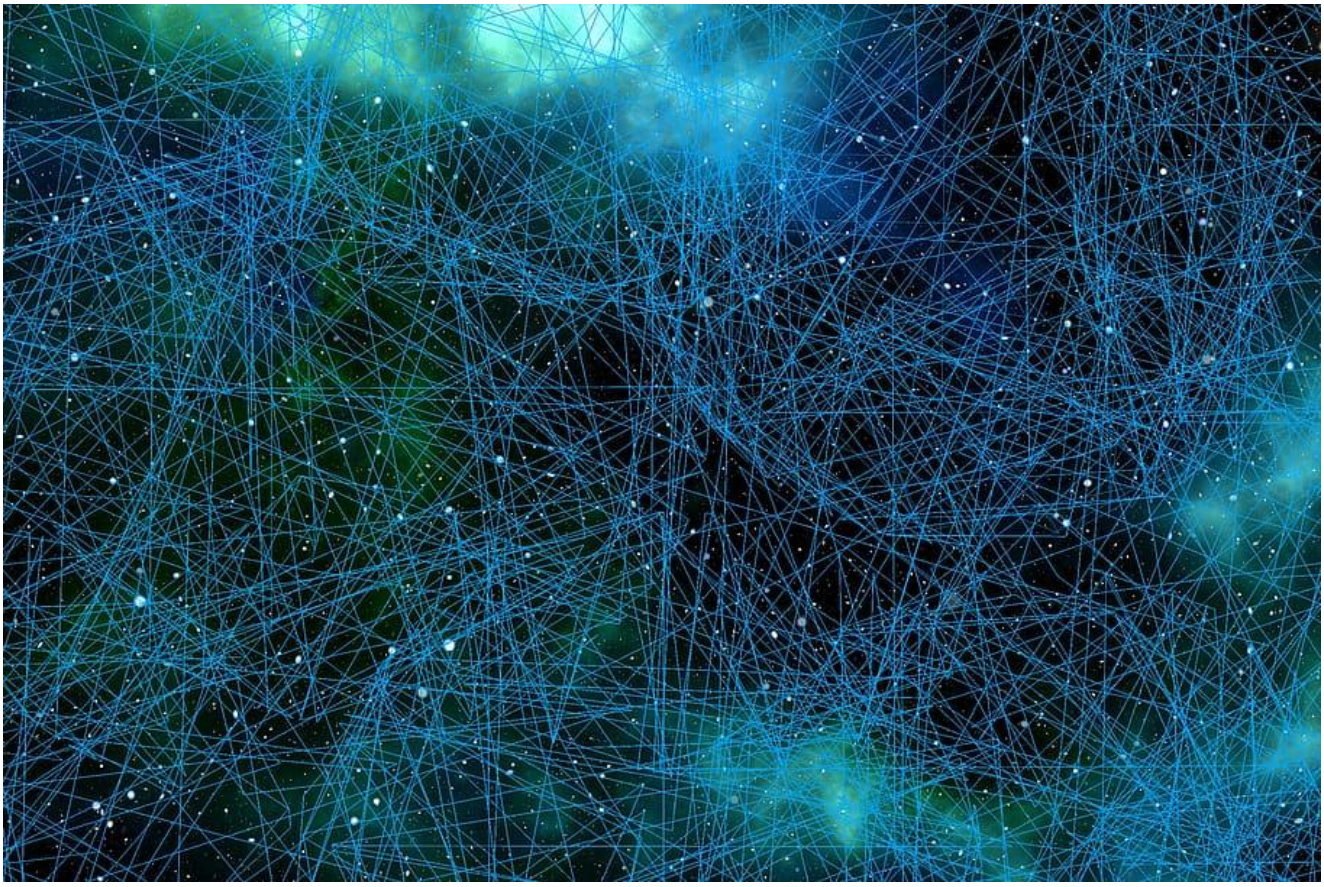

BLUE BRAIN TECHNOLOGY

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ABSTRACT

The world's first virtual brain is known as Blue Brain. That is, a machine can perform the functions of a human brain. Scientists are currently working on developing an artificial brain that can think, respond, make decisions, and remember anything. The primary goal is to upload a human brain into a machine. So that man can think and make decisions without exerting any effort. Following the death of the body, the virtual brain will assume the man's role. So, even after a person's death, we will not lose the knowledge, intelligence, personality, feelings, and memories of that person, which can be used to advance human society. Reverse engineering is a fundamental notion that entails incorporating the human brain and recreating it at the cellular level within a full simulation. The objective of Blue Brain technology is to collect all available brain information, increase global reverse engineering research efficiency, and construct a full theoretical framework.

Key Words: Blue-brain, Neurons, sensory Nanobots, artificial neurons

INTRODUCTION:

Although humans do not survive for thousands of years, the knowledge in their heads may be kept and used for thousands of years. Intelligence is defined as the capacity to comprehend, think, act, interpret, and forecast the future in order to attain and manage relationships, concepts, and so on. It facilitates decision-making, problem-solving, learning, and thinking. Thus, intelligence plays a critical role in surviving and progressing beyond the present. Blue Brain technology is useful in this activity.

The Blue Brain Project is a brain research initiative based in Switzerland that seeks to upload the human brains into machines. The Brain and Mind Institute of the École Polytechnique Fédérale de Lausanne (EPFL) in Switzerland began the project in May 2005. Its objective is to determine the underlying principles of brain structure and function using physiologically precise digital reconstructions and simulations of the mammalian brain.

The project is led by Henry Markram, who also founded the European Human Brain Project, and co-directed by Felix Schürmann, Adriana Salvatore, and Sean Hill. The simulation combines a physiologically accurate model of

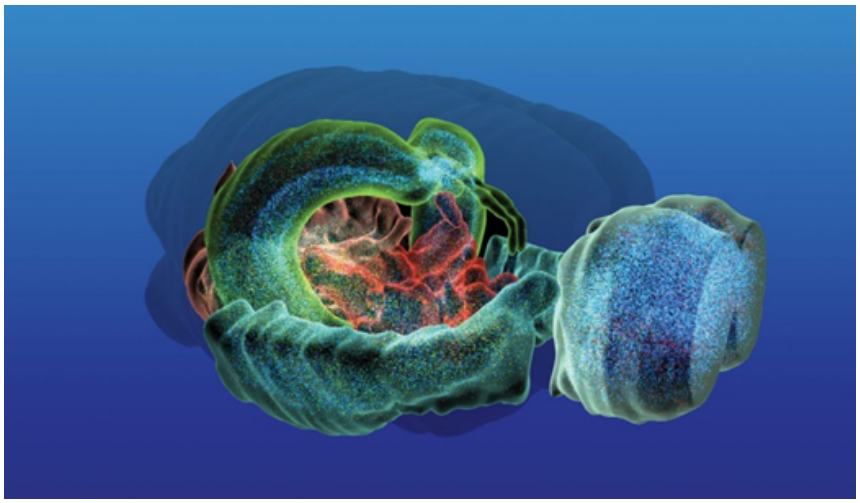
neurons and an experimentally rebuilt model connectome on a Blue Gene supercomputer using Michael Hines' NEURON program.

The aim of introducing Blue brain is to enable extremely fast development of recovery measures for Brain diseases. This has been a very useful tool for Short term memory patients. They can recollect their lost information through this feature. Research-based on this is done on actual living brains, slicing down human brain tissues and applying Microscopes and Clamp electrodes for detailed study. Data from each neuron are collected. The real role of International Business Machines (IBM) is to regenerate a neuron model for this project.

As of August 2012, the largest simulations involve approximately 1 million neurons and 1 billion synapses in microcircuits containing around 100 cortical columns. This is roughly the same size as a honeybee brain. A rat brain neocortical simulation (21 million neurons) was completed by the end of 2014. If sufficient funding is obtained, a full human brain simulation (86 billion neurons) should be possible by 2023. The research involves simulating the human brain and studying its biological accuracy and intelligence

BLUE BRAIN:

Blue Brain is solely dedicated to developing a physiological simulation for biomedical applications. That is a machine that can perform the functions of a human brain. To accomplish this, we must upload the human brain into the machine. As a result, a machine can assist a man in thinking and making decisions without exerting any effort. Following the death of the body, the virtual brain will assume the man's role. The reverse engineering process of the human brain is implemented in the virtual brain. Nobody has ever fully comprehended the complexity of the human brain. It is more complicated than any other circuitry on the planet. It is possible by using a supercomputer, with a huge amount of storage capacity, processing power, and an interface between the human brain and the artificial one. It can think like the brain, take decisions based on past experience, and respond as a natural brain. Eminent computer geniuses and neuroscientists have foretold that specially programmed machines will be capable of thought and even reach some level of consciousness.



STEPS TO BUILD A BLUE BRAIN:

I. Data collection

II. Data simulation

III. Visualization

I. DATA COLLECTION:

It involves collecting brain sections, examining them under a microscope, and gauging the shape and electrical behavior of individual neurons. This method of studying and cataloging neurons is well-known and widespread. The neurons' shape, electrical and physiological activity, location within the cerebral cortex, and population density are all captured. These observations are converted into precise algorithms that describe the neuron's process, function, and positioning methods.

The algorithms are then used to generate biologically realistic-looking virtual neurons that are ready for simulation. A 12-patch clamp instrument is used to study the electrophysiological behavior of neurons, and it is the foundation of the research and was developed specifically for this project.

II. DATA SIMULATION:

In the 1990s, a software package is known as NEURON was developed by Michael Hines. This is used for neural simulations. It is written in languages like C, C++, and FORTRAN.

It concerns two major aspects:

i . Simulation speed

ii . Simulation workflow

i . SIMULATION SPEED:

Simulations of a single cortical column (more than 10,100 neurons) run about 200 times slower than in real-time. One second of stimulated time takes about five minutes to complete. The simulations show unequal line scaling.

Biological soundness, rather than presentation, is currently the primary goal. After determining the biologically significant factors for a given effect, crop constituents that do not subsidize performance may be feasible.

ii . SIMULATION WORKFLOW:

The main goal of this step is to create virtual cells using algorithms written to define and describe real neurons. Algorithms and constraints are tailored to the age, species, and stage of disease of the animal being simulated. Each protein has been simulated. One cell contains hundreds of millions of proteins.

a. First, a network skeleton is constructed using all of the different types of synthesized neurons.

b. The cells are then joined using the experimentally discovered rules.

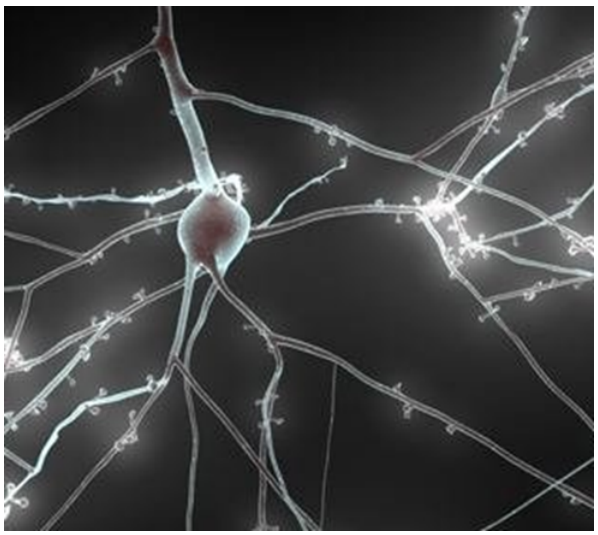
c. Finally, the neurons are activated, and the simulation comes to life.

Visualization software is used to monitor the blueprints of emerging behavior.

III. VISUALIZATION

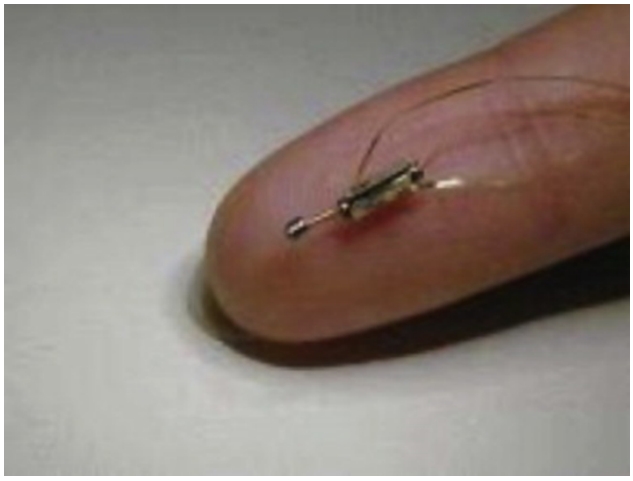
Blue Brain Project's primary application for visualizing neural simulations is RT Neuron. This software was created internally by the BBP team. It is written in C++ and OpenGL. RT Neuron is a piece of ad-hoc software designed specifically for neural simulations; it cannot be generalized to other types of simulation. In NEURON, RT Neuron takes the output of Hodgkin-Huxley simulations as input and renders it in 3D. This enables programmers and researchers to observe the propagation of action potentials through or between neurons. The researchers can interact with the model by pausing,

stopping, starting, and zooming the animations. The visualizations are multi-scale in nature.



HOW TO UPLOAD IN HUMAN BRAIN:

The uploading is made possible by the use of Nanobots, which are small robots. These robots are small enough to circulate throughout our bodies. They will be able to detect the activity and structure of our central nervous system as they travel through the spine and brain. They will be able to provide an interface with computers that are as close to our minds as they can be while we are still in our biological form. Nanobots can also scan the structure of our brains and provide an accurate readout of the connections. When the information is entered into a computer, it can continue to function as if it were us. As a result, the data can be stored throughout the brain before being uploaded to the computer.



HARDWARE AND SOFTWARE REQUIREMENTS:

- 22.8 TFLOPS peak processing speed.
- 8,096 CPUs at 700 MHz (downgraded to handle massively parallel processing).
- 256MB to 512MB memory per processor.
- Linux and C++ software.
- 100 kilowatts power consumption.
- Very powerful Nanobots to act as the interface between the natural brain and the computer.
- A supercomputer
- A program to convert the electric impulses from the brain to input signal, which is to be received by the computer, and vice versa.

NATURAL BRAIN VERSUS ARTIFICIAL BRAIN

NATURAL BRAIN	ARTIFICIAL BRAIN
INPUT: Through the natural neurons	INPUT: Through the silicon chip or artificial neurons
INTERPRETATION: By different states of the neurons in the brain.	INTERPRETATION: By a set of bits in the set of register.
OUTPUT: Through the natural neurons.	OUTPUT: Through the silicon chip.
PROCESSING: Through arithmetic and logical calculations.	PROCESSING: Through arithmetic and logical calculation and artificial intelligence.

MEMORY: Through permanent states of neurons.	MEMORY: Through secondary memory

PROGRESS OF THE PROJECT TABLE:

YEAR	PROGRESS
2005	The 1st cellular model was finished and therefore the project printed its first results in scientific format.
2007	Completed building the full cortical column of a rat.
2008	The 1st synthetic cellular neocortical column with 10,000 cells became constructed.
2010	Scaled up the project from the rat brain to the human brain. The project was given an obvious name “The Human Brain Project”.
2011	A cellular circuit of hundred neocortical columns with million cells was built
2015	EPEL developed a model for the relationship between the glial cell astrocytes and neurons that describes managing the energy of the brain through NGV [Neuro-glial Vascular Unit].
2017	Neural cliques linked to at least each other as many as 11 dimensions were discovered using algebraical topology.

2018	The Blue brain project launched its first digital 3-D neuron atlas with positions in 737 areas of the brain.
2019	Idan Segev, a computational neuroscientist engaged on the Blue brain venture stated that the complete cortex for the mouse brain turned into complicated and digital encephalogram experiments would begin soon
2020	They improve upon the performance modeling techniques used in brain tissue simulations. They create analytical performance models based on brain tissue simulations, demonstrating the viability of full brain tissue simulations.
2022	The Blue Brain Project at EPFL has discovered a way to automatically draw neurons in 3D using only mathematics, implying that we are getting closer to being able to create digital twins of brains.

APPLICATIONS:

- Collecting and testing data spanning 100 years.
- Deciphering the Neural Code
- Gaining an Understanding of Neocortical Information Processing
- A Novel Drug Discovery Tool for Brain Disorders
- Establishing a Global Facility
- A Foundation for Whole-Body Simulations
- A Basis for Molecular Modeling of Brain Function

ADVANTAGES

- Blue brain is a method of storing and utilizing human intelligence and information present in the mind even after the death of the human.
- It is a significant step toward self-decision-making by a computer or machine equipped with a Blue brain.

- Business analysis, conference attendance, reporting, and other important tasks that an intelligent machine can perform consistently.
- It can act as a bridge between human and animal minds. The BBP has proven to be effective in rats and a few other animals, which is a good sign.
- It is an effective treatment for human disabilities, such as deafness, as information can be obtained through direct nerve stimulation.

DISADVANTAGES

- Computer viruses will become a more serious threat.
- Data can be manipulated and misapplied.
- People will become completely reliant on computers if it is implemented.
- Another source of concern is human cloning.

CONCLUSION:

If the blue brain project is successful, it will change many things around us and boost the field of research and technology. Certain types of research and development can take decades or even centuries to complete, so a scientist's knowledge and efforts can be preserved and used in his absence. Simultaneously, replicating the complex brain system into a computer is a difficult task. This could take anywhere from several years to decades