BLUE BRAIN: AN ARTIFICIAL BRAIN SURVEY

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Abstract: God's most wonderful creation is the human being. But, has anybody ever thought what makes him unique among his species? It is a person's brain. This brain allows man to execute activities something no other animal can. The world largest first virtual brain, known as "Blue Brain," is a computer that can simulate the functioning of the human brain. An artificial brain is presently being developed by scientists. The main objective is to turn a brain function into a machine. In order for a person to think and make judgments without expending excessive effort. The synthetic brain will take over the job of the man after the real body has died. As a consequence, we will still not lose access to a person's knowledge, intellect, personality, feelings, or memories after their death, which may be used to enhance human civilization.

Keywords: Blue Brain, Fuzzy Logic, Natural Brain, Nanobot's Method, Wetware Method.

1. INTRODUCTION

Blue Brain is the name given to IBM's supercomputer. Blue brain, on the other hand, is a virtual brain that can do human-like functions. A virtual brain, also known as an artificial brain, is software or hardware that works in the same way as the organic human brain. This can be accomplished via reverse engineering techniques. It makes decisions based on a person's previous experiences and applies them to a current situation. We can upload our minds into blue brain with the help of blue brain. It is extremely tough to comprehend the human brain, which is the most challenging circuit to comprehend. It is now possible to build a virtual brain. The same data may have been utilized to help civilization progress. The project's goals are to get a thorough knowledge of the brain so that better and quicker therapies for brain illnesses may be developed [1]–[3].

1.1.Importance of Virtual Brain.

Intelligence is an innate quality that cannot be taught. This skill exists in certain individuals, and their mental capability allows them to conceive at an advanced rank than others. People commonly have difficulty remembering details such as similar words, birthdate, word constructions, proper grammar, and significant events in history, and so on and so on. In today's hurried environment, everyone wants to unwind. To keep someone's knowledge, expertise, and competence for an endless period of time. To be able to recall information quickly and easily. To keep the data safe, it can be retrieved at any time. After death, the brain and intelligence will continue to exist [4], [5].

Disease simulation and assessment innovation - These simulations might be used to test ideas regarding the pathology of pathological and mental diseases, as well as design and test novel treatments. Providing a digital logic console - Detailed models might show advanced schematics that could be incorporated into computer processors and employed as intelligence devices in industry.

Discovering complexities - For the foreseeable being, using sophisticated, exact brain models is the only method to explain why because the brain needs so many distinct ion channels. Researchers may use this strategy to retrace the steps followed by a called neurons in the creation of electronic states that represent the gene and its surroundings. Defining the fundamental components' functions- A complete model will allow precision control of both of these elements but also a system-level examination of their impact to emergent behavior [6], [7].

1.2.Human brain functioning

The human capacity to feel, understand, such as seeing in browser equations is controlled by the magical nerve system. Although we cannot see the nerves and muscles, it operates by delivering electric impulses from the brain. One of the most "complexly constructed" electron systems on the planet is the nervous system. Engineers haven't even come close to replicating the nervous systems delicate and accurate circuit boards and processors. To comprehend this system, one must first grasp the three basic roles it performs: sensory input, integration, and

motor output. The system's three components are sensory input, integration, and motor output.

1.3.Sensory Information:

When our eyes see something or our fingers contact a warm surface, sensory cells, also units called Neurons, send a message to the brain. This operation of gathering information from your surrounds is referred to as sensory input since we are sending things into your brain via your senses.

1.4.Integration:

Integration is the process of converting what we've felt, experienced, and contacted with our sensory neurons, also described as neurons, into reactions that the body recognizes. All of this involves cognitive, where a great number of neurons work together to comprehend the environment.

1.5.Output of the motor:

Once our brain has processed all of the information we've gathered, whether by touch, taste, or any other sense, it communicates with b lymphocytes, such as nerve or tissues throughout the body, which deliver out our commands and act on the atmosphere.

1.6.Comparison between Natural Brain and Simulated Brain

Photoreceptor cells, also individual neurons, convey a sensory information to the brain when human eyes see what's or our fingers touch a warm surface, and the brain responds in a manner that the body knows. This is all done in the brain, where a large number of neurons collaborate to understand the world [8].

Table 1: Illustrated the Comparison of natural brain and virtual brain

Human Brain	**Blue Brain**
Input: Sensory cells get the input from the body. This sensory cell sends out a variety of electrical impulses, which are picked up by neurons. These electrical impulses are carried to the brain by neurons.	Input: These neurons have been studied to see if they can receive input from sense cells. As a consequence, these prosthetic neurons connect physical impulses from sensory cells.
Interpretation: Within the brain, certain states of multiple neurons are used to interpret information.	Interpretation: Registers can be used to interpret the electrical impulses received by the artificial neuron
Processing: We consider a number of factors while making a decision. else we'll make the figures, sensible and logical arithmetic the computations in our midst Circuit of the brain. The knowledge gained throughout Previous memories as well as the existing signal inputs employed, and the condition of peculiar. There are neurons present. changed in order to generate output	Processing: Similarly, computer decision-making can be performed using stored states and received information, as well as arithmetic and logical calculations. To provide the output, specific neurons are changed.
Output: Dependent on the conditions of the neurons, the brain transmits electrical impulses that signify the replies that our somatic immune cells start receiving in connection to neural connections at this moment.	Output: Guess it depends on the cashier's settings, the output signal may be directed to perceptron in the corpus that are processed by the sensory cell.
Memory: Certain neurons in our brain are inextricably linked to different situations. Our brain can represent this condition if appropriate, and we can recall events from the past. We compel neurons to exhibit particular	Memory: Our brain's neurons are inextricably linked to specific situations. Our brain can represent this condition if appropriate, and we can recall events from the past. We compel neurons to exhibit particular states

states of the brain forever or for any intriguing or significant subject in order to remember things. This occurs unintentionally.	of the brain forever or for any intriguing or significant subject in order to remember things. This occurs unintentionally.

1.7.Building of Virtual Brain

To build virtual brain follow this instruction. Three steps are required to build the virtual Brain: Collecting data: During data gathering, the shape and release of energy of neural activity are determined which involves placing brain slices under a microscope. Morphology, or the shape of neurons, is being studied. This approach of researching and classifying neurons is well-known and widely used throughout the world.

Simulations on a computer: It builds a model that more correctly and effectively measures the many results observed during various electrochemical processes.

1.8.The simulation has two dimensions:

Simulation time: Simulations of a single cortical column (more than 10,100 neurons) operate at around 200 times the speed of in real time yet another second of heightened time takes around five minutes to complete. In the computer simulations, there may be uneven line scaling. Biological soundness is currently the most sought-after quality. It may be possible to harvest ingredients that do not subsidize in order to enhance performance after biologically significant factors for a certain effect have been identified [9].

Simulation Workflow: Virtual cells are created during the simulation procedure. To begin, a network skeleton is constructed using all of the generated neurons. The cells are then connected using the rules discovered through experimentation. The simulation is finally brought to life after the neurons have been functionalized.

1.9. The Outcome's Visualization:

Individual neurons or complete networks can be rendered in the multi-scale visualizations the image on the right was created using RT Neuron. A lot of data is generated by the Blue Brain simulation. Individual neuron evaluations must be conducted hundreds or thousands of repetitions. Multicore computing, that were used to create data, may be used to analyze it. The inquiry should include a visual evaluation of the circuit.

1.10. Nanobot's Method:

Human brains can be uploaded using nanobot's, which are little robots. These robots are tiny enough to roam about freely inside the body simulation). They will be able to monitor the functioning and composition of our nerve cells by traveling into the column and brain. They will have the ability to communicate with machines. Nanomaterials may also be able to examine the physiology of our brains, giving us a full picture of the relationship. When this data is given into a technology, it will behave similarly to how we do. On the screen, the knowledge out from brain will be presented. Figure 1 shows the nanobot's in the system.

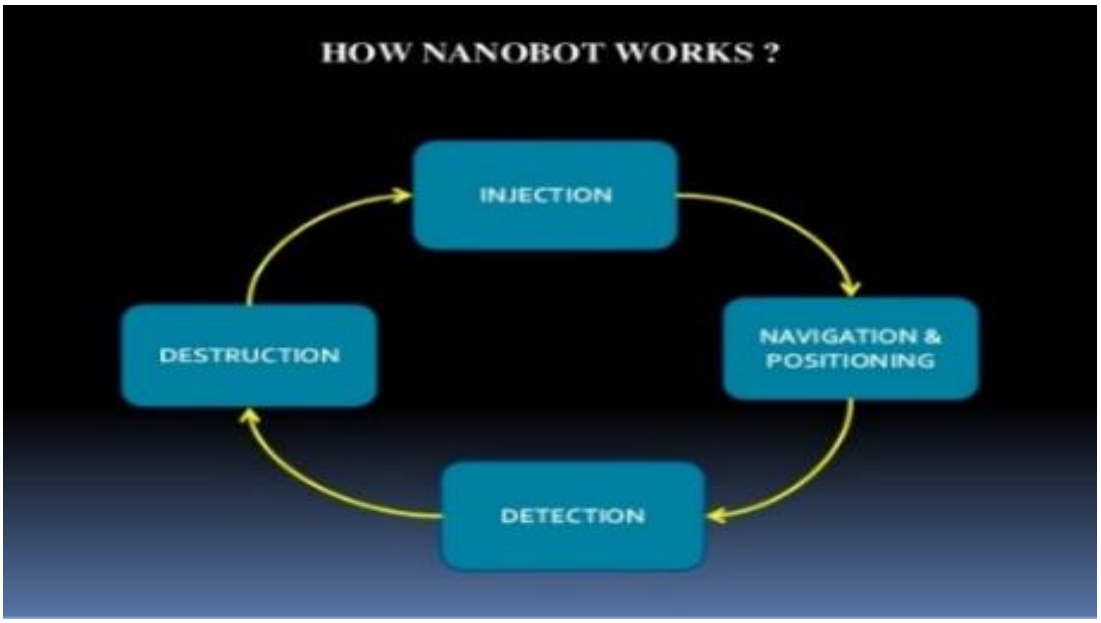

Figure 1: Illustrated the Nanobot's in human brain work

1.11. The Wetware Methodology:

The phrase "wetware" is derived from the computer terms "hardware" and "software," but it refers to biological life forms. Wetware technology is nothing more than a connection between natural and artificial neurons. The term "wetware" refers to the aspects of a person's central nervous system (CNS) and cognition that are analogous to hardware and software. Using wetware technology, a sample of grey matter is now put on a 60-electrode computer chip where the microchip should have been. They are linked to technology devices that conduct a range of tasks. That gadget is now living, thinking, making choices, and solving issues creatively. Scientists are really witnessing a brain grow and change in actual time, which might provide new insights into how our brains function but also how we recover. In addition to thinking creatively about technology and automated devices, this technology may give insights into cures for mental illnesses that experts have now been studying on for decades. Figure 2 disclose the wetware system.

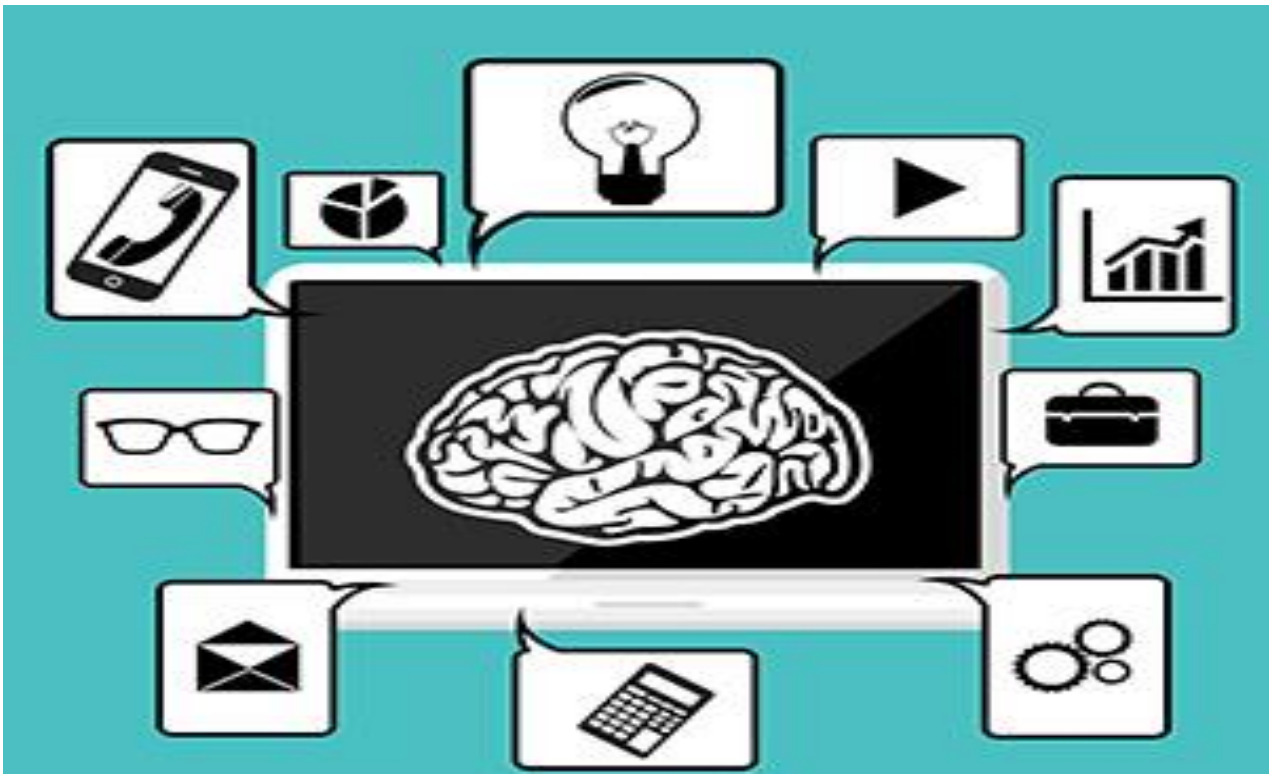

Figure 2: Illustrated the Wetware Methodology.

2. DISCUSSION

2.1. Fuzzy Logic:

In Blue Brain, fuzzy logic aids the human brain in making a decision. It is logic that assists humans in performing an action at the appropriate time. Previous experiences influence the decision. Fuzzy logic is a kind of logic that closely resembles human thinking. FL's algorithm based on how people make choices, and it takes into account all possibilities between its electronic signals YES and NO. A computer can understand a classical logic block, which takes precise input and outputs TRUE or FALSE, which is the human equivalent of YES or NO. Three major processes constitute a fuzzy controller. The first method is fussification, which processes and fuzzes inputs by using defined membership functions. The second component, the rule-based inference system, makes use of these fuzzed inputs. To generate a fuzzy response, this system employs previously stated linguistic rules. In the final step, defuzzification, the fuzzy response is defuzzified. As a result of this procedure, an actual number will be produced. The fussification Module is in charge of converting the crisp numbers in the system into fuzzy sets [10], [11].

2.2.Most Effective Method:

The wetware methodology, in my opinion, is the ideal methodology. Wetware technology has the power to think, make decisions on its own, and, most remarkably, solve problems imaginatively, which no other technology has ever done before. A living-neuron computer is a type of wetware computer (also known as an artificial organic brain or a neurocomputer). This technology is now being used to combine human neurons with computers, resulting in neural networks that can develop in the same manner as brains do, forming new pathways and learning new skills.

- In Wetware, a new breed of fast and flexible computers that can figure out how to solve problems on their own rather than being told what to do. In other areas of technology, we must instruct them on how to complete the task.

- In another technique, typical computers require 100% accurate data to arrive at the proper result each time. A wetware (biologic) computer, on the other hand, will arrive to the correct answer based on incomplete data by filling in the gaps.

- The device the team created in Wetware can "think for itself" since the neurons can build their own connections with one another. Because of its adaptability, the biological computer devises its own solution to the problem. In another technique, ordinary silicon computers only make the connections that the programmer instructs them to establish.

- In Wetware, we don't need to teach the cell any new tricks; all we have to do is place the old ones in the appropriate order.

Data Collection and Testing for the Last 100 Years: The most immediate advantage is having a design concept within which the preceding 100 years of knowledge on the microstructure structure and function of something like the neo cortical paragraph can be included and evaluated.

2.3.A Novel Approach to Drug Development in Neurodegenerative Disorders:

Understanding the NCC's multiple components and pathways would provide a solid basis for investigating the basic cell and synaptic foundations of a variety of mental conditions [12], [13].

2.4.Discovering the Neural Code's Secrets:

The Neural Section establishes how the brain uses electrical patterns to build an item. The NCC is the primary network for computing in the neocortex. In order to comprehend how the neocortex accumulates, processes, and discloses information, a precise copy of the NCC that creates the electric dynamism of the genuine microcircuit must be built.

2.5.Whole-Brain Simulation Framework

Current and future modern techniques are therefore unable to replicate the whole cellular and synaptic complexities of a human brain

2.6. Global Facility

Using a software clone of an NCC, researchers will be able to investigate theories of brain function and dysfunction, which will speed up science. Using an innovative 2D, 3D, and 3D immersive visualization technology, several facts about brain dynamics during information processing, storage, and retrieval will be "imagined."

2.7.Understanding Neocortical Information Processing

An effective simulation's strength is its capacity to provide predictions about the neo cortex. In order to produce an accurate duplicate of the NCC, iterations between simulations and tests are required. Individual components (neurotransmitters, connections, signaling molecules, and receptors), pathways (mono-synaptic, synaptic, and multi-synaptic loops), and metabolic responses (functional characteristics, learning, reward, and goal-directed behavior) should all be revealed throughout these rounds.

2.8.Structural Cognitive Ability Modeling: A Foundation:

A microscopic scale model of the NCC will serve as the platform for combining gene expression with system structure and function. The NCC is situated at a point where genes and higher cognitive functions collide. Research will be able to predict the cognitive consequences of hereditary disorders and backwards engineer cognitive impairments to identify the molecular and genetic causes by establishing this link. This kind of simulation will be required at a most improved manner of Blue Gene research.

The Blue Brain Project's primary machine is IBM's Blue Gene supercomputer. The phrase "Blue Brain" was created as a result of this. IBM agreed to give EPFL with a Blue Gene/L as a "technology demonstration" in June 2005. The acquisition's terms were not mentioned in the IBM news release. In June 2010, this computer was updated to a Blue Gene/P. The machine is managed by CADMOS (Center for Accelerated Modeling Science), which is situated on the EPFL Lausanne campus (Google map). The computer is utilized by a variety of research groups, including the Blue Master’s level. The BBP was accounting for around 20% of the times daily. Brain simulations are often available 24 hours each day, six days a week.

The remainder of this year will be dedicated to planning and analyzing simulations. Supercomputer data and employment history are publicly accessible online; look for positions labeled "C-BPP"[9]. The purpose of A Blue Body is to employ a supercomputer's raw strength to uncover the brain's secrets. The IBM Blue Gene Computer system is the blue brain's principal machine. This machine has been updated as a result of CADMOS' introduction of Blue Gene/P on the EPFL campus. A full-day brain emulation is performed once a week; otherwise, data from quantum computer simulations is analyzed. Once a week, the brain simulation was done, and the remaining next week is spent collecting data and researching cells in hopes to uncover new things to achieve their research, as well as evaluating all of the data collected.

- Peak processing speed of 22.8 TFLOPS.
- A fast processors [256 MB to 512 MB memory per processor] modelling billions of neurons
- 8096 CPUs at 700 MHz
- A software that translates electric afferent neurons into Supercomputer input signals and vice versa.
- Software written in C++ and Linux.
- Power usage of 100 KW.
- Extremely strong nanobot’s to serve as a link between the human brain and the computing.

2.9.Technology:

Blue Brain is an Artificial Brain initiative spearheaded by Swiss brain researchers with the goal of recreating an artificial brain by reverse engineering brain circuitry. The Blue Brain Project was established in May 2005 at EPFL, a Swiss brain and mind institute specializing in natural sciences and engineering. The supercomputer used by the blue brain is called "Blue Gene" and was manufactured by IBM. Blue Gene is a supercomputer used for simulations. Which runs "NEURON," a simulation environment designed by Michael Hines and John Moore that replicates the network of neurons in the human brain. According to reports, the project would be officially inaugurated in 2023.

In the future, this technology will be extremely beneficial to humans. If blue brain technology is combined with robotics, it will usher in a new era in which we will be able to use a person's intelligence on a whole new level even after death. This technology will be important in the future for diagnosing human brain malfunctions as well as developing remedies for neurological illnesses. Because this technology may be used to investigate the flow of signals from the brain to the sensory cell and from the sensory cell to the brain [14].

So that it would be simple to diagnose the problem and discover a remedy, which would aid researchers and scientists in determining the precise problem that the person is experiencing and developing a solution. Because blue brain technology necessitates a large amount of memory to retain information and the state, it will be beneficial to recall the state when making decisions. This challenge can be remedied in the future by new technology that takes up less room and saves massive amounts of data that can be used to recall and make decisions. The brain-based chip or DNA-based chip, which has the ability to store a vast quantity of memory, is one of the techniques we consider.

The EPFL team has completed the first phase of a computer reconstruction of a neocortex segment. The neocortex is the area of the brain where many types of neurons with various functions such as storing, transporting, perceiving, and so on are found [15].

2.10. Advantages and Disadvantages

2.10.1. Blue Brain's Advantages

A blue brain is a means of storing and exploiting human resources and insight in the mind after the death, and it represents a big step further in the capacity of a computer or machine to make choices on its own. Business analysis, attending conferences, reporting, and other important tasks that an intelligent computer can perform on a regular basis

- It can be used to connect the thoughts of humans and animals. The BBP has shown to be effective in rats and other animals, which is a good indicator.
- It is an effective treatment for human disabilities, such as deafness, as it allows deaf people to receive information through direct nerve stimulation [16].

2.10.2. Blue Brain's disadvantage:

It continuously increases the risk of human reliance on Blue Brain.

- It constantly increases the risk of human reliance on Blue Brain.
- Because it's such a way of making machines bright and thinking, it enhances the danger of robots battling people. • Because it is a way to make technologies brilliant and thoughtful, it greatly increases the risk of vehicles killing dogs.

3. CONCLUSION

We shall be able to transfer ourselves into computers in the future thanks to the development of a blue brain. The therapy of brain illnesses with Blue Brain is possible. Over the course of their lives, a huge proportion of people will develop brain disorders. As a result, having a robust method for identifying these disorders and determining appropriate treatments is critical. Blue Brain will look for clues about how people think and remember things. Blue Brain is a new way of looking at consciousness. It's a step forward in the direction of creating machines that can think for themselves.

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