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Reframing the Possibilities in Healthcare Using Blue Brain Technology

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Abstract. The main intention of this paper is to reframe the possibilities in healthcare with the aid of Blue Brain technology. In general, blue brain is usually associated with the preservation of the intelligence of individuals for future. This paper has stepped ahead by describing the other possible solutions that can be provided by implementing the blue brain technology in the medical field. The possibilities in decreasing the demise rates that occur due to the complications in brain have been discussed. The blue brain can be used for monitoring the conditions of the brain, based on which the brain diseases can be diagnosed & cured in advance. In this paper, the details about blue brain, its functions, simulations & up gradation of human brain are explored in depth. The future enhancements & predictions in the field of blue brain that can benefit the humanity are also being discussed in this paper.

Keywords: Blue Brain, Virtual Brain, Nano bots.

INTRODUCTION

Human Brain is a marvelous creation of God. It's the brain which makes a human intelligent & the sixth sense of the man makes him st& different from the animals that also possess a brain. The brain is not actually a single part of the human body. It is a complex organ connecting each & every organ & organ system present in the body. It plays a vital role in the functioning of every organ as it has the overall control of all the parts. It enables a person to think & make decisions. Even the innovative thoughts that had led to countless inventions have their origins in brain. But the sad reality is that the knowledge in the brain is lost along with the destruction of body after death. The Blue Brain has been under development for resolving this particular issue.

BLUE BRAIN

Blue Brain is the name given to the first Virtual Brain [2] of the world, which is being developed by IBM. It is actually the artificial brain created by man that could function as if the original human brain. It has been predicted that, within the next 30 years, we human beings will be able to scan ourselves into the computer. As mentioned earlier, it is an artificial brain, which can behave actually like a natural brain. It can perform thinking; decision making based on experience & can respond too. In order to make this possible, all we need is a super computer, a memory with a large amount ofstorage capacity, a processor having a high processing power, a wide network, a program to convert electric impulses into input signal & an interface between the natural brain & artificial brain for uploading data from

natural brain to computer. By doing this the intelligence of that particular brain can be stored further use in the future, even after the death of that corresponding person.

The development we have been attaining at each phase of Science & Technology is because of the intelligence possessed by individuals. Being an inborn quality, intelligence cannot be created. Not everyone is blessed with this quality, but the ones who have this are extra ordinary thinkers. It usually begins & ends with the person who has it. The blue brain can provide a solution for preserving this intelligence [5] even after the death. It can also be used for assistance during one's life time for remembering the important days or facts that have higher chances of being forgotten.

STEPS INVOLVED IN BUILDING A BLUE BRAIN

There are three major steps [3] involved in building a Blue Brain. They are given as follows:

1. Data Collection
2. Data Simulation
3. Visualization

1. Data Collection:

In this phase, the different portions of brain is collected, made to undergo examination through microscope & the shape & electrical behaviour of individual neurons is measured. The neurons are identified based on their form, electrical & physiological behaviour, location in the cerebral cortex, & population density. The observations thus made can be translated into algorithms that are capable of describing the process, function & the positioning methods of neurons. These techniques may be used to build physiologically realistic-looking virtual neurons that are ready for simulation.

2. Data Simulation:

Data Simulation concerns with two major features:

i. Simulation Speed
ii. Simulation Workflow

i. Simulation Speed:

The simulation speed is very less when compared with the natural brain. The simulation of one cortical column [10], or more than 10,000 neurons, runs around 200 times slower than actual time. It takes around five minutes to complete one second of stimulated time. The simulation results are most likely unequal. One second of stimulated time takes around five minutes to complete. The simulation results are most likely unequal. a Biological soundness is currently the primary goal. Following a thorough study of the physiologically relevant elements for a certain impact, it may be conceivable to crop the constituents that do not subsidise in order to improve performance.

ii. Simulation Overflow:

This step involves virtual cell production based on the algorithms generated to describe the real neurons. On the basis of age, species & the disease stage of the animal to be simulated, the algorithms are chosen.

a. From all kinds of synthesized neurons, a network skeleton is built.
b. Based on the rules framed through experiments, the cells are joined together.
c. The neurons are activated, & the simulation comes to life.

3. Visualization:

For the visualization of neural simulations, the Blue Brain project makes use of RT Neuron(An application) [9]. RT Neuron is coded using C++ & OpenGL & is specifically used for neural simulations. It takes input as neuron & displays the output in 3D form. This has been very interactive.

FUNCTIONING OF HUMAN BRAIN

Almost every sense of a human being is being controlled by the nervous system. None can see the actual functioning of it, but it does its responsibility very smoothly through the electric pulses. It is the most complicatedly organized electron mechanism in the world. In order to underst& this complex system, one should have the knowledge about the three basic functions [8] performed by this system:

1. Sensory Input
2. Integration
3. Motor Output

1. Sensory Input:

Whenever we sense something, i.e., if we see, hear or taste something, the sensory cells i.e., neurons, belonging to our eyes, skin & tongue is responsible to send those messages to the brain. This process of receiving information from the surroundings is known as sensory input.

2. Integration:

This function involves interpretation of things that we have felt & this process happens within the brain. For example, if you have touched a hot pan, the sensory input will be given to the brain. The brain identifies that it is a hot pan & responses.

3. Motor Output:

This includes the responses given by brain to those sensory nerves. In case of touching the hot pan, the brain sends message impulse to the hands commanding to take of it from the pan, in order to avoid injuries.

BRAIN SIMULATION

In Natural Brain, the input is received through the natural neurons, interpreted through the various neurons present in the brain & is delivered as output through the same natural neurons. Here, the processing is done by the arithmetic & logical calculations & the result obtained is stored in the permanent states of neurons.

In Simulated Brain, the reception of input is through the silicon chips or artificial neurons. The interpretation is done by a set of bits in the set of registers & the output obtained is transported through the silicon chips. The results of processing done using arithmetic & logical calculation & artificial intelligence are stored in the Secondary memory.

UPGRADING HUMAN BRAIN TO BLUE BRAIN

The data stored in the human brain may be transferred to a computer using miniature robots known as Nanobots [7]. Because these bots are nanoscale, they can traverse throughout the human circulatory system. These bots can monitor the actions & structure of our nervous system by travelling often to the brain & spine. These can also act as an interface between human brain & the computer. The bots are capable of scanning our brain & its structure, thus recording the complete connection. When one enters these recorded details into a computer, it starts functioning as human. In this way, the entire data stored in the Human Brain can be uploaded to a computer.

IBM is working with scientists at the Ecole Polytechnique Federale de Lausanne's (EPFL) Brain & Mind Institute in Switzerl& to simulate biological systems of the brain & deliver the results in the form of a working Three Dimensional model [6] that could recreate the high-speed electro-chemical interactions occurring within the interior parts of the brain. These interactions include mental diseases such as depression & autism, as well as cognitive skills such as language, learning, perception, & memory. From there, the modelling will be expanded to other areas of the brain and, if successful, will give information on the connections between genetic, molecular, cognitive functioning of the brain.

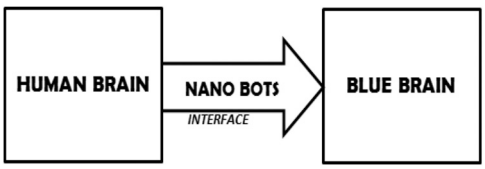

Figure 1. Upgrading human brain to blue brain.

INNOVATIVE APPROACH

Blue Brain being a replacement for the real human brain, it can be used to overcome certain disorders happening in the brain. The very first case which we take into consideration is the death rates due to Brain tumors. In most cases, the tumor is identified only in the worst stage. Even among those, the lives of a good percent get expired because of the delay in the identification. Such mortal rates can be decreased by using this blue brain technique. As the nano bots will be continuously monitoring the brain & spine, any minor change in its behavior will be recorded. Based on the recordings, one can identify the issues with the brain & its functions. If the change is the initial stage of tumor, diagnosis can be done & proper treatment can be provided. This will lead to the increase in chances for the survival of the affected person.

The next case we consider is the brain deaths. As we know, brain is the functional unit & control unit of human body, brain death is indeed the person's death. The blue brain can be a solution for this too. The brain which is dead can be replaced by the virtual brain, thus helping the life of the person sustain.

ADVANTAGES AND DISADVANTAGES

Like the other fields of Science, there are both pros & cons in case of Blue Brain too. Blue Brain technology facilitates a person to remember everything without any effort. The activities of human beings & other animals can be understood & can be used for advanced research purposes. This can also help in decision making without the presence of a person. It reduces the illness related to brain to a greater extent. The deaf can be made to hear using the direct connection towards the nerves [4]. Most importantly, it can be used to save the intelligence of individuals even after their deaths.

On the other hand, it can make humans lazier & dependent on machines [11]. Anti-Socialists can use technology against it & can involve in human cloning with wrong intensions. If future locums for humans are invented, there will be no human contact & the world would be ruled entirely by computers.

DISCUSSION

Being a technology under research, it is a difficult task to predict the exact implementation techniques & methodology for it. The blue brain to be used for the replacement of dead brains should be more enhanced. The blue brain in a computer will be vain in this case. In short, the blue brain can be a chip or a bot functioning from the interior of the human body in near future. This can enable the quick replacement of the damaged or dead brain. As the intelligence of the person is already recorded within the blue

brain, he/she can live a comfortable life even after the brain death. This can also reduce the death rates occurring in the reason of brain deaths can also be considerably brought down to a much lower level.

CONCLUSION

The advancements in Science & Technology have been considered as a bane by the public sometimes. The technologies like Blue Brain have been serving as an evidence for the boon part of advancements thus leading the world towards a sustainable development [1]. The day, we will transform into computers is not so far. At some point, this transformation happens & may lead to immortal life of humans, thus proving that it can bring both benefits & harm to human society. Whatever the case may be, this technology will be widely acknowledged across the world sooner or later as a means of encouraging sustainable development.

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