Uploading Human Brain to Blue Brain

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Abstract— **Upgrading a human brain to blue brain is the first made global effort to reverse-engineer the brain of mammalian, in order to understand the function of brain through detailed simulation. BLUE BRAIN is the name acknowledged as the world's prime virtual brain which means, a machine that can function as human brain. Nowadays scientists are in research to build an artificial brain that can guess, react , take decision and keep anything in memory. The main objective is to upload human brain into machine with the help of nanobots. So that, man can take decisions without any effort. After the mortality of the body, the virtual brain will act as the man. So that, even after the mortality of a person we will not lose the knowledge, Intelligence, feelings, and memories of that man that can be further used in the development of human society.**

I. INTRODUCTION

Human brain is the most complex circuitry than any circuits in the world. No one has ever understood human's brain complexity. So, question arises "Is human brain can be created?" the answer is 'yes'. Because it is noticed that what ever human has created, he has always followed the nature. The best example is the creation of computer, it became possible to create computer because of technology. Technology is expanding faster, as IBM is in research to create virtual brain. The first ever virtual brain is blue brain. This system is an attempt to reverse engineer the human brain and rebuild it at cellular level inside a computer simulation. Blue brain project was founded in 2005 by Henry Markram at the EPFL in Lausanne, Switzerland. Objectives of the project are to achieve complete understanding of the brain and do better and faster development of brain disease treatment. Slice of living brain issues is studied using microscopes and patch clamp electrodes. From different neuron types data is collected. Biologically realistic models of neurons and neuron's network build in cerebral cortex using data. The simulations are carried out on a Blue Gene Supercomputer.[5]

1.1What is blue brain?

Blue brain is the name given to the world's first virtual brain by IBM. Blue brain is an artificial brain, which can act as a natural brain. It can think, response, take decisions based on the experiences, and keep anything in memory. The main objective is to upload human brain into machine. Super computer made this possible it contains a large amount of storage space, processing power, and interface between the human brain and artificial one. Data stored in natural brain can be uploaded into computer through interface. So even after the death of the person their brain, knowledge, intelligence, personalities, feelings and memories can be stored be stored and used forever.[6]

1.2What is virtual brain?

Virtual brain is an artificial brain, which means a machine can act as the brain. It can think, take decisions from past experiences, response, memorieses, and can do whatever human's brain can. It can stores the data of human brain. So that data can be used after death of the human.

1.3Need of virtual brain

Development is dependent of intelligence. Intelligence is the inborn quality which cannot be created. Some people are blessed with quality of intelligence, they can think up to such a level where no one can be able to reach. Human society is always is always needed of such an intelligence brain to have with. But human' intelligence is lost along with their body after the death. This problem can be solved by virtual brain. The brain and intelligence of person will kept alive after the death.

In the busy life, we often face many difficulty in remembering the things like person's name, their birthdays, words, spellings, grammar, history facts, etc. this problem can be solved by virtual brain.

1.4How it is possible?

Initially, it is helpful to depict the basic manners in which human may be uploaded into a computer. Raymond kurzweil has provided a paper on this topic. In it, he has described both invasive and noninvasive techniques. The use of small robots, or nanobots was most promising. These small robots will be enough to travel throughout our circulatory system. By traveling into spine and brain, they can monitor the activity and structure of central nervous system. They will provide interface with computers that is as closest as our mind can be while we still reside in our biological form. Nanobots can scan the brain's structure, and provide complete readout of the connections between each neuron. They would also record the brain's current state. When this information is entered into computer, could then continue to function like us. A computer with large storage space and processing power is required.[8]

II. HISTORY

Blue Brain is basically a concept of virtual brain. It is synthetic brain's design by reverse engineering, the mammal brains down to the molar level. The aim of this research work is to study a human brain's architectural and functional principles which was founded in May 2005 by the Brain and Mind Institute of Switzerland. Henry Markram, Institute's

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director is in charge of this research work. Running Michael Hine's NEURON software by using a Blue gene supercomputer, the piquancy does not contain simply of an artificial neural network, but hold a biologically realistic model of neurons. It is promised that sooner or later it will drop light on the nature of cognizance. There are a few number of sub concepts, with the Cajal Blue Brain, reconcile by the Supercomputing and Visualization Centre of Madrid (CeSViMa), and others execute by universities and independent laboratories.

Goals of this research works is to explore for insights into how human beings think and remember. There is a disease called Parkinson's disease, scientists think that blue brain concept could be used for curing this disease. The brain circuitry is in a complicated state of flux, the brain itself rewire every point of its survival. If the scientists can able to reveal the secret of how and why the brain does it, the information could head to new extraction of supercomputers.

Its initial intention was the reproduction of a rat neocortical column, which is studied by some researchers to be the tiniest functional section of the neocortex. This was completed in December 2006. In November 2007, the research work proclaimed the end of the starting section, distributing a data-driven evolution for creating, validating and researching the neocortical column.

By 2005, the prime single cellular model was enacted. The prime artificial cellular neocortical column of 10,000 cells was constructed by 2008. By July 2011, a cellular microcircuit of 100 neocortical pillars with a million cadre in full was created. A cellular rat brain is designed for 2014 with 100 microcircuits in all a hundred million cells. At the end a cellular human brain is concluded desirable by 2023 identical to one thousand rat brains with a total of a 100 billion cells. In 2015, researchers at Ecole Polytechnique Federale de Lausanne (EPFL) matured a quantative model of the formerly unidentified relationship between the glial cell astrocytes and neurons. This representative explains the energy management of the brain over the function of the neuro-glial vascular unit (NGV). The padding layer of neuron glial cells is actually added to blue brain project models to advance working of the system.[1]

Funding:

This research work is subsidized primarily by EPFL, which orderly funded by the Swiss government. EPFL is the only two organized-subsidized universities in Switzerland, another being ETH in Zurich. The BBP has also reserved subsidize from EU research grants, foundations, other subsistence, and personage. Henry Markram revealed in an interview in 2009 that there was "one unique visionary donor" but didn't specify who.

In march 2012 the ETH Board inquired CHF 85 million (€70 m) from the Swiss government to subsidize the blue brain research work from 2013 to 2016.[2]

III. WORKING OF NATURAL BRAIN

The human power to feel, render and even see is controlled, in computer like calculations, by the supernatural nervous system. Surely, the nervous system is quite like magic because we can't see it,its working through electric impulses through your body.

The brain necessarily serves as the body's information processing centre . Brain receive signals from the sensory neurons in central and peripheral nervous system and in response generates new signals. These new signals that instruct the corresponding parts of the body to move or react in some way. The brain weighs about 1,500 grams and constitutes about 2 percent of total body weight.

It consist of three major divisions:

- The massive paired hemisphere of the cerebrum.
- The brainstem, consisting of the thalamus, hypothalamus, epithalamus, subthalamus, midbrain, pons and medulla oblongata.
- The cerebellum.

To understand this system, one has to know the three simple functions that it frame into action:

- Sensory Input
- Integration
- Motor Output

3.1 SENSORY INPUT

When our eyes see something, nose smell or our hands touch a warm surface, the sensory cells, also known as Neurons, send a message straight to our brain. This action of getting data from our surrounding

environment is called sensory input because we are putting things in our environment by the way of our sense.

3.2 INTEGRATION

Integration is known as the integration of things we have felt, tasted, and contacted with our sensory cells, also known as neurons, into responses that the body recognizes. All these processes are accomplished in the brain where huge number of neurons work together to understand the environment.

3.3 MOTOR OUTPUT

Once our brain has interpreted all that we have learned, either by hearing, smelling, touching, or using any other sense, then our brain sends an information through neurons to effector cells, muscle or gland cells, which really work to do our requests and act upon our environment.[5]

IV. COMPARISION BETWEEN NATURAL BRAIN AND SIMULATED BRAIN [8] [6]

NATURAL BRAIN	SIMULATED BRAIN
• INPUT In our body nervous system is responsible for the message convey. There are sensory cells in our body who dispatch message to the body. Sensory cells create electric impulses which are accepted by the neuron. These neurons deliver electric impulses to the brain.	• INPUT In a similar way artificial nervous system can be created. The scientist has already generated artificial neurons by interchanging them with the silicon chip. It has been also tested that these neurons can receive the input from sensory cells. Thus, the electric impulses from the sensory cells can be received through these artificial neurons and after that send to the super computer for interpretation.
• INTERPRETATION The electric impulses acquired by the brain from the neurons are rendered in the brain. The interpretation in the brain is completed by the means of certain states of many neurons.	• INTERPRETATION The conclusion of electric impulses received by the artificial neuron can be done by the means of set of register. Register stores different values and these values will represent different states of simulated brain.
• OUTPUT It is based on the states of the neurons the brain sends electric impulses representing the response. These responses are further received by the sensory cell of our body to respond neurons in the brain at that time.	• OUTPUT In a similar way, it is based on the states of register. Now, the output signal can be given to the artificial neurons in the body which will be accepted by sensory cell.
• MEMORY There are certain neurons in our brain which represents states permanently. When needed, this state is represented by our brain and we can remember the past things. To retrieve things we force the neurons to represent definite states of the brain permanently or for any interesting or serious matter that happens implicitly.	• MEMORY It is possible to store the data permanently by using the secondary memory. Likewise, the mandatory states of the register can be stored permanently and when required these information can be retrieved and utilised.
• PROCESSING When we take decision, we think about something, or make any logical and arithmetic calculations are done in our neural circuitry. The past experience stored & the current input received and used , the states of definite neurons are changed to produce output.	5.PROCESSING Similarly, the decision making can be done by the machine by using some stored states and the received input and performing some arithmetic and logical calculation.

5. WORKING OF BLUE-BRAIN PROJECT

The Blue Brain is the prime comprehensive undertaking to reverse-engineer the mammalian brain, in sequence to study brain working and dysfunction over explained reproduction.[3]

5.1 INTERPRETING THE RESULTS

Running the blue brain simulation produces a big range of information. Analyses of particular neurons must be recursive thousands of times. And inquiry dealing with the network action must controlled with knowledge that simply achieve hundreds of gigabytes per second of simulation. Using densely parallel computers, the information can be determined where it is created.

The geometric complexity of the column is given, an observable research of the circuit is a significant part of the

study. Joining the simulation information onto the morphology is particular for a sudden verification of single cell action as well as network experience. Architects at EPFL have experience with the blue brain developers to plan an optical interface that interpret the blue gene information into a 3D visual model of the column. Another supercomputer is used for this estimation intensive task. The visualization of the neuron's model is a challenging work given the unchangeable fact that a column of 10,000 neurons accomplished in high quality web report for initially 1 billion triangles for which around 100 GB of management information is requested. Reproduction data with a decision of electrical compartments for every single neuron reports for another 150GB. As the electrical impulse traverse over the column, neurons glow up and modify colour as they become electrically progressive. An optical interface makes it credible to suddenly determine surface of interest that can then be understand more greatly using further reproduction. An optical model can also be help to differentiate the simulation goals with research that perform electrical action in the brain.[5]

5.2 DATA MANIPULATION CASCADE

Building the Blue column requests an order of information manipulations. The initial step is to separate each 3-D morphology and debug errors because of the vitro arrangement and repair. The reconstructed neurons are dropped in a database by which statistics for the different objective groups of neurons are achieved. These demography are helped to clone an uncountable number of neurons in every single group to capture the full morphology diversity. The second step is to take every single neuron and put ion channel representative in sequence to create the class of electrical types. The research has achieved a sufficient level of convergence to create efforts to identify neurons.[5][4]

6. UPLOADING NATURAL BRAIN

Uploading of human brain or natural brain is possible by the use of robots called as Nanobots. Natural brain is uploaded to record functioning of natural brain. Nanobots scan the structure of the brain.

6.1 Merits and Demerits

The Blue brain project helps in remembering things without any efforts, decisions can be made in the absence of the person. Even after the death of the person his knowledge can be used. By interpretation of the electric impulses from animal's brain, their thinking can be easily understood. Deaf can hear via direct nerve stimulation, and also helpful for psychological diseases.Due to blue brain system humans will become computer dependent. Hackers can misused a system, computer viruses are the increasingly threat.

6.2 Applications

Gathering and Testing 100 years of data, Neural code cracking, understanding neocortical information processing, A global facility, A foundation complete simulations, A foundation for molecular modeling of brain.[5] [7]

CONCLUSION

The whole idea is that, we will be able to transfer ourselves into computers at some point. We can hope to acquire a great deal about brain function and dysfunction from an exact models of the brain. The time taken to build detailed models of the brain counts on the level of detail that is captured . Most arguments against this outcome are apparently easy to put off. They are either simple minded, or simply require further time for technology to increase. There is no intense obstacle for modelling the brain and it is therefore liable that we will have detailed models of mammalian brains, including that of human, in the coming future. The only serious threats raised are also overcome as we remark the combination of biological and digital technologies.

Using the Blue Gene supercomputers, up to 100 cortical columns, 1 million neurons, and 1 billion synapses can be imitiated at once. This is roughly equivalent to the brain power of a honey bee. Human, by contrast, have approx 2 million columns in their cortices. In spite of the sheer complexity of such an attempt, it is prognosticated that the project will be capable of this by the year 2023.

REFERENCES

[1] https://en.wikipedia.org/wiki/Blue_Brain_Project#Goals
[2] http://www.artificialbrains.com/blue-brain-project#funding(2016)
[3] http://pediain.com/seminar/blue-brain-seminar-report.pdf
[4] http://www.123seminarsonly.com/Seminar-Reports/006/46260004-blue-brain-seminar-report.pdf
[5] http://www.isca.in/COM_IT_SCI/Archive/v3/i2/1.ISCA-RJCITS-2015-002.pdf (2015)
[6] http://www.ijaiem.org/Volume2Issue3/IJAIEM-2013-03-28-091.pdf (2013)
[7] http://www.ijaiem.org/Volume2Issue3/IJAIEM-2013-03-28-091.pdf (2013)
[8] http://www.ijaict.com/issue3/ijaict%202014070306.pdf (2014)