The Blue Brain Technology

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Abstract -- Human brain the most valuable creation of god. The man is intelligent because of the brain. "BLUE BRAIN" was the world's first virtual brain. BLUE BRAIN is a machine can function as human brain. Today scientists are in research to create an artificial brain that can think, response, take decision, and keep everything in memory. This project is the first complex project in which a human brain is been portrayed in such a way that it helps us to understand its function and dysfunction to through detailed simulations. The main aim of the BLUE BRAIN is to upload human brain into a machine. After the death of our body, the virtual brain will act as the man. So, that after the death of a person we can use it, for the development of the human society.

Indexed Terms: Blue gene, Blue brain project, Neuron, RT- Neuron

I. INTRODUCTION

No one can ever understand the complexity of the human brain. It is very complex than any circuitry in the world. With the increasing number of people having mental disorders the accuracy to detect some mental illness has reduced. One of the main goals of neuroscience is to understand the biological mechanisms responsible for the human mental activity. The Blue Brain system is attempted to reverse engineer of the human brain and recreate it at the cellular level inside the computer simulation. The project was founded in May 2005 by Henry 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 electro codes. A data is collected about all the many different neuron types. This data is used to build biologically realistic models of the neurons and networks of neurons in the cerebral cortex. The simulations are carried out on the Blue Gene supercomputer built by IBM, hence the name "Blue Brain". The simulation software is based on Michael Hine's NEURON, together with other custom-built components. As of August2012 the Largest simulations are of micro circuits containing around 100 cortical columns such simulations involve approxiimately1 million neurons and 1 billion synapses. This is about the same scale of that a honey bee brain. It is hoped that a rat brain neocortical simulation (~21 million neurons) will be achieved by end of 2014. A full human brain simulation (86 billion neurons) should be possible to 2023 provided sufficient funding is received.

II. WHAT IS BLUE BRAIN?

BLUE BRAIN is a virtual brain, which is not the actual natural brain, but it will act as the brain. The human brain is the most complex thing in the world. i.e. an artificial brain, which is not actually a natural brain, but can act as the brain. It can think like a brain, take decisions based on the past-experience and respond as the natural brain. Now the IBM is developing a virtual brain known as the Blue Brain. It would be the world's first virtual brain. Within 30 years. We can say it artificial Brain. The data stored in natural brain that can be uploaded into the computer. 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 it is artificial one. This is not happening today. Nor tomorrow. But we should be expecting this in our near future. The Blue Brain project uses the Blue Gene supercomputer by IBM. Blue Brain project is the birth event of modern say AI technology applied in smart phones, self-driving cars and smart home or practically anything that is connected to internet.

III. WHAT IS VIRTUAL BRAIN

Today we are developed because of our intelligence. Intelligence is the inborn quality that cannot be created by anyone. Some people have this quality. So, they can think up to such an extent where other cannot reach. Human society is always in need of

such intelligence and such an intelligent brain to have with, but the intelligence is long along with the body after the death. The virtual brain is a solution to it. The brain and intelligence will be alive to the after death. We often face the difficulties to remembering such things as the people names, their birthdays and the spellings of words, proper grammar, important dates, and history facts. In the busy-life everyone wants to be relaxed. The virtual brain can try to gather important information related to neuronal connectivity and structure of the brain. It will inform us about activated group of neurons, their connections, their respective distance, the time and the speed of their communications. This software will also collect data from related to the structure of the brain like 3D cortex geometry and the exact location of neuron groups. After identifying the involved population of the neurons, they will be assembled in large neuronal networks and finally construct a brain model.

IV. FUNCTION OF BLUE BRAIN

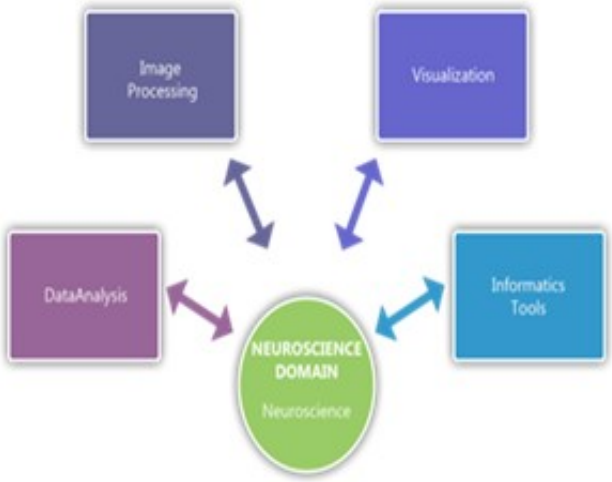

Fig. 1: Functional block diagram of Blue Brain

Structural data that is to be gathered includes data on the genome, the transcriptome, proteins, metabolites, organelles, neurons and glia cells, synapses, extracellular space, microcircuits the vasculature, blood, the blood brain barrier, the ventricles, the cerebrospinal fluid, and the large-scale organization of the whole brain. Required functional information includes data on gene transcription, protein translation, cell biology processes, receptor functions, biochemical, biophysical and electrochemical processes and properties, neuronal and synaptic information processing, information processing at the macro-circuit level and at the level of the whole brain, metabolism, development, adaption, learning, perception, cognition, and behaviour.

One of the projects key strategies is to exploit interdependencies in the experimental data to build comprehensive digital reconstructions of the brain, including features that have yet to be characterized experimentally. The BBP has to apply this strategy in several different areas (prediction of the spatial distribution of ION channels in 3D model neurons, prediction of neuronal firing properties from expression data for as selected set of ION channels, prediction of synaptic connectivity from the neuronal morphology). In future work, the project plans to extend its use to new domains, including the prediction of structural and functional features of the human, from sparse human data augmented with data collected in rodent. Nanobots can also carefully scan the structure of the brain, providing a complete readout of the connections between each neuron. They can also record to current state of the brain.

V. FUNCTION OF NATURAL BRAIN

The brain is essentially serves as the body's information to the processing centre. It receives signals from the sensory neurons in the central and peripheral nervous systems and generate to response and sends new signals that instruct the corresponding parts of the body to move or react in some way. It also integrates the signals received from the body with signals from adjacent areas of the brain, giving rise to perception and consciousness. The brain weight around 1,300-1,400 g. i.e. about 3 pounds and constitutes about 2 percent of the total body weight. one of the world's most is "intricately organized" electron mechanisms is the nervous system. Not even the engineers have come close for making the circuit boards and the computers as delicate and precise as the nervous system. To understand this system, one has known the three simple functions that it puts into action: sensory input, integration, motor output.

a) Sensory input:

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

b) Integration:

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

c) Motor output:

Once our brain can interpreted to all that we have been learned, either by touching, tasting, or using by any other sense, then our brain sends a message through neurons to effecter cells, muscle or gland cells, which work to perform our requests and act upon the environment. We see, hear, feel, smell, and take decision.

VI. BRAIN SIMULATION

Natural Brain	Simulated Brain
INPUT In the nervous system in our body the neurons are responsible to the message passing. The body receives the input by sensory cells. This sensory cell can produces the electric impulses which are received by The neurons. The neurons are transferring these electric impulses to the brain.	**INPUT** In the same way the artificial nervous system can be created. The scientist is created the artificial neurons by replacing with the silicon chip. It has also been tested that these neurons can received the input from the sensory cells. So, the electric impulses from the sensory cells can be received through to these artificial neurons.
INTERPRETATION The electric impulses is received by the brain from The neurons are interpreted in the brain. The interpretation of the brain is accomplished by means of certain states of the many neurons.	**INTERPRETATION** The interpretation of the electric impulses received by the artificial neurons can be done by means of registers. The different values in this register will represent different states of brain.
OUTPUT Based on the states of the neurons the brain sends the electric impulses representing the responses which are further received by sensory cell of our body to respond neurons in the brain at that time.	**OUTPUT** Similarly it can based on the states of the register the output signal can be given to the artificial neurons in the body which will be received by the sensory cell.
MEMORY There are certain neurons in our brain which represent to certain states are permanently. When required, this state is represented by our brain and we can remember to the past things. To remember -things we force the neurons to represent o certain states of the brain permanently or for any interesting or serious matter this is happened to implicitly.	**MEMORY** It is impossible to store the data permanently by using the secondary memory. In similar-way the required states of the registers can be stored to permanently and when required these- information can be received and used.
PROCESSING When we take decision, think about something, or make any computation, logical and arithmetic computations are done by our neural circuitry. The past-experience can store and the current inputs received to use and the states of certain neurons are changed to give the output.	**PROCESSING** In same -way decision making can be done by the computer by using some stored states and the received inputs and performing some arithmetic and logical calculations.

VII. STEPS TO BUILDING A BLUE BRAIN

a) Data collection:

It involves microscopic study of the shape and electrical behaviour of each neuron by using slices of living brain. These neurons are lie within the cerebral cortex and their population density. A 12 patch clamp instruments is used for the study of electrophysiological behaviour of neuron, and this very instrument forms the foundation of the research and was developed as the tool for only this project.

b) Data Simulation:

In the 1990s, a software package is known as NEURON was developed by the Michael Hines. This is used for neural simulations. It is written in languages like C, C++, and FORTAN. The current version of which software is working is 7.2 and it will still under development.

Data simulation has two major aspects:

- Simulation speed
- Simulation workflow

BBP-SDK- Abbreviated as Blue Brain project:

Software Development Kit, it is a set of the software classes that allows researchers to examine models and simulations and use them. The software kit is a C++ library enfolded to java and python.

c) Visualization:

- RT-Neuron:

RT-Neuron is the main application that Blue Brain project is used for visualization of neural simulations. It is software specifically written for neural simulations not generalized to other kinds of simulation. The output is obtained from Hodgkin simulations as input in NEURON and is produced in 3D, making it visible to researchers and programmers as potentials activated propagate through or within the neurons. The researchers can then interact with the model since the animations can be paused, stopped, started and zoomed. A 32- Processor Silicon Graphics Inc. (SGI) SYSTEM with 300 Gb of the shared memory is used for visualization of the results.

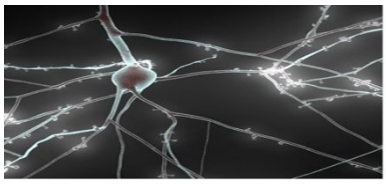

Fig. 2: RT-Neuron visualization of a neuron

VIII. HOW TO UPLOAD IN HUMAN BRAIN

The uploading is possible by use of small robots known as the Nanobots. These robots are the small enough to travel throughout our circulatory system. Travelling into the spine and brain, they will be able to activity and structure of our central nervous system. They will be able to provide and interface with computers that are as close as our mind can be while we still reside in our biological from. Nanobots can also carefully scan the structure of our brain and providing a complete readout of the connections. The information, when entered- into a computer, could then continue to function as us. Thus, the data can stored in the entire brain that will be uploaded into the computer Merits and demerits with the blue brain project the things can be remembered without any effort and decisions can be made without the presence of the person. Even after the death of the 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 to easily. It would allow the deaf to hear via direct nerve stimulation, an also be helpful for many phycological diseases. Due to the blue brain system, the 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.

IX. ADVANTAGE AND DISADVANTAGE

Advantages	Disadvantages
1. A person can remember and recollect anything without and effort.	1. Increased risk of the dependency of a person on the blue brain technology, all the time.
2. Decision can be made by the computer to itself without any external help.	2. Susceptible to higher forms of risks and the critical threats, like hacking issues and computer viruses etc. That means, when a machine becomes so intelligent, it will use his brain against him and it may cause war between the machine and the man.
3. The activity of the different animals could be understood easily.	
4. It is helpful for a deaf person and for many psychological disorders, as they can easily get any information through this.	

X. APPLICATIONS

1. Gathering and Testing 100 Years of Data.
2. Cracking the Neural Code.
3. Understanding Neocortical Information Processing.
4. A Novel Tool for Drug Discovery for the Brain Disorders.
5. A Global Facility.
6. A Foundation for the Whole Brain Simulations.
7. A Foundation for Molecular Modelling of the Brain Function.

XI. CONCLUSION

In conclusion, we will be able to transfer ourselves into computers at some points. Most arguments are against to this outcome are seemingly easy to circumvent. They are either simple minded, or simply require further time for the technology to increase. The only serious threats raised are also overcome as we note the combination of the biological and the digital technologies. While the road ahead is long, already researches have been gaining great insights are from their model. Using the Blue Gene supercomputers, are up to 100 cortical columns, 1 million neurons, and 1 billion synapses can be simulated at once. Despite the sheer complexity of such the endeavour, it is predicted that the project will be capable of this year 2023.

XII. CONCLUSION

I would like to thank assistant professor K. Reshma for providing relevant information and support.

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