ARTIFICIAL INTELLIGENCE

ASSSIGNMENT-III

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Blue Brain

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ABSTRACT

Human brain is the most complicated circuit in the world. BLUE BRAIN is the name of the world's first virtual brain which means, a machine that can function as human brain. It's primary aim is to transfer the brain content to supercomputer by injecting nanobots into human brain. It will convert the electrical impulses of brain into machine language. Using the knowledge stored in computer, it might be possible to transmit the knowledge to a person who is devoid of that knowledge. It will be possible to manipulate human ideas by cracking the neural code. So We will be able to create a false environment so that our body experiences a feeling of being there. when the person is dead then the knowledge and intelligence of person also lost with that body, so solution for it to have the artificial brain that can hold the brain content then the knowledge can be preserve after the death of person. In other words, human is does not live for thousands of years but the information in his mind could be saved and used for several thousands of years. By using this Human Being can remember things without any effort and 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 easily. It is also possible to treat the mental disorder of the persons. This technology can be used for the development of the human society .

Key words: Virtual brain ,blue brain.

INTRODUCTION

Technology has been progressing to a great extend such that even the human brains are being created artificially through the science of artificial intelligence. Is this really possible to create an artificial human brain? Yes, today it is possible due to the technology. Technology is growing faster as IBM is now in research to create a virtual brain. It is called "Blue brain ". In near years, this would be the first virtual brain of the world. Blue brain project is the emerging one where a human brain is computerized.

A. *Human Brain*

Every animal we can think, mammals, birds, reptiles, fish has brain but human brain is unique. It gives the power to speak, imagine and problem solving capacity. It is truly an amazing organ. Our brain, spinal-cord, peripheral nerves makeup complex, integrated processing & control system known as Central nervous System. It

controls conscious and unconscious facet of life.

B. Blue brain

The Blue Brain Project is an attempt to create a synthetic brain by reverse-engineering the mammalian brain down to the molecular level. The aim of the project, founded in May 2005 by the Brain and Mind Institute of the École Polytechnique Fédérale de Lausanne (EPFL) in Switzerland, is to study the brain's architectural and functional principles. 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 project is headed by the founding director Henry Markram and co-directed by Felix Schürmann and Sean Hill. The research involves studying slices of living brain tissue. Data is collected about all the many different neuron types. This data is used to build biologically realistic models of neurons and networks of neurons in the cerebral cortex. The simulations are carried out on a Blue Gene running Michael Hines's NEURON software, supercomputer built by IBM. Hence the name ‗Blue Brain'.

SIGNIFICANCE OF A NEW BRAIN

The production of the computer will bring many benefits to society. It may very well expand, or even change, many of the theories we have about our world. Obviously at the front of the line is the fact that with the help of the final product, scientists and researchers can delve deeper into neurology. They will be able to finally understand the brain in its entirety, and modify many current models of how the brain functions – as opposed to developing a theory based on observations and predictions. The Project also provides another means of education for student engineers. As a student engineer, I believe it is important to know what is currently developing in the world of engineering – whether topics are specific or vague. This is because we are able to see what we learned and what we will be learning applied in our actual career path, mainly emphasizing the importance of learning the boundaries – ethics – that we are confined by. By integrating ethical engineering into our curriculum, we, student engineers, can not only learn about them, but see perfect examples of how to solve problems accordingly.

DISCOVERING NEW PATHS

In 2005, Henry Markram, along with the Brain Mind Institute (BMI) and International Business Machines (IBM), launched a new project: The Blue Brain Project . Previous models of the brain have been presented before; however, the models have been of individual parts and their functions – i.e. molecules, lobes, neurons, microcircuits. Because the brain is so sophisticated, it is near impossible to "observe what is happening within a small group of neurons while at the same time imaging the activity of the whole brain" . Markram realized this problem, and proposed his idea to view the brain, as a whole, by rebuilding it artificially. He stated that one "could encode all of those models explicitly and get them to work together". The goal of his project, the Blue Brain Project, is to reconstruct the human brain, and eventually brains of different species, by integrating the research data acquired from specialized branches of studies in neuroscience; the project is an "attempt to reverse engineer the human brain and recreate it at the cellular level inside a computer simulation" . Furthermore, the

project will explore if microcircuits – modules in the brain that act as processing units – develop randomly, or follow a certain pattern.

DATA ATTAINMENT

Researchers have collected data by observing brain slices of rats and "measuring the shapes and electrical activity of individual neurons," and produced representations, of tens of thousands of individual, different neurons; from the data, the team has been able to identify similar patterns of circuitry in different brains . The Blue Brain Project Team is now able to reconstruct an artificial microcircuit based on the data about the properties of neurons collected.

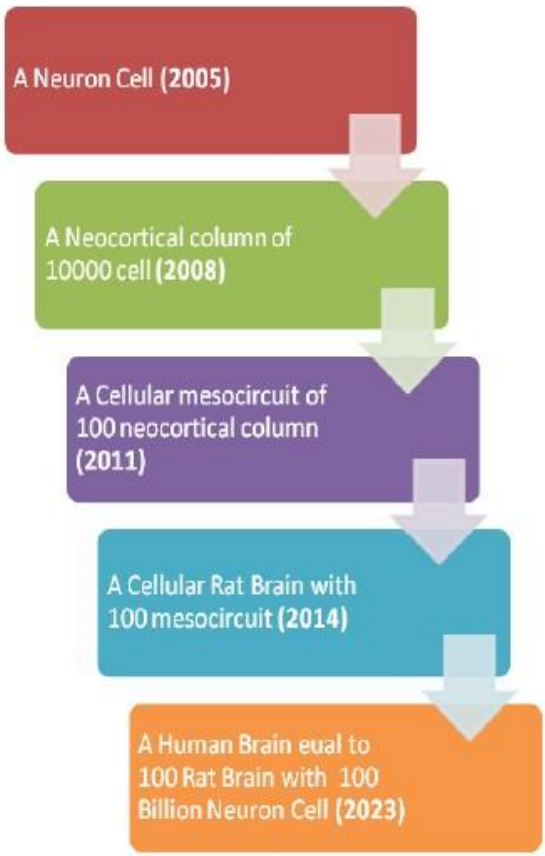


Figure V. Project Development

NANOBOTS IN MEMORY TRANSFER

The uploading of brain is possible by the use of small robots known as the Nanobots.
Nanobots act as interface between brain and computer. These robots are small enough to enter into circulatory system of human. Nanobots could also carefully scan the structure of our brain, providing a complete readout of the connections between each neuron. They would also record the current state of the brain. It converts the electric impulses of human brain to machine language. This information when entered into a computer, could then continue to function as us.

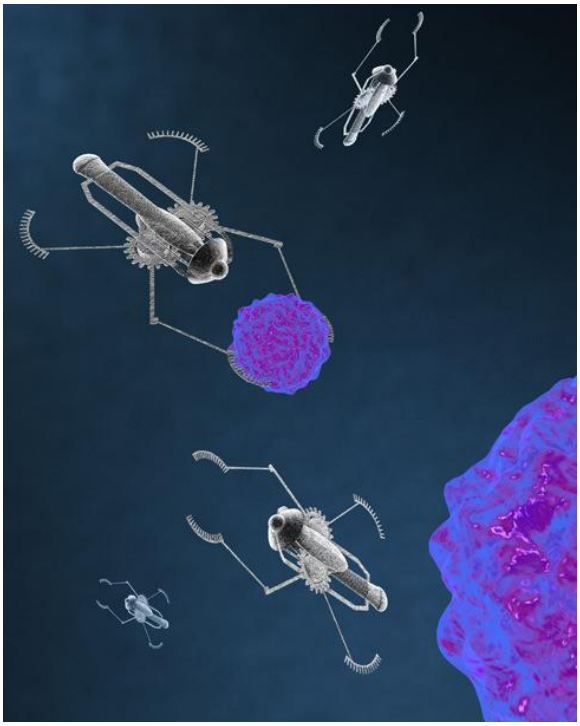


FIG: NANOBOTS

All that is required is a computer with large enough storage space and processing power. Is the pattern state of neuron connections in our brain truly all that makes up our conscious selves? Many people believe firmly those we possess a soul, while some very technical people believe that

quantum forces contribute to our awareness. But we have to now think technically. Note, however, that we need not know how the brain actually functions, to transfer it to a computer. We need only know the media and contents. The actual mystery of how we achieved consciousness in the first place, or how we maintain it, is a separate discussion.

HOW BLUE BRAIN WORKS?

Once our brain has interpreted all that we have learned, either by touching, tasting, or using any other sense, then our brain sends a message through neurons to effecter cells, muscle or gland cells, which actually work to perform our requests.

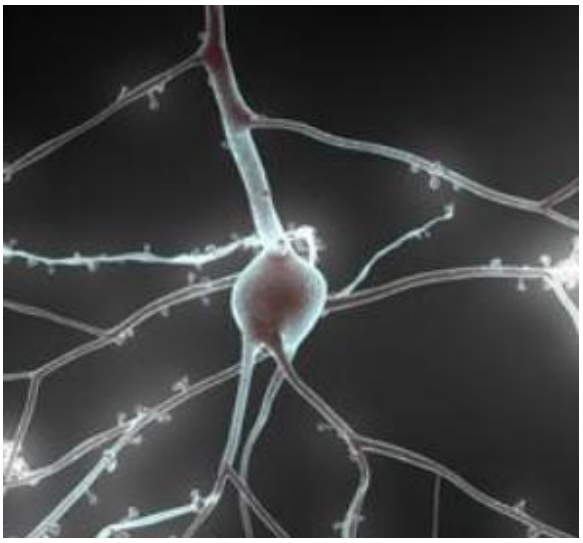


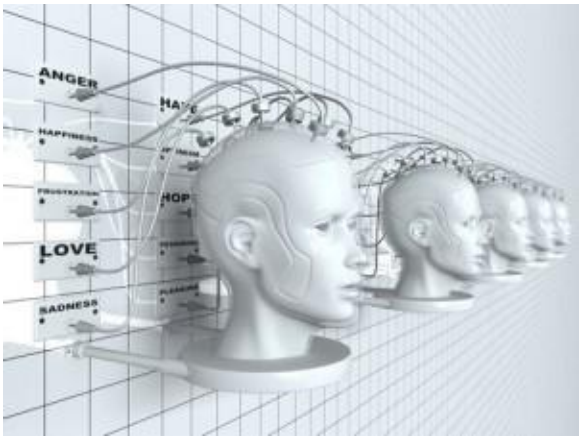
FIG: NEURON

There are certain neurons in our brain which represent certain states permanently. When required these state is interpreted by our brain and we can remember the past things. To remember thing we force the neurons to represent certain states of the brain permanently or for any interesting or serious matter this is happened implicitly.

These informations are stored in synapses of the brain.In blue brain concept it is possible to store the data permanently by using the secondary storage. In the similar way the required states of the registers can be stored permanently. And when required these information can be retrieved and used.

RESEARCH WORKS

IBM is on progress with developing the "Blue brain". Since November 2008, IBM received a $4.9 million grant from the Pentagon for research into creating intelligent computers. The Blue Brain project is being conducted with the assistance of IBM in Lausanne. The project is based on the premise that it is possible to artificially link the neurons "in the computer" by placing thirty million synapses in their proper three dimensional position. In March 2008, *Blue Brain* project was progressing faster than expected: "Consciousness is just a massive amount of information being exchanged by trillions of the brain cells human." Some proponents of strong AI speculate that the computers in connection with Blue Brain and Soul Catcher may exceed human intellectual capacity by around 2015, and that it is likely that we will be able to download the human brain at sometime around 2050.



Requirements-Hardware and Software

- A Super computer.
- Memory with a very large storing capacity.
- Processor with a very high processing power.
- A very wide network.
- A program to convert the electric impulses from the brain to input signal, which is to be received by the computer and vice versa.
- Very powerful Nanobots.

BBP-SDK

The BBP-SDK (Blue Brain Project - Software Development Kit) is a set of software classes (APIs) that allows researchers to utilize and inspect models and simulations. The SDK is a C++ library wrapped in Java and Python.

Computer Hardware:

The primary machine used by the Blue Brain Project is a Blue Gene supercomputer built by IBM. This is where the name "Blue Brain" originates from. IBM agreed in June 2005 to supply EPFL with a Blue Gene/L as a "technology demonstrator". The IBM press release did not disclose the terms of the deal. In June 2010 this machine was upgraded to a Blue Gene/P. The machine is installed on the EPFL campus in Lausanne (Google map) and is managed by CADMOS (Centre for Advanced Modelling Science). The computer is used by a number of different research groups, not exclusively by the Blue Brain Project. In mid-2012 the BBP was consuming about 20% of the compute time.
The brain simulations generally run all day, and one day per week (usually Thursdays). The rest of the week is used to prepare simulations and to analyse the resulting data. The supercomputer usage statistics and job history are publicly available online - look for the jobs labelled as "C-BPP".

Fig. BLUE GENE/p

Blue Gene/P technical specifications:

It consists of,

- 4,096 Quad-core nodes.
- Each core is,PowerPC 450, 850 MHz.
- Total:56 teraflops,16 terabytes of memory.
- 4 racks, one row, wired as a 16x16x16 3D torus.
- 1 PB of diskspace, GPFS parallel file system.
- Operating system: LinuxSuSE SLES 10

This machine peaked at 99th fastest supercomputer in the world in November 2009.

Silicon Graphics: A 32-processor Silicon Graphics Inc. (SGI) system with 300 Gb of shared memory is used for visualization of results.

Commodity PC clusters: Clusters of commodity PCs have been used for visualization tasks with the RT Neuron software.

JuQUEEN

JuQUEEN is an IBM Blue Gene/Q supercomputer that was installed at the Jülich Research Center in Germany in May 2012. It currently performs at 1.6 peta flops and was ranked the world's 8th fastest supercomputer in June 2012. It's likely that this machine will be used for BBP simulations starting in 2013, provided funding is granted via the Human rain project. In October 2012 the supercomputer is due to be expanded with additional racks. It is not known exactly how many racks or what the final processing speed will be. The JuQUEEN machine is also to be used by the research initiative. This aims to develop a three dimensional, realistic model of the human brain.

Fig: JuQUEEN Supercomputer In Germany

Deep - Dynamical Exascale Entry Platform

DEEP (deep-project.eu) is an exascale supercomputer to be built at the Jülich Research Centre in Germany. The project started in December 2011 and is funded by the European Union's 7th framework program. The three-year prototype phase of the project has received €8.5 million. A prototype supercomputer that will perform at 100 petaflops is hoped to be built by the end of 2014. The Blue Brain Project simulations will be ported to the DEEP prototype to help test the system's performance. If successful, a future exascale version of this machine could provide the 1 exaflops of performance required for a complete human brain simulation by the 2020s.The DEEP prototype will be built using Intel MIC (Many Integrated Cores) processors, each of which contains over 50 cores fabricated with a 22 nm process. These processors were codenamed Knights Corner during development and subsequently.

Fig. BLUE BRAIN STORAGE RACK

Advantages

- We can remember things without any effort.
- Making decision without the presence of a person is possible.
- We can Use the intelligence of a person after his/her death.
- Understanding the activities of animals is possible.
- Allowing the deaf to hear via direct nerve stimulation is achievable.

FUTURE SCOPES:

It will be possible to create a communication among various persons' conscious. Currently, there are roughly 2 billion people on the planet that are affected by mental disorder. They can be cured by this project as well as Allowing the deaf to hear via direct nerve simulation. It can helps to make decisions entirely of its own.

CONCLUSION

Human Being will be able to transfer the brain content into Computer. The project of Blue Brain initiated by Henry Markram will become both beneficial and harm for society. Using the Blue Gene supercomputers, up to 100 cortical columns, 1 million neurons, and 1 billion synapses can be simulated at once. This is roughly equivalent to the brain power of a honey bee.

Humans, by contrast, have about 2 million columns in their cortices. Despite the sheer complexity of such an endeavour, it is predicted that the project will be capable of this by the year 2023. Although research into bluebrain is in its preliminary stages, the promise of such technology is endless.

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