ISSN 2348 – 9928
IJAICT Volume 2, Issue 7, July 2015 Doi:01.0401/ijaict.2014.03.06 Published Online 05 (7) 2015

THE BLUE BRAIN

Ms. K. Kaviya
Electronics and Communication Engineering,
Kalaignar Karunanidhi Institute of Technology
Coimbatore, Tamilnadu, India

Abstract- The Blue Brain Project is the first made comprehensive attempt to reverse-engineer the brain of mammalian, so that through detailed simulations the function of brain can be understood. BLUE BRAIN is the name of the world's first virtual brain which means, a machine that can function as human brain. Today, scientists are in research to create an artificial brain that can think, respond, take decision, and store anything in memory. The main aim of this research is to upload human brain into machine. So that man can think and take decision without any effort. After the death of the body, the virtual brain will act as the man. So, even after the death of a person we will not lose the knowledge, intelligence, personalities, feelings and memories of that man that can be used for the development of the human society. In this paper, we present the complete research work which explains the concept and functioning model of blue brain and the recent research and developments in the process.

Keywords— Blue Brain, Human Brain, Knowledge Sharing, Artificial Brain.

I. INTRODUCTION

No one has ever understood the complexity of human brain. It is complex than any other circuits in the world. So, question may arise "Is it really possible to create a human brain?" The answer is "Yes". Because, whatever man has created today, he has always followed the nature. When man does not have a device called computer, it was a big question for all if it is really possible to design a computer. But 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.

II. ARTIFICIAL BRAIN OVERVIEW

Artificial brain is a term commonly used in the media to describe research that aims to develop software and hardware with cognitive abilities similar to those of the animal or human brain. Research investigating “artificial brains” plays three important roles in science

- A study called cognitive neuroscience, which helps neuroscientists to make an ongoing attempt to understand how human brain works.
- A thought experiment in the philosophy of artificial intelligence (AI), which demonstrates that it is actually possible to create a machine that has all the capabilities of a human being in theory.
- A serious long term project to create machines capable of general intelligent action or Artificial General Intelligence. This idea has been popularised by Ray Kurzweil as strong AI (taken to mean a machine as intelligent as a human being).

An example of the first objective is the project reported by Aston University in Birmingham, England where researchers are using biological cells to create "neurospheres" (small clusters of neurons) in order to develop new treatments for diseases including Alzheimer's, Motor Neurone and Parkinson's Disease.The second objective is a reply to arguments such as John Searle’s Chinese room argument, Hubert Dreyfus' critique of AI or Roger Penrose's argument in The Emperor's New Mind. These critics argued that there are aspects of human consciousness or expertise that cannot be simulated by machines. One reply to their arguments is that the biological processes inside the brain can be simulated to any degree of accuracy. This reply was made as early as 1950, by Alan Turing in his classic paper "Computing Machinery and Intelligence".

The third objective is generally called artificial general intelligence by researchers. However Kurzweil prefers the more memorable term Strong AI. In his book *The Singularity is Near*, he focuses on whole brain emulation using conventional computing machines as an approach to implementing artificial brains, and claims (on grounds of computer power continuing an exponential growth trend) that this could be done by 2025. Henry Markram, director of the Blue Brain project (which is attempting brain emulation), made a similar claim (2020) at the Oxford TED conference in 2009.

III. HISTORY OF THE BLUE BRAIN

The aim of the project, founded in May 2005 by the Brain and Mind Institute of *the École Polytechnique Fédérale de Lausanne* (Switzerland) is to study the brain's architectural and functional principles. The project is headed by the Institute's director, Henry Markram. Using a Blue Gene supercomputer running Michael Hines's NEURON software, the simulation does not consist simply of an artificial neural network, but involves a biologically realistic model of neurons. It is hoped that it will eventually shed light on the nature of consciousness. There are a number of sub-projects, including the Cajal Blue Brain, coordinated by the supercomputing and Visualization Center of Madrid (CeSViMa), and others run by universities and independent laboratories.

3.1 Goals

3.1.1 Neocortical column modeling

The initial goal of the project, completed in December 2006, was the simulation of a rat neocortical column, which can be considered the smallest functional unit of the neocortex (the part of the brain thought to be responsible for higher functions such as conscious thought). Such a column is about 2 mm tall, has a diameter of 0.5 mm and contains about 60,000 neurons in humans; rat neocortical columns are very similar in structure but contain only 10,000 neurons (and 10^8 synapses). Between 1995 and 2005, Markram mapped the types of neurons and their connections in such a column.

3.1.2 Whole brain simulation

A longer term goal is to build a detailed, functional simulation of the physiological processes in the human brain: "It is not impossible to build a human brain and we can do it in 10 years," Henry Markram, director of the Blue Brain Project said in 2009 at the TED conference in Oxford. In a BBC World Service interview he said: "If we build it correctly it should speak and have intelligence and behave very much as a human does."

3.2 Progress

In November 2007, the project reported the end of the first phase, delivering a data-driven process for creating, validating, and researching the neocortical column. By 2005 the first single cellular model was completed. The first artificial cellular neocortical column of 10,000 cells was built by 2008. By July 2011 a cellular microcircuit of 100 neocortical columns with a million cells in total was built.

A cellular rat brain is planned for 2014 with 100 microcircuits totaling a hundred million cells. Finally a cellular human brain is predicted possible by 2023 equivalent to 1000 rat brains with a total of a hundred billion cells. Now that the column is finished, the project is currently busying itself with the publishing of initial results in scientific literature, and pursuing two separate goals: construction of a simulation on the *molecular level*, which is desirable since it allows studying the effects of gene expression; simplification of the column simulation to allow for parallel simulation of large numbers of connected columns, with the ultimate goal of simulating a whole neocortex (which in humans consists of about 1 million cortical columns).

3.3 *Uploading Human Brain*

First, it is helpful to describe the basic manners in which a person may be uploaded into a computer. Raymond Kurzweil recently provided an interesting paper on this topic. In it, he describes both invasive and non invasive techniques. The most promising is the use of very small robots, **or** nanobots**.** These robots will be small enough to travel throughout our circulatory systems. Travelling into the spine and brain, they will be able to monitor the activity and structure of our central nervous system. They will be able to provide an interface with computers that is as close as our mind can be while we still reside in our biological form.

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. This information**,** when entered into a computer, could then continue to function as us. All that is required is a computer with large enough storage space and processing power. Is the pattern and 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.

IV. RESEARCH WORK

IBM is on progress with developing the "Blue brain". IBM, in partnership with scientists at Switzerland's Ecole Polytechnique Federale De Lausanne's (EPFL) Brain and Mind Institute will begin simulating the brain's biological systems. 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.

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.

Limitations

- We become dependent on the Computer.
- Others may use technical knowledge against us.
- Another fear is found today with respect to human Cloning.
- In addition there seem to be power constraints. The brain consumes about 20W of power whereas supercomputers may use as much as 1MW or an order of 100,000 more (Note: Landauer limit is 3.5x1020 op/sec/watt, at room temperature).

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.

V. CONCLUSION

The whole idea is that mental illness, memory and perception triggered by neurons and electric signals could be soon treated with a supercomputer that models all the 1,000,000 million synapses of brain. The key finding is that irrespective of gender and race, human brains are basically identical. We will be able to map the differentiations by nuancing the patterns later. The exciting part is not how different we are but how similar we all are. There are good reasons to believe that, regardless of implementation strategy, the predictions of realizing artificial brains in the near future are optimistic.

References

[1] IBM Aims To Simulate A Brain, Forbes, 6 June 2005.
[2] Mission to build a simulated brain begins, [New Scientist] News, 6 June 2005.
[3] Blue Brain Project site, Lausanne.
[4] Henry Markram, "The Blue Brain Project", Nature Reviews Neuroscience, 7:153-160, 2006 February. PMID 16429124.
[5] Growing a Brain in Switzerland, Der Spiegel, 7 February 2007
[6] Reconstructing the Heart of Mammalian Intelligence Henry Markram's Lecture, March 4, 2008.
[7] Simulated brain closer to thought BBC News 22 April 2009
[8] Firing Up the Blue Brain -"We Are 10 Years Away From a Functional Artificial Human Brain" Luke McKinney, July 2009
[9] Henry Markram builds a brain in a supercomputer TED Conference. July 2009.