

Blue Brain-A Massive Storage Space

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Abstract

Human brain, the greatest creation of god which is package of unimaginative functions. A man is intelligent because of the brain. "Blue Brain" is world's first virtual brain. Pink brain is special because of that it can think, respond, take decision without any effort and keep anything in memory. Aim of the project is to archive features of Pink brain to a Digital system. In short, "Brain to a Digital System". After death of a human, data including intelligence, knowledge, personality, memory and feelings can be used for further development of society.

BB Storage space is an extracted concept from Blue brain project. Storing numerous and variety of data on memory is an advantage provided. By this concept, registers act as neurons and Electric signals as simulation impulses. Variation of data are identified based on signal variation that reach the registers. Registers mentioned here is same that a normal system maintains. Benefit

focused by this concept of storage is storing data without deletion on real time as normal brain does. Attaching this concept to an expert system reflects drastic changes while it responds. To make the system more friendly a regional Language conversion using Natural Language Processing (NLP) is included with a voice recognition technique. In similar way, system should also respond using the experiences that it has been traveled through, in voice format. This is the output format of BB storage space. Nanobots on Blue brain which is used for information collection from neurons is replaced by real time experiences provided to the machine.

Keywords - Blue Gene, Blue Brain Storage space(BB Storage space), Nanobots

I. INTRODUCTION

Blue Brain also named as "Virtual Brain" , was the first intellectual brain which attempts reverse-engineering on the brain of mammals. These process helps to study the detailed stimulation and functionality of Pink brain. The project was initialized b Prof.Henry Markram from Brain and Mind Institute at EPFL (Ecole Polytechnique Federale de Lausanne) in Lausanne, Switzerland. IBM was collaborated with this project to ensure technical assistants. Recreating most valuable advantage of Pink brain - the Brain Uploading even after death of a person been a great challenge for the project. The aim of introducing Blue brain is to enable extremely fast development on recovery measures for Brain diseases. This has been a very useful tool for Short term memory patients. They can recollect their lost information through this feature. Research based on this is done on actual living brain, slicing down human brain tissues and applying Microscopes and Clamp electrodes for detailed study. Data from each neurons are collected. The real role of IBM is to regenerate a neuron model for this project.

These collected data is used to create biological-realistic model and network of neurons. Stimulation are performed using Blue Gene supercomputer built by IBM (shown in fig.1).

II. BLUE BRAIN

Blue brain was world's first virtual brain. Blue Brain is focused exclusively on creating a physiological simulation for biomedical applications. That means a machine which can function as human brain. For this purpose we have to upload human brain into machine. So a machine can help a man to think, take decision without any effort. After the death of the body, the virtual brain will act as the man. In virtual brain we implement the reverse engineering process of the human brain. No one has ever understood the complexity of human brain. It is complex than any circuitry in the world. So, question may arise "Is it really possible to create a human brain?" The answer is "Yes". It is possible through which a person may be uploaded into a computer. The uploading is possible by the use of small robots known as the Nanobots . These robots are small enough to travel throughout our circulatory system. Traveling 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. This information, when entered into a computer, could then continue to function as us. Thus the data stored in the entire brain will be uploaded into the computer.

EPFL Brain and Mind Institute will begin simulating the brain's biological systems and output the data as a working 3-dimensional model that will recreate the high-speed electro-chemical interactions that take place within the brain's interior.

These include cognitive functions such as language, learning, perception and memory in addition to brain malfunction such as psychiatric disorders like depression and autism.

In a similar way the artificial nervous system can be created. The scientist has created artificial neurons by replacing them with the silicon chip. It has also been tested that these neurons can receive the input from the sensory cells. So, the electric impulses from the sensory cells can be received through these artificial neurons. The interpretation of the electric impulses received by the artificial neuron can be done by means of registers. The different values in these register will represent different states of brain. 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. It is possible to store the data permanently by using the secondary memory. In the similar way the required states of the registers can be stored permanently and when required these information can be received and used.

The decision making can be done by the computer by using some stored states and the received input and the performing some arithmetic and logical calculations. The computer chip, which is implanted into the brain, monitors brain activity and converts the intention of the user into computer commands. These applications may include novel communications inter-faces for motor impaired patients, as well as the monitoring and treatment of certain diseases which manifest themselves in patterns of brain activity, such as epilepsy and depression.”

Currently the chip uses 100 hair-thin electrodes that sense the electro-magnetic signature of neurons firing in specific areas of the brain, for example, the area that controls arm movement. The activities are translated into electrically charged signals and are then sent and decoded using a program.

The simulation step involves synthesizing virtual cells using the algorithms that were found to describe real neurons. The algorithms and parameters are adjusted for the age, species, and disease stage of the animal being simulated. Every single protein is simulated, and there are about a billion of these in one cell. First a network skeleton is built from all the different kinds of synthesized neurons. Then the cells are connected together according to the rules that have been found experimentally. Finally the neurons are functioned and the simulation brought to life. The patterns of emergent behavior are viewed with visualization software.

III. BLUE BRAIN AS EFFICIENT STORAGE SPACE

Blue brain emphasis a benefit of well-organized large storage and frequent responding. Based on this point, giving a brain to an expert system provides extra advantage for storage area. Intelligence of a man is the contribution of brain. Likewise, providing a brain to a system makes it intelligent to respond in the form of voice, text and so on.

The concept of Blue brain storage space is exactly an additional memory for digital system other than a main memory and secondary. Features of BB storage space is brain uploading. Brain uploading mentioned here is collecting in-formation to the memory using Machine Learning algorithms that works on real time. Data collected will be grouped into separate storage folders or Registers based on variations on data. This data categorization is done based on changes identified on input values. Binary values (1 and 0) are the only values which can be used to detect existence of data, decimal point variation on the bound values identifies data type variations. Incorporating technique of Natural Language Processing (NLP) makes project livelier and user friendly. Every user will be comfortable while they are interacting on a region language. Combination of both makes a huge hit on the field of Artificial Intelligence versus Natural Language Processing (NLP) .



Fig. 1. Blue Brain information storage

IV. SIMULATION OF BLUE BRAIN VS BB STORAGE

Simulation of Blue brain over BB storage space is shown in fig.2.

	SIMULATED BRAIN	BB STORAGE
INPUT	Nanobots are injected to collect data from neurons	User provides information as voice and real time uploading of data is performed (NLP and machine learning algorithms).
INTERPRETATION	Electric impulses are received by artificial neurons can be done by means of registers. The different values in these registers will represent different states of brain	Electric impulses are received by registers. The different values in these registers will represent different states of brain (neuron concept).
OUTPUT	Based on the states of registers the output signal can be given to the artificial neurons in the body which will be received by the sensory cell.	Responding to user in real time through voice based on information learned.

Fig. 2. Comparison of blue brain vs BB storage

V. WORKING OF BB STORAGE SPACE

Intelligence is a main factor which makes society developed. Intelligence is an inborn quality that cannot be created. People with this quality can think and they are able to extend by themselves. The brain and intelligence will be alive after the death of a person. Virtual brain helps people to get relaxed by uploading themselves to the system. Inborn intelligence for a chat bot can be created by a programmer. Here, programmer is the creator. More data storage makes system more intelligent and accurate to respond. Blue brain which is very similar to a living brain have a large storage space. BB storage space is one such concept based on large storage space or a extended idea of Blue brain.

BB storage space is not a software exactly but a storage space used for accepting the speech to text format data in the form of bits. We recommend bits as storage medium to get fast execution and more data storage. This performs on three levels and at final stage the storage is done.

Flow of data on BB storage is shown in fig.3.

Levels on which the BB storage travel through is as follows:

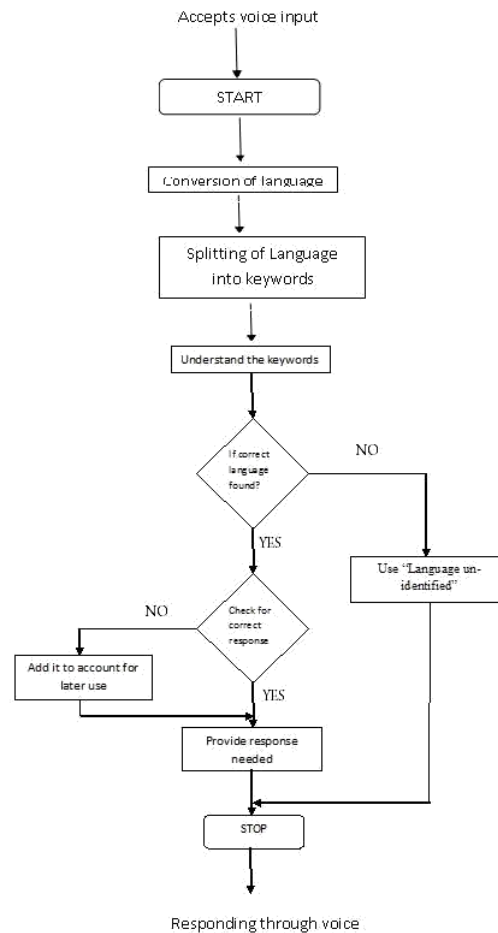


Fig. 3. Flowchart of BB storage space

A. Input and Output Speech Recognition

Transmission of data to and from BB storage space is done through speech. A combination of Natural Language processing (NLP) and speech recognition strengthen this concept. Layer performs three actions:

Accepting input through speech
 Converting speech to text and text to speech
 Speech output generation

Hidden-Markov models (HMM) are popular statistical models used to implement speech-recognition technologies. Process involves the conversion of acoustic speech into a set of words and is performed by software component. Accuracy of speech recognition systems differ in vocabulary size and confusable, speaker dependence vs. independence, modality of speech (isolated, discontinuous, or continuous speech, read or spontaneous speech), task and language constraints. Speech recognition system can be divided into several blocks: feature extraction, acoustic models database which is built based on the training data, dictionary, language model and the speech recognition algorithm. Dictionary is used to connect acoustic models with vocabulary words.

Language model reduces the number of acceptable word combinations based on the rules of language and statistical information from different texts. Speech recognition systems, based on hidden Markov models are today most widely applied in modern technologies. They use the word or phoneme as a unit for modeling. The model output is hidden probabilistic functions of state and cannot be deterministically specified.

Continuous speech recognition, each state represents one phoneme. Under the concept of training we mean the determination of probabilities of transition from one state to another and probabilities of observations. Iterative Baum-Welch procedure is used for training. The process is repeated until a certain convergence criterion is reached, for example good accuracy in terms of small changes of estimated parameters, in two successive iterations. In continuous speech the procedure is performed for each word in complex HM model. Once states, observations and transition matrix for HMM are defined, the decoding (or recognition) can be performed. Decoding represents finding of most likely sequence of hidden states using Viterbi algorithm, according to the observed output sequence. It is defined by recursive relation. During the search, n-best word sequences are generated using acoustic models and a language model.

General flow structure HMM is shown in fig.4.

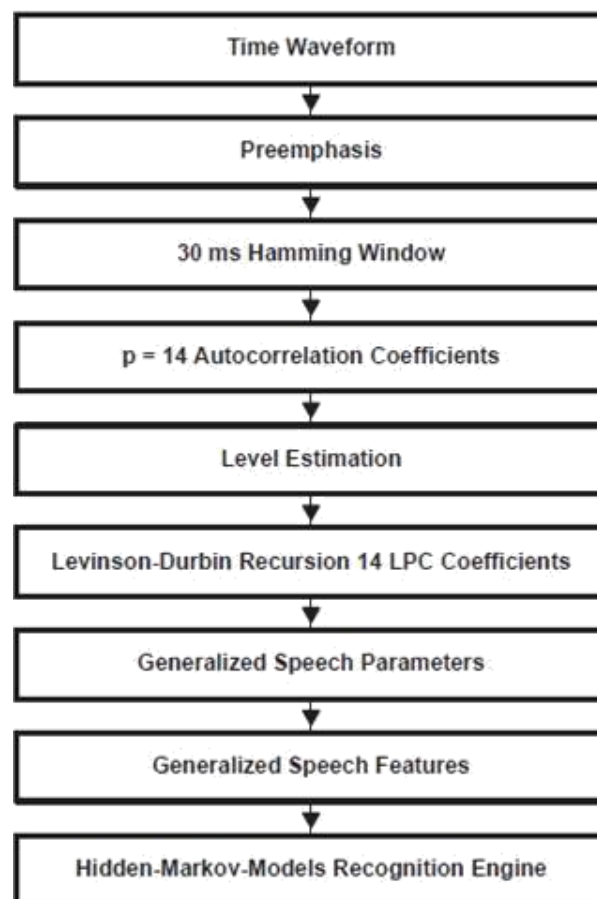


Fig. 4. Layers of Speech recognition

B. Text Analytics and AI

Text Analytics is most recent name given to Natural Language Understanding, data and Text Mining. Previous layer generates a text format output on which the text mining need to be performed. Text Analytics is an extension of data mining that finds pattern from unstructured sources. A technique called Sentiment analysis is a highlighted features of Text analytics. Sentiment analytics categorizes the text depending on positive and negative perception of comments provided by user.

To understand the concept take a look at the example. if user inputs two different emotional statements such as “I’m very happy today” and “It’s a bad day”. The words happy and bad presents the positive and negative perceptions and the word very shows the frequency of emotions. On such various situations system should respond accordingly. On other hand, if user inputs I plan to go to Jaipur tomorrow with my wife. Then system should respond what happens if you won’t go to Jaipur with your wife?. The process of converting my to your is called as Transpositions. Transposition is a technique included in Deep Learning.

Deep learning concept of Text mining will be suitable for analyzing such a situation. Deep learning is a widely used method for text mining and sentiment analysis. Deep learning works on two functions called Recurrent Neural Network (RNN) and Convolution Neural Network(CNN). CNN is basically used for sentiment analysis. Layers of convolution over input layer to compute output and each layer applies different filters, that combines to a result is the strategy used in CNN.

The output of this layer is generated after Tokenization. Tokenization is a method of identifying words or tokens from the text. Tokenization is applied to the text generated as the output of Text mining. Formatted Text (Structured text) is used because Tokenization process will be easy.

C. Data on BB Storage Space

BB Storage Space is about storage on registers. Neurons on brain are replaced by registers which act very similar to neurons. Registers are selected for this because it has an advantage of storing data in the form of smaller bits. Data to this registers are carried out in real time. But before taking it into a real world, a group of basic training is provided which will be permanently stored on the space. Basic training is done using Machine Learning algorithm. As we are focusing on speech, all the training set provided will be depending upon speech.

Highlighting feature of BB storage space over other storage techniques is that, it only stores speech input data using small bits. This BB storage space also capable of Taking decision by its own to respond based on input comments of user. This technique makes the system intelligent. Adding data which is not existed is a features of BB storage space, if already stored then respond using existing one. Storing in form of bits makes the execution faster.

Flowchart of data storage and retrieval to and from registers is shown in fig.5.

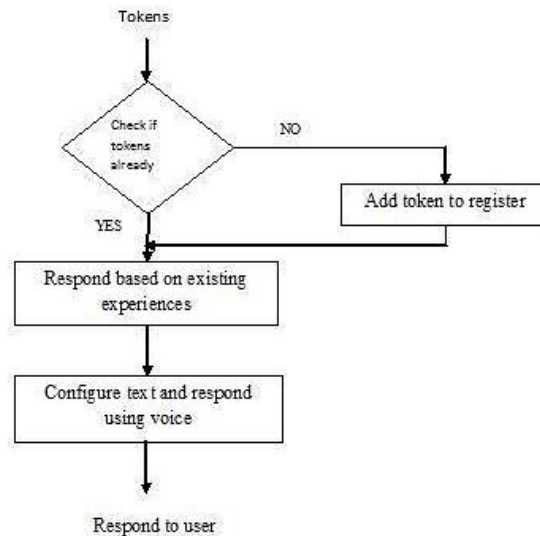


Fig. 5. Flowchart of Response on BB storage space

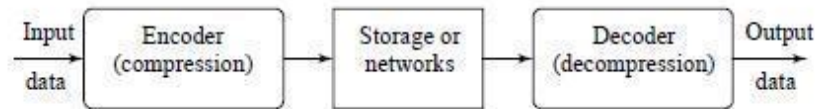


Fig. 6. A General data compression scheme

For making the storage of the data in registers can effectively done using the algorithm lossless compression. Compression technique is a process of coding that will effectively reduce the total number of bits needed to represent certain in information. General structure of compression is shown in fig.6. If compression and decompression process induce no information loss, then the compression scheme is lossless. Otherwise, it is lossy. Many variety of algorithms such as Huffman coding, extended Huffman coding performs similar action. But LZW compression and decompression algorithm is considered to be much powerful than others. LZW algorithm is used for fixed length code words to represent variable length strings of symbols or characters that commonly occur together.

D. Working of entire system

User can input comments through speech/ voice . User is able to input through standard language (English) or input can be in any regional language. if input is detected and accepted correctly based on the syntax of specified regional language an electric impulse is generated and transmitted to the registers. When impulses reaches registers, it checks whether token already existed in the registers. Tokens are not presented in

registers, Text analytics is performed. Otherwise, response is done based on experiences of system. Simple conversation of user and system is as follows:

message : Hello, How are you? response: Hi, I'm fine. How's your day? message: The day was spectacular.

response: Can you share what makes you so happy? Likewise, the conversation continues. Based on this interaction, user can understand that the system was fully intelligent. Because it has the capability to recognize the user was on positive perspective from the word spectacular. That is how system request to share user's happiest movements.

VI. FUTURE SCOPE

BB storage space is a concept focusing on storage where input and output is only provided through voice/speech. As future extension of this concept we can include visual data as input. Visual data can be video's, pictures or even a real time action. Using the same decomposition algorithms we can split up the pictures and video's in to smaller bits which results large amount of data storage.

VII. CONCLUSION

BB storage space is an additional advantage provided for our existing system. This makes the large amount of data stored in memory with less effort. BB storage space for a chat bot makes it more intelligent and faster to respond based on the experiences provided.

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