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Electro Neuro Memory Simulation Program (ENMSP)

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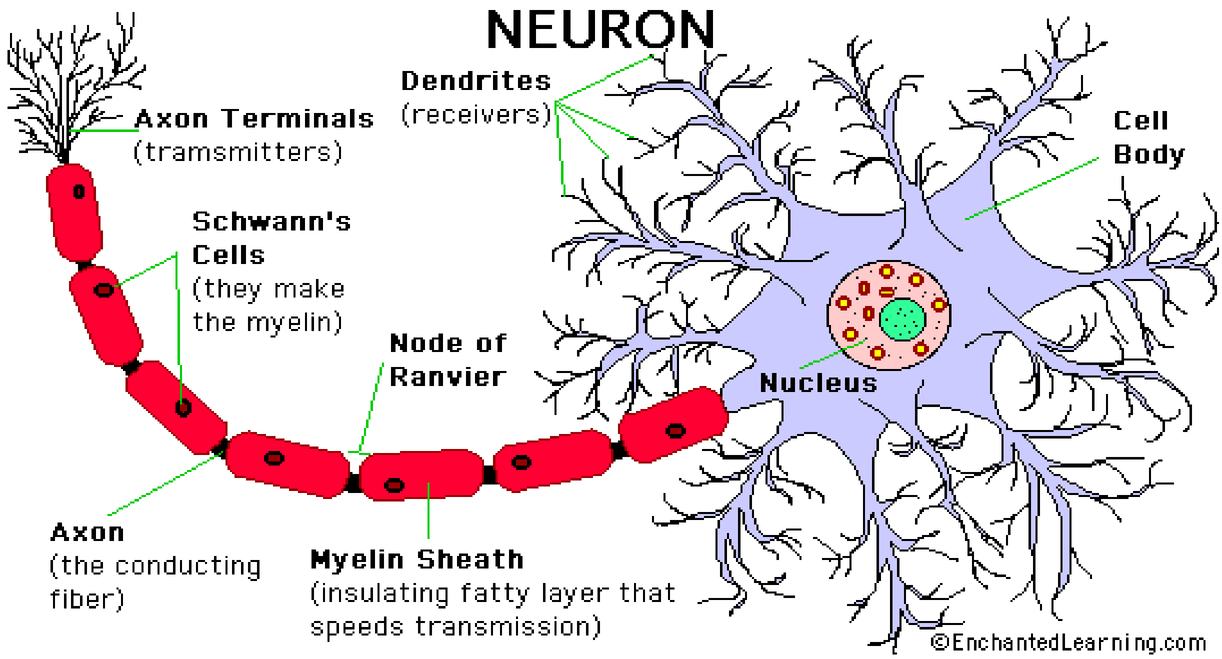
Abstract: **When we sense anything by our senses like touch, hearing, smell (Sensory memory). … . The data stored regarding about this in the hippocampus by ENMSP (Electro Neuro Memory Simulation program) is called out by (recalling) primary network (Usual human recalling system).**

I. INTRODUCTION

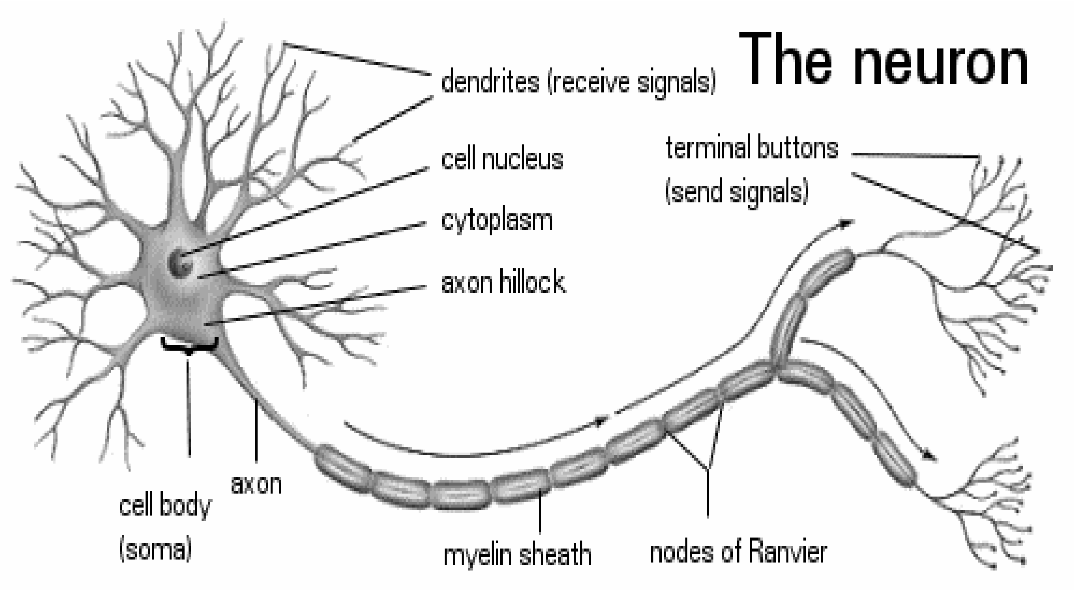
For long years of hard work and experience I've got a diplomatic experiment to do as my Project work. Here as I mentioned above **Electro Neuro Memory Simulation Program**, is the technique that I use to be followed to be imparting data to the brain. Our brain (human Brain) has the storage capacity of almost 2.5 petabytes. So far we concerned Albert Einstein had high capacity of storage, yet He didn't use all of His memory, only few had He used. Through this program we can convert any hard data like text music anything to the brain, Hippocampus and its associated unit are responsible for storing data in the Brain. At first the signal is converted into in to digital then to impulse and thence converts this signal in to equivalents of brain's signal coding. When I'm at the middle of this program I was totally in doldrums state that how we can simply convert this output signals to the equivalence of brain signal. During that period I happened to read news at The Times of India that Californian scientist experimented a **Bionic Eye**, which is an electronic device which converts light signals to the brain through optic nerve. The small intermediate device between Bionic Eye and brain, which does the conversion function electrical signals from the electrode to the equivalence of brain. And now I'm sure I can convert the electrical signal by this methodology. If it will be a successful invention we can use almost all of our memory. The memory unit for the implantation of data is a secondary memory so far our primary memory will not be affected by this. Once we store any data by this process, the neural network around the storage part help to recall the stored data when it is required.



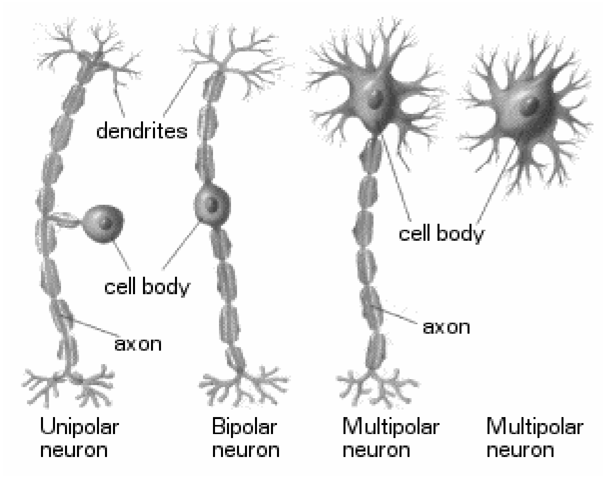
When our brain process any information then neurons in different Parts of our brain interact with each other. When neurons interact with each other then they pass the brain information through electric signals. Between two consecutive neurons there exists a very small gap and there the neuron Axon transmits the electric signal to the Dendrites by means of electromagnetic radiation. By the ENMSP method we are going to make a mutual electromagnetic wave of equivalent of brain's neural signals and then finally transmit these signals to the corresponding neural network by ENMSP simulation methods.

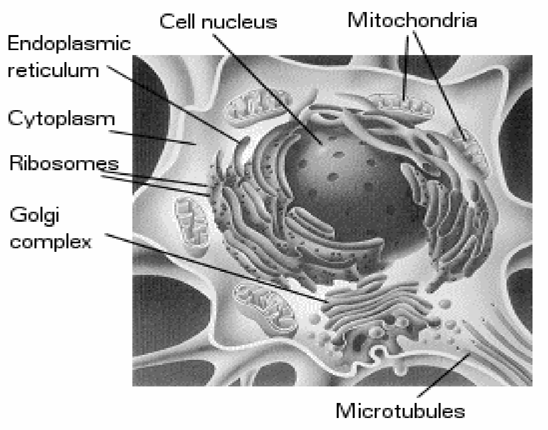
II. PRINCIPLE OF SELF-EXCITATION OF NEURONS

Although the structure and organization of the brain seems highly complicated, all the different parts boil down to the same fundamental building block: the neuron. The neuron is a special type of cell which processes and transmits information by electrochemical means. Neurons are found in the brain, the spinal cord, and in the nerves of the peripheral nervous system. They come in a great variety of shapes and sizes, however, most of them look like the one in the illustration below. Neurons are tiny. The cell body (soma) has a diameter of only 10-25 micrometers, which is just a little bit more than its cell nucleus. Their quantity, however, is immense. The human brain has roughly 100 billion neurons, each of them having several thousand connections to other neurons. This comes up to a whopping total of 500-1000 trillion connections within the brain. No computer on earth has that many connections or such a massively parallel organization. At any rate, the often cited brain-computer analogy is inept. Nervous systems are a far cry from the simple feed forward input/output circuits of a contemporary computer. Unlike a computer, the brain is a living thing; it can grow and change; and the processes of neural conduction is much more complex than signal conduction in the logical gates of a computer chip.



Neurons, or nerve cells, are eukaryotic cells which resemble all other cells in the human body with one exception. They are specialized in conducting information. The neuron has several fundamental characteristics. It has an excitable membrane which allows it to generate or propagate electrical signals, a tree of dendrites which receive signals, and an axon that transmits signals. The axon is a cable-like fiber that transmits nerve impulses from the neuron to other neurons. Axons are only about one micrometer across, but they can become extremely long. For instance, the axons of the sciatic nerve in the human body may run a meter or longer from the spine to the toes. This could be compared to a 50 cm caliber pipeline that runs 2000 km long. A layer of fatty cells, the myelin sheath punctuated by the unsheathed nodes of Ranvier, insulates the axons of some neurons and speeds the impulses. Each neuron has only one axon which usually branches out extensively and passes signals to multiple target cells. Terminal buttons at the end of each axon branch connect the neuron to the receiver cells via synapses. Thus the synapse provides the functional connection between different cells. It consists of the target area, which may be a spine, a dendrite, or a cell body, and the synaptic gap between the axon terminal and the receiver cell. The dendrites are a branching arbor of cell projections that receive signals from terminal buttons which they conduct to the cell body.





Neural conduction

The principle of neural conduction can be described by neural impulses and synaptic transmission. These are two complementary methods of conduction which neurons are capable of. The neural impulse is either on or off, whereas synaptic conduction –based on the transmission of chemicals– is gradual. This can be likened to digital and analogue signal conduction. A neuron fires an impulse when it is stimulated by chemical messages from connected neurons, or by pressure, heat, or light. This impulse, called action potential, is caused by the depolarization of the membrane potential of an excitable cell. Normally an electrical potential exists between the inside and outside of the cell. When ion channels in the cell membrane open, the exchange of ionized elements through the open channels causes an electric discharge. This impulse travels through the cell membrane and the axon hillock down to the axon and is then carried away from the cell. It propagates through the body at a speed of 10-100 meter per second, depending on the type of axon. The impulse doesn't travel like an electrical signal, but rather through successive depolarization of adjacent areas of the axon membrane, much like falling dominoes. During a very brief resting pause, the neuron pumps positively charged atoms back outside the membrane, after which the neuron is ready to fire again. This electrochemical process can be repeated 100 times per second.

Synaptic transmission is different. There are two type of synapses, electrical and chemical synapses. Electrical synapses couple neurons electrically via gap junctions. Chemical synapses work through the exchange of special chemicals called neurotransmitters. There are some 75 known neurotransmitters which amplify, relay, or modulate signals between neurons and other cells. These substances are produced by the soma, the chemical factory inside the neuron. The neurotransmitter molecules are usually packaged in spherical vesicles. These vesicles are conveyed through the axon towards the terminal buttons through special channels called microtubules, which are tiny pipelines running inside the axon. When a neural impulse reaches the knob-like terminals of the axon it triggers a biochemical cascade which causes the vesicles to fuse with the pre-synaptic membrane and release their neurotransmitters. The neurotransmitter molecules then cross the synaptic gap from the pre-synaptic membrane to the postsynaptic membrane within 1/10,000th of a second. It is like a very brief rain shower of neurotransmitters. Receptors on the postsynaptic membrane bind the neurotransmitter molecules. For a very brief period, ion channels on the postsynaptic membrane open to allow ions to rush in or out. This causes the Trans membrane potential of the receiver cell to change. There are two types of changes. Depolarization causes an excitatory postsynaptic potential; hyper polarization causes an inhibitory potential.

III. PROBLEM DESCRIPTION

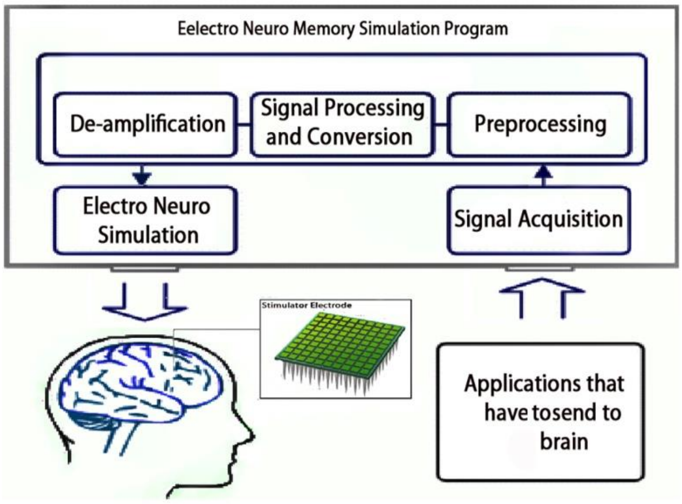
In this project we would like to create an instrument based on ENMSP method. This process is mainly devoted to make human brain as storage devise in the brain itself, and make use of all the remaining area of brain which is not yet commonly used by human kind. This process is mainly accompanied with electrical simulation method,

These are the following tasks have to be implemented in this process.

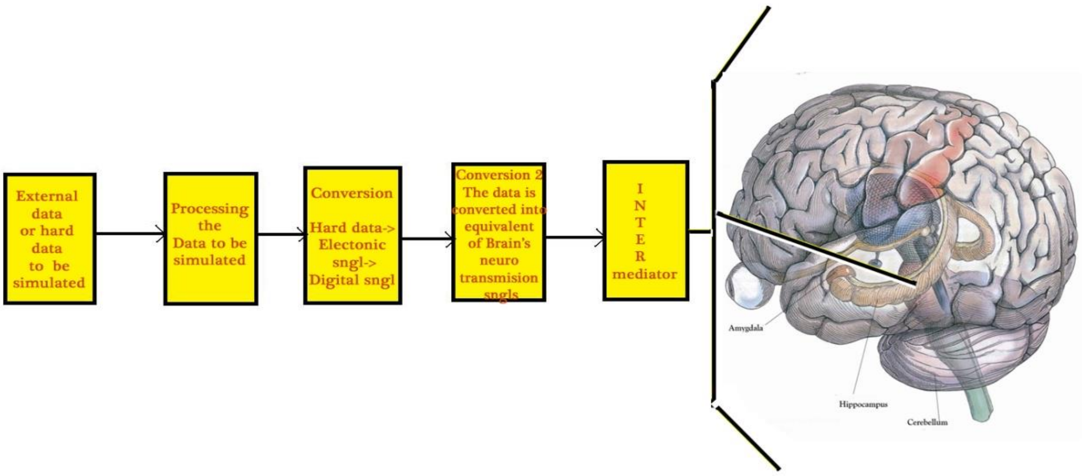
- Any data (hard data) which may be in the convenience form of human sensory memory is allowed to computer.
- In the computer the first conversion process is happening, where all the hard data can be digitized.

- These digitized signals from the computer are again converted into brain equivalent signals by using specially made conversion software.
- These equivalents of artificially created brain wave are transmitted into the brain by using various simulating electrode of number 17- 24 around the brain's neural network.
- After the simulation process the converted data will be stored to the storage unit of the brain by electrical simulation process.
- When one face any physiological situation regarding the stored data in the brain by ENMSP method. The primary memory network of the brain recalled the stored memory from the secondary memory section, Hippocampus.

Basic Block Diagram



The chain process of insertion of any data converted into Digital ->analog-> and thence to neuro impulse



The above is the graphical representation of the Electro Neuro Simulation Memory Program.

External Devise

Here the data is to be transmitted is first allow to pass to the first process where the data is analyzed then the processed data is electronically converted into digital form, this converted data is again processed. At the last stage before the intermediator the signal is again processed and then converted into equivalent of Brain's neuro signal (passing through neuro transmitter);.

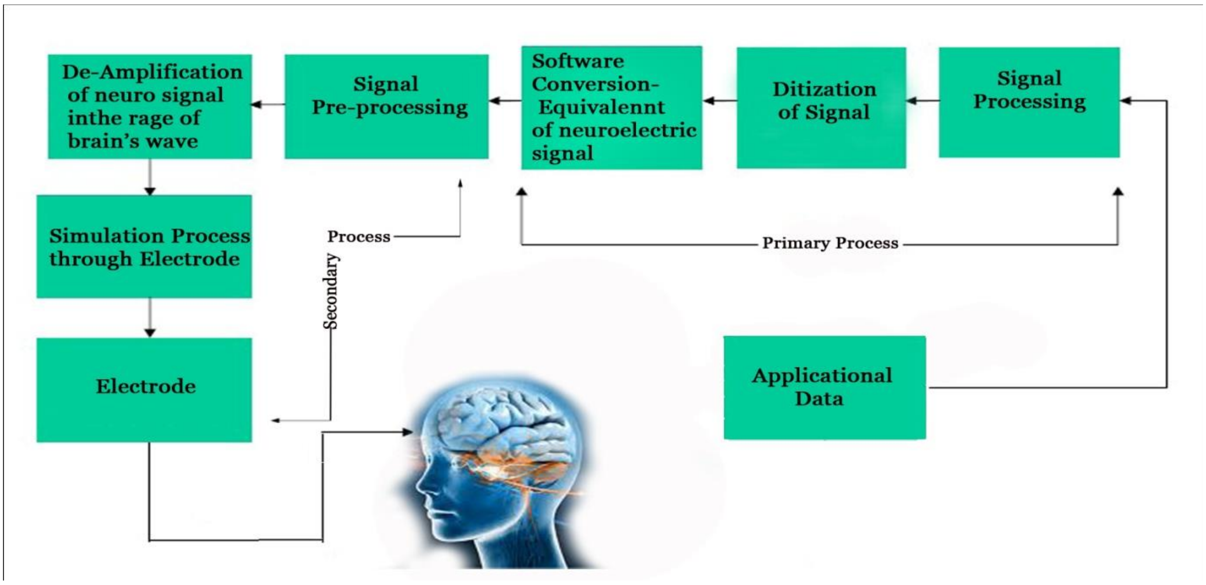
Intermediator

The Intermediator helps to pass the converted signals equivalent of brain's neuro impulse to the Brain through the nerves which pass through the external of cortex, which has direct link with Hippocampus.

Process involved in Brain

When the intermediator allows the signals to the brain, it passes through the nerves which has direct link with hippocampus. It is clear that hippocampus is known as the center of ***memory storage and emotion***. Which is completely covered by neuron network? During the volume conduction of neuro transmission, by this process the data that we sent has been stored on neuro network in the hippocampus. Which is short-term to long -term memory, and also the hippocampus belongs to secondary memory region. The primary memory has no role to this process I think, but it might be involved partly. This is the process behind **ENMSP (Electro Neuro Memory Simulation program).** Then the whole is maintained by Primary memory region and its associated neuron network.

Signal Flow Graph:



IV. DESCRIPTION OF HARDWARE COMPONENTS

The main process involved in this process is

- Primary Process and
- Secondary Process

Primary process:

- Signal Processor
- Digitization processor
- Software for neural signal conversion

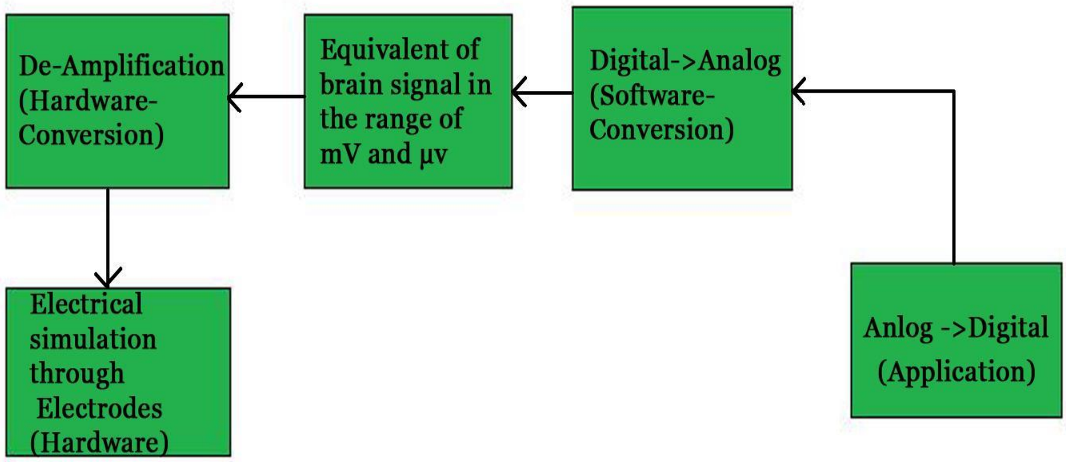
Secondary Process:

- Signal pre-processor
- De-Amplifier
- Electrode

Interpretation of application data in to the brain -Software Analysis for the

While doing the ENMSP process several types of hardware and software conversions are required. The Input of this process is the application data which is in the form of hard application which can be first converted in the form digital signal in the form of 0's and 1's. These digitized signals are then preprocessed again. The second process of conversion is again the software conversion where the primarily converted data is again processes and converted in to analog signals, which might be in the same amplitude and characteristics of human brain waves in the range of mV and µv. For all these conversion process we need to have a specially designed algorithm like the reverse of 'Hough Spikers Algorithm'. The third process of conversion is the hardware conversion; during these cycles of conversion the output of the second process is de-amplified to the equivalent of brain waves. Finally the de amplified analog signal is transmitted to the brain with help of electrodes placed over the cortex of the brain by simulating the brain's nerves like the reverse process of EEG.

Basic Diagram for software and Hardware conversions



In which part of Brain is associated with storing data (Memory is stored in which part of brain?)

This is the part of brain where we are going to experiment!

Brain areas such as the hippocampus, the amygdala, the striatum, or the mammillary bodies are thought to be involved in specific types of memory. For example, the hippocampus is believed to be involved in spatial learning and declarative learning, while the amygdala is thought to be involved in emotional memory. Damage to certain areas in patients and animal models and subsequent memory deficits is a primary source of information. However, rather than implicating a specific area, it could be that damage to adjacent areas, or to a pathway traveling through the area is actually responsible

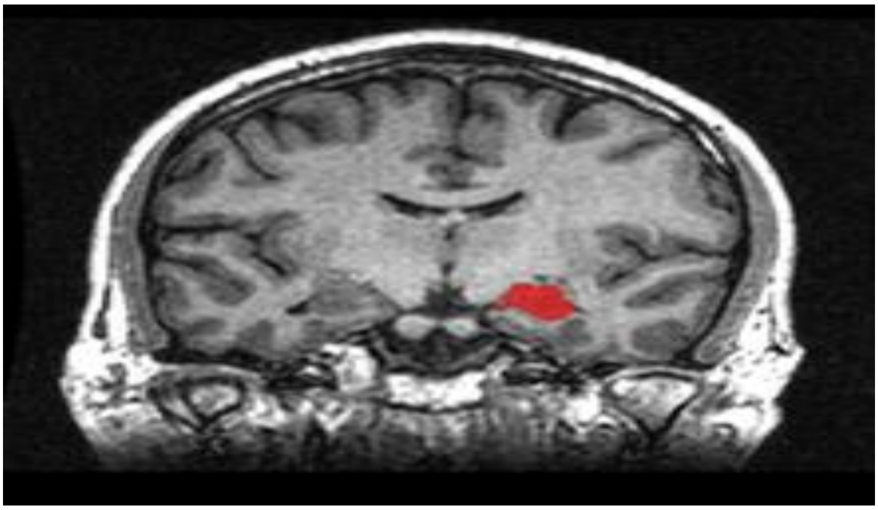
For the observed deficit. Further, it is not sufficient to describe memory, and its counterpart, learning, as solely dependent on specific brain regions. Learning and memory are attributed to changes in neuronal synapses, thought to be mediated by long-term potentiation and long-term depression.

Hippocampus

Hippocampus (disambiguation)

Brain: Hippocampus

The hippocampus is located in the medial temporal lobe of the brain. In this lateral view of the human brain, the frontal lobe is at left, the occipital lobe at right, and the temporal and parietal lobes have largely been removed to reveal the hippocampus underneath.



MRI coronal view of a hippocampus shown in red

The **hippocampus** is a major component of the brains of humans and other vertebrates. It belongs to the limbic system and plays important roles in the consolidation of information from short-term memory to long-term memory and spatial navigation. Humans and other mammals have two hippocampi, one in each side of the brain. The hippocampus is closely associated with the cerebral cortex, and in primates is located in the medial temporal lobe, underneath the cortical surface. It contains two main interlocking parts: Ammon's horn and the dentate gyrus.

In Alzheimer's disease, the hippocampus is one of the first regions of the brain to suffer damage; memory problems and disorientation appear among the first symptoms. Damage to the hippocampus can also result from oxygen starvation (hypoxia), encephalitis, or medial temporal lobe epilepsy. People with extensive, bilateral hippocampal damage may experience anterograde amnesia—the inability to form or retain new memories.

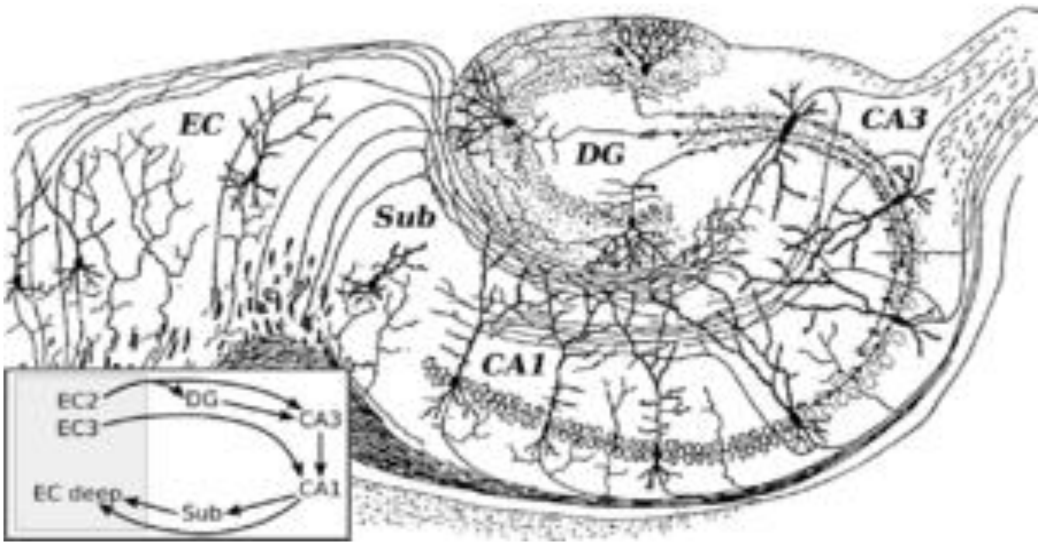
In rodents, the hippocampus has been studied extensively as part of a brain system responsible for spatial memory and navigation. Many neurons in the rat and mouse hippocampus respond as place cells: that is, they fire bursts of action potentials when the animal passes through a specific part of its environment. Hippocampal place cells interact extensively with head direction cells, whose activity acts as an inertial compass, and with grid cells in the neighboring entorhinal cortex.

V. NEUROLOGY

(The adult human Brain has been estimated to store a limit of up to 2.5 petabytes of binary data equivalent)

Since different neuronal cell types are neatly organized into layers in the hippocampus, it has frequently been used as a model system for studying neurophysiology. The form of neural plasticity known as long-term potentiation (LTP) was first discovered to occur in the hippocampus and has often been studied in this structure. LTP is widely believed to be one of the main neural mechanisms by which memory is stored in the brain.

How (Mechanism of) the storing process occurs in Brain

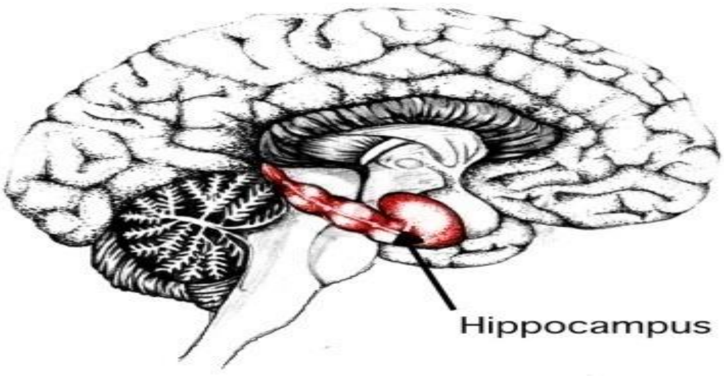


Basic circuit of the hippocampus, as drawn by DG: dentate gyrus. Sub: subiculum. EC: entorhinal cortex.

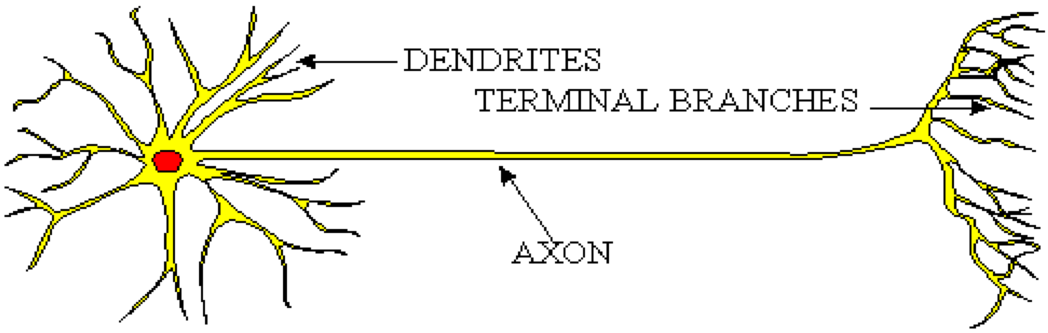
The entorhinal cortex (EC), located in the parahippocampalgyrus, is considered to be part of the hippocampal region because of its anatomical connections. The EC is strongly and reciprocally connected with many other parts of the cerebral cortex. In addition, the medial septal nucleus, the anterior nuclear complex and nucleus reuniens of the thalamus and the supramammillary nucleus of the hypothalamus, as well as the raphe nuclei and locus coeruleus in the brainstem send axons to the EC. The main output pathway (perforant path, first described by Ramon y Cajal) of EC axons comes from the large stellate pyramidal cells in layer II that "perforate" the subiculum and project densely to the granule cells in the dentate gyrus, apical dendrites of CA3 get a less dense projection, and the apical dendrites of CA1 get a sparse projection. Thus, the perforant path establishes the EC as the main "interface" between the hippocampus and other parts of the cerebral cortex. The dentate granule cell axons (called mossy fibers) pass on the information from the EC on thorny spines that exit from the proximal apical dendrite of CA3 pyramidal cells. Then, CA3 axons exit from the deep part of the cell body, and loop up into the region where the apical dendrites are located, then extend all the way back into the deep layers of the entorhinal cortex—the Shaffer collaterals completing the reciprocal circuit; field CA1 also sends axons back to the EC, but these are more sparse than the CA3 projection. Within the hippocampus, the flow of information from the EC is largely unidirectional, with signals propagating through a series of tightly packed cell layers, first to the dentate gyrus, then to the CA3 layer, then to the CA1 layer, then to the cubiculum, then out of the hippocampus to the EC, mainly due to collateralization of the CA3 axons. Each of these layers also contains complex intrinsic circuitry and extensive longitudinal connections.

Several other connections play important roles in hippocampal function. Beyond the output to the EC, additional output pathways go to other cortical areas including the prefrontal cortex. A very important large output goes to the lateral septal area and to the mammillary body of the hypothalamus. The hippocampus receives modulatory input from the serotonin, norepinephrine, and dopamine systems, and from nucleus reuniens of the thalamus to field CA1. A very important projection comes from the medial septal area, which sends cholinergic and GABAergic fibers to all parts of the hippocampus. The inputs from the septal area play a key role in controlling the physiological state of the hippocampus: destruction of the septal area abolishes the hippocampal theta rhythm, and severely impairs certain types of memory.

The cortical region adjacent to the hippocampus is known collectively as the parahippocampalgyrus (or Para hippocampus). It includes the EC and also the perirhinal cortex, which derives its name from the fact that it lies next to the rhinal sulcus. The perirhinal cortex plays an important role in visual recognition of complex objects, but there is also substantial evidence that it makes a contribution to memory which can be distinguished from the contribution of the hippocampus, and that complete amnesia occurs only when both the hippocampus and the Para hippocampus are damaged.

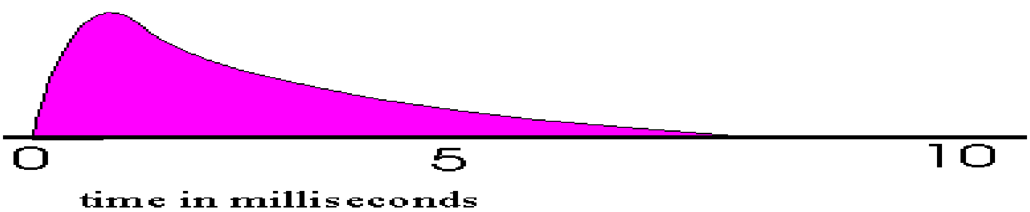


Man's neural system (including his brain) is also digital.



The sketch shows a typical nerve cell which is provided in the body for the transfer of information. The red dot on the left represents the nucleus of the cell. Signals are input from other nerve cells or from sensors to the cell wall and the dendrites. There may be many inputs. As a result of these inputs the cell will develop an electrical pulse which will travel down the axon and away from the nucleus. The axon may be quite short or it may be up to a meter in length. When the signal reaches the right end of the axon it will travel to the ends of the terminal branches. There the signal will be applied to many other nerve cells.

The input signal is arranged on receipt to act as either an excitation signal or an inhibition signal. Some pulses received on certain locations tend to excite the subject nerve cell into discharging an electrical pulse down the axon, others at different locations tend to inhibit the generation of a pulse. **The cell then becomes a decision mechanism which generates pulses in response to a form of signal summation,** *quite like a multi-term Boolean function* (*state machine*) in modern computers. The signal on the axon is then distributed to many other nerve cells for a similar summation (further computation). A typical axon signal is shown below.



The axon signal is an electrical voltage pulse. It requires about.7 millisecond for the pulse to reach its peak voltage. The decay of the pulse is quite long, about 7 milliseconds. The shape of the pulse with time is incidental; it is the presence or absence of the pulse which matters in the data transmission. That method is within the definition of digital communication.

Modern communications practice is to provide high volume data transmission by multiplexing single paths. A single channel is setup on a signal conductor (example - a fiber optic line) and a high volume of signals are processed by time-sharing the line. The switching from signal to signal is done so rapidly that it appears to the end user as if a separate line was assigned to each signal. Modern computer practice is to use parallel high speed channels with one binary bit transmission on each channel. Electronic signals travel at the speed of 300,000,000 meters per second. The speed of the pulse on an axon is about 100 meters per second. Switching speeds on electronic equipment are measured in nanoseconds (1/1,000,000,000 second). Axon speeds are measured in milliseconds (1/1000 second), about a million times slower. All of the signals passing through and into the brain are in the form of digital pulses.

Future Extensions & Fictions:

- It helps to make ordinary human as an encyclopedia.
- It could help deaf and dumb
- It could help Alzimers patient
- It will be change the Robot to think
- It will be a diplomatic achievement in medical science

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