ARTIFICIAL MEMORY ARCHITECTURE FOR ENHANCING OBJECT STORAGE AND RETRIEVAL MECHANISM IN ROBOTICS

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Abstract

Information flows from the outside world through our sight, hearing smelling, and tasting and touch sensors. Memory is simply ways we store and recall things we've sensed. The implementation of the memory architecture is also lead to perform the storage operations and retrieval in a effective and efficient manner. In this paper, we are going to just perform an comparison between the information passing through the human brain and the Robot's artificial brain architecture.

Key words: Information, storage, sight, and brain

1. INTRODUCTION

The way to implement the machine like a human is a wonderful approach in the present research industry. Before the implementation, we should know the basic architecture of our body. It gives more useful information regarding to construct the machine architecture. The primary component of the our body structure is Brain. Recalling memories re-fires many of the same neural paths we originally used to sense the experience and, therefore, almost re-creates the event. Memories of concepts and ideas are related to sense experiences because we extract the essence from sensed experiences to form generalized concepts.

Let us consider, Sir Isaac Newton, for example. Newton "hammered wooden pegs" into the ground, and "cut sundials into stone" to measure the Sun's movement through the sky, writes James Gleick in *Isaac Newton*. "This meant seeing time as akin to space, duration as length ...." Newton generalized what he observed into a concept of time.

We store — for fractions of second — sensory information in areas located throughout the cortex. Then some data moves into short-term memory. Finally, some of that information goes in long-term storage in various parts of the cortex, much of it returning to the sensory cortex areas where we originally received it.

Only the data that catches our attention (like a police car behind us) or because we need it soon (a telephone number) goes into short-term memory. We hold short-term data for maybe half a minute. Short-term storage is small; it holds about seven independent items at one time, such as "carry" numbers when calculating arithmetic.

Finally, information that may help us in the future (for instance, the downwind smell of a saber-toothed tiger) goes into long-term memory, where it can last a lifetime.

Long-term memory involves three processes: encoding, storage and retrieval.

- First we break new concepts into their composite parts to establish meaning. Furthermore, we include the context around us as we learn a new concept, or experience another episode in our life. For example, I might encode the phrase "delicious apple" with key descriptive ideas — red color, sweet taste, round shape, the crisp sound of a bite — and then such contextual items as '"I'm feeling good because it's a happy fall day and I'm picking apples."
- Second, as we store the memory, we attach it to other related memories, like "similar to Granny Smith apples but sweeter," and thus, consolidate the new concept with older memories.
- Third, we retrieve the concept, by following some of the pointers that trace the various meaning codes and decoding the stored information to regain meaning.

If I can't remember just what "delicious apple" means, I might activate any of the pointer-hints, such as "red" or "picking apples." Pointers connect with other pointers so one hint may allow me to recover the whole meaning.

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How do our brains consolidate a new short-term memory like "delicious apple" and place it into long-term memory?

We use the hippocampus, an ancient part of the cortex, to consolidate new memories. An event creates temporary links among cortex neurons. For example, "red" gets stored in the visual area of the cortex, and the sound of a bitten apple gets stored in the auditory area. When I remember the new fact, "delicious apple," the new memory data converges on the hippocampus, which sends them along a path several times to strengthen the links. The information follows a path (called the Papez circuit), starting at the hippocampus, circulating through more of the limbic system (to pick up any emotional associations like "happy fall day," and spatial associations like "apple orchard"), then on to various parts of the cortex, and back to the hippocampus. Making the information flow around the circuit many times strengthens the links enough that they "stabilize," and no longer need the hippocampus to bring the data together, says neuroscientist Bruno Dubuc of the Canadian Institutes of Neuroscience, Mental Health, and Addiction. The strengthened memory paths, enhanced with environment connections, become a part of long-term memory.

2. Components of Human Memory –just a glance

2.1 Short-term memory

All the information that has been dealt with since the last time the system was cleaned or maintenance was performed will be found in this memory, that is, since the last time a person slept enough time to perform this task. The degree of conservation or state of the information will depend on the mentioned time and, of course, on the physiological or genetic capacity of each individual. This memory will be fed mainly on the data that has gone through the auxiliary working memory, both from medium and long-term memory, and the experience and reasoning during normal life through our perception. Due to historical evolution, this memory is most efficient for approximately 16 hours, reserving 8 hours daily for its maintenance. Probably not all the time that we sleep is used to clean short-term memory; a significant amount of time is also dedicated to the transfer of information from medium-term to long-term memory (to state it simply), and other diverse maintenance functions. There are short-term memory cleaning systems that are highly recommended and others that are strongly advised against. Just say the first will not be easy to obtain if there are elements in the short-term memory that generate tensions and demand the individual's attention. In regards to the latter, the effects of abusive ingestion of alcohol can be used as an example; this can in turn give us an idea of the effects of non-abusive but counterproductive ingestion, especially for the information contained in this memory.

2.2 Medium-term memory

Maintaining information as organized as possible is a way of optimizing the information contained in short-term memory; this will probably make us take in a lot of information that we cannot organize immediately but that we can store to deal with and order afterwards. This eliminates duplicated information and permanently saves information, or similar concepts for reference, and, in this way, saves a large quantity of the memory's capacity or information archive. In the future, it is very likely that computers will always be functioning, whether by running requested programs or by reorganizing themselves. We can already cite programs that can be run automatically: defragmenting and maintenance of the hard drive, cleaning of the Windows system log, search for and downloading of news or any type of program, information compression, anti-virus, etc. The expression of medium-term memory is useful but does not precisely reflect the nature of its content. The information that is retained for a rather long time is found in this memory. But this period of time is larger because the information is more relational and contains less concrete information. That is, the information can be obtained not only directly, but rather by its relation to other information also saved in the memory. In this respect, independently from whether certain information is saved in the memory in its original state, (like the birthday of someone you are close to) medium-term memory tends to be more fixed as the information is transformed into concepts and these are defined by the base of a system of multi-dimensional references. Over time, concepts will only remain in the indicated form; precise information usually ceases being useful or, if relevant, becomes a part of instantaneous memory and the memorized relations tend to be incorporated into the cited multidimensional system. And if required, a new dimension will be added in the system. All of these processes are not free from errors; the mechanisms that are good in the majority of cases can turn out to be totally inadequate for others. One of the circumstances that concern me the most occurs when an act or an idea is repeated many times during a certain period, and especially when it appears or is proposed as a hypothesis that develops in various ways. In accordance with normal mechanisms in the brain, this act or idea will be saved in layers that go deeper and deeper into our brain memory. Afterwards, when our memory accesses this information, it will be likely to interpret this as its own already accepted information because it is found in a deep layer.

The error can be significant -*a strange idea is supplanting our true knowledge or feelings*! It is called **brainwashing** and it is likely to occur, for example, when we read a book that repeats something thousands of times. Each time we read it, the brain has enough time to memorize the idea or transfer it to a deeper layer. Of course, this effect depends on the ideas and the individuals.

2.3 Long-term memory

This expression is more correct than the previous one in that it clearly implies long-term, but also needs some clarification as far as its nature. If medium-term memory is configured like a multidimensional system, long-term memory is formed independently of the famous 'birthday' by an exclusively multidimensional system in which there are less dimensions than in medium-term memory, and these are the base of the essential character of a person, not of their knowledge. We are referring to what is commonly known as general personalized principles such as justice, equality, liberty, respect, education, benefit of the doubt, etc. Knowledge or concepts are found ordered in the deepest medium-term memory layers, or otherwise stated, in the most superficial layers of long-term memory. The necessity to re-adapt these principles to a greater

or lesser extent is an interesting effect that occurs in personality growth and development. Obviously, the unconsciousness does not like the idea; changing these principles supposes, to some extent, the recognition of some errors in them; this is a large task because all of the remaining memory will be changed and will need to be readjusted. These will probably be periods in which the person will sleep more than he/she is used to. In line with the question, this vision is coherent with the fact that people sleep less as they get older in normal conditions.

2.4 Vital memory

Here, we are not referring to a visual or emotional memory but rather a very special type of memory of visual-emotional nature that can be compared to **extra-fast movies** when a person thinks there is a certain probability that he/she will die in a matter of seconds. The content varies from person to person but usually tends to be a sequence of very symbolic emotive images in chronological order. Another type of super special and super persistent memory could be the **genetic memory** which contains all of the genetic information transmitted to the descendents.

3. The artificial memory architecture of the Robot's:

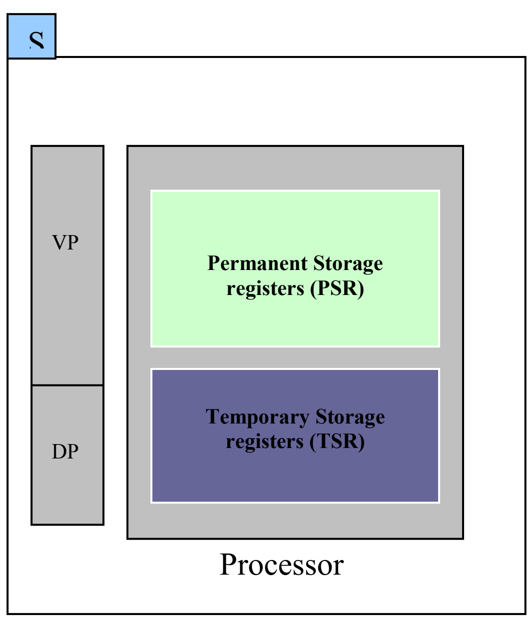

Fig 1.1 Basic Components of the Processor

The basic idea of this architecture is to capture the image with the help of visual part (In this section we can use any kind of advanced digital camera). The visual appearance of an object as a loosely structured combination of a number of by distinctive key features, or fragments.

A local context region can be thought of as an image patch surrounding the key feature and containing a representation of other features that intersect the patch. Now under different conditions (e.g. lighting, background, changes in orientation etc.) the feature extraction process will find some of these distinctive keys, but in general not all of them.

The object (either in the stable state or in the moving state) will enter into the observe region of the AI robot's will be intimated by the sensor attached at the top. The sensor may be a square shape or in the form of aerial .But, any how it is an omni directional. Then the objects will permitted to occupy into the Temporary Storage Registers (TSR) reside in the processor (In general, it is a form of segment). It acts as an Short-term memory .Then, it will be compared with different shapes of the object already located in the Permanent Storage Registers (PSR), with the help of orthogonal algorithm. It acts like an long-term memory. The method of object storage and retrieval will be performed by using an Orthogonal algorithm.

3.1 Functional Units for the architecture

The nature of the sensor unit placed at the top of the Robot (either in the form square shaped device or an antenna) emit an radio waves regarding to identify the entry of an object into its active region.

The nature of the sensor unit placed at the top of the Robot (either in the form square shaped device or an antenna) emit an radio waves regarding to identify the entry of an object into its active region. The specific reason for the usage of radio waves are Omni directional and also cover long distance. The signal unit resides in the sensor part alert as well as activate the inner components of the Robot concurrently within a fraction of second concurrently and deviate the attention towards the object entering in to the active region.

The visual part of the device is deigned to cover all the directions like a rotating eye ball. High resolution digital camera can be used to capture the image and send it to the temporary storage register (TSR).Then the image will be divided into different segments and loaded into the appropriate segment registers with unique sequence number. A special register resides in the TSR named as segment register (it includes "n" number individual registers) reside in the TSR. The sequence numbers are used to retrieve the object from the Permanent Storage Register (PSR). Few standard objects are already stored in this register for pre-determination for identification process. Any one of the segment will be compared with the object located in the PSR. Then the comparison algorithm is used to find the similarity.

In order to use the system with an object, its appearances must be stored in the Permanent storage Registers. Currently, this is done by obtaining a number of segments of the object from different directions. About a set of views are needed to cover the entire viewing sphere for the curve-based keys we have used. For each view, key features are extracted, and a number of the strongest are stored in the memory with associated information about the object and view that produced them and their relationship to an arbitrarily specified either in the 2-D configuration (position, orientation, scale) for that view. Or in the 3-D configurations.

To recognize an object, that is to answer the question "what object is in this image?", key features together with their local contexts are extracted from the image, and fed into the PSR. All matches are retrieved, and for each match, the associated information is used to compute a hypothesis about the identity, view, and configuration of a possible object. This hypothesis is fed to a second, "working" associative memory, where current hypotheses are stored. If any matches are found, the evidence associated with them is updated to reflect the new information. Otherwise a new hypothesis is entered. The accumulation is not a flat voting process, but depends on the frequency of occurrence of the feature over the entire database, with uncommon features providing more evidence.

To find an object of known characteristics in a scene, that is to answer the question of the form "where is the plane in this image?", (just an example) , the same procedure is followed, except that key feature matches are filtered on the basis of whether the came from a view of a plane. This actually provides rather powerful mechanisms for partially indexed retrieval, since the filtering can occur on any combination of attributes that we care to associate with the features, either in the database, or from the image. Each and every block having the built in flag register.

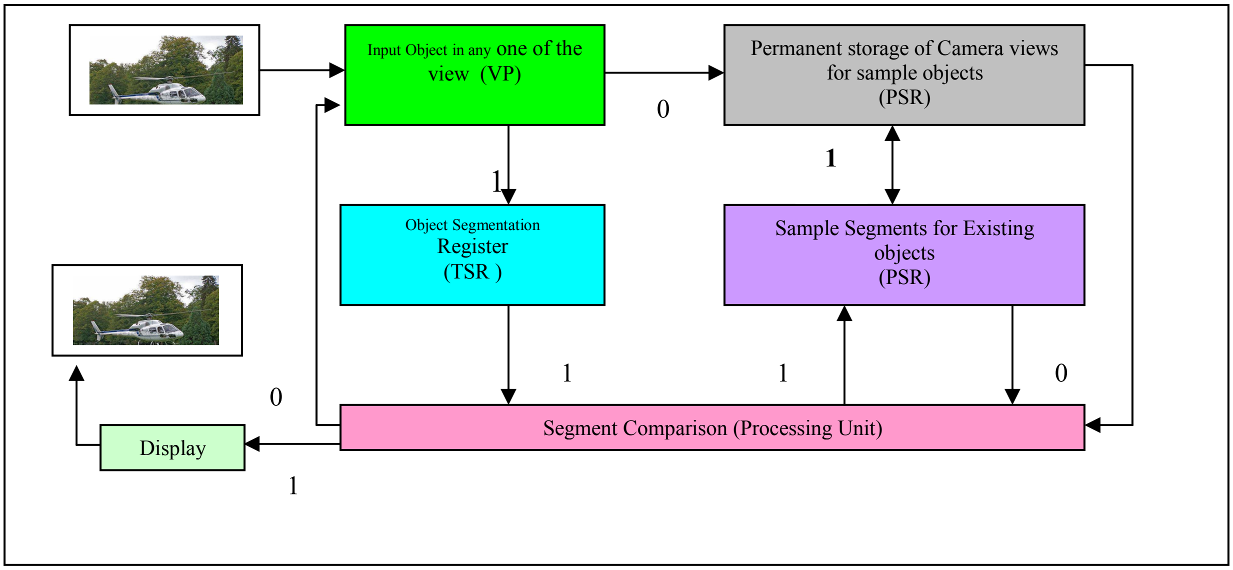

Fig 1.2 basic operations between the components

Let us consider, the object enter into the visible region is already exists in the PSR and to start the process. If the segmented part is not available in the Sample Segment Register while the segment comparison process will be initiated by the Processing unit, then the falg-0 will intimate the absence of the object in the PSR. Thereafter, the connection will automatically establish in a direct manner with Permanent Storage Register (PSR) regarding to store it for further process and then to re-initiate the process till to display in the monitor.

4.**Conclusion**

The objective of the work is to reduce the number of comparison in the search progress and also to improve the response time in a effective and efficient manner. One of the disadvantage for the design of this processor is, not suitable to record multiple objects will enter into the active region simultaneously. In this pitfall will be eliminated in the deign for multi-processes architecture Identification Technique.

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