Divide and Link: Robust Memory Techniques from Vedic Learning

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When we recall a mobile number such 9849524750, we rarely recall the entire number instantly. Further it is very unlikely that we remember individual digits of the number (e.g: 9,8,4,9,5,2,4,7,5,0). This is because we might have actually remembered this sequence as 98 495 24 750 or as 98 49 52 47 50 or some other combination of chunks. Chunks are groups of digits, in this case, that are easily remembered. Another example is the PIN codes used by the postal department. The six digit PIN codes are naturally written as a pair of three digit numbers such as 500 036. The idea of chunking can be used for remembering not only numbers but other things as well. George Miller, in 1956, has suggested that our short term memory has a limited capacity of being able to remember 7±2 items at a time. This is called as working memory. By using chunking, we decrease the number of items holding in the working memory. For example instead of remembering ten individual digits of the mobile number in the above example, we would remember fewer (4 or 5) chunks of numbers. There various kinds of memory training and mnemonic systems that can be used for remembering large numbers. One popular example is to remember the value of pi. The number of alphabets in each word of the phrase "How I wish I could calculate" would give us 314159, which can be used to remember the value of pi upto five decimal places. In this article I focus on the chunking method, which put simply corresponds to dividing the amount of information into chunks and then linking them together with examples from Vedic learning.

It is surprising to know that the limit of capacity of our working memory is between 5 and 9 items as proposed by George Miller. The human memory has immense potential. The number of facts we learn at school and college, the number of popular songs in cinemas, the details of friends and relatives are all examples of the huge memory capacity of the human brain. The oral tradition of vedic learning has preserved the entire vedic texts by purely human memory for several generations. This in an enormous accomplishment given the vast corpus of text preserved without any errors creeping in.This has been made possible by a diligently devised systematic scheme of chanting the vedic corpus. I describe briefly few techniques used in Vedic chanting and discuss them in the context of chunking mechanisms contributing to robust memory. We have learnt that in Indian languages compound words can be formed by combining two words based on sandhi-rules. The mantras (verses) in Vedic literature consists mainly of sentences with a number of words compounded together. The original recitation of the mantra is thus called the samhita patha, where samhita means collection and patha means recitation. Remembering a large number of such verses was achieved by dividing each mantra into individual words (pada patha) and linking these words together into small groups. For example, the RigVeda alone consists of about 10,552 verses. Transliteration of the first line of a verse reads

Samhita Patha:
Ahamevaswayamidam vadami jushtam devebhirutamaanushebhiH …

This sentence can be broken into individual words as follows

Pada Patha:

Aham – Eva – Swayam – Idam – Vadami – Jushtam – DevebhiH – uta – maanushebhiH

Clearly, remembering a number of such verses in either of the above two forms is not plausible with constraints on working memory capacity. In the Krama Patha of the Vedas, the words come step by step.

Krama Patha:

Ahameva - Evaswayam – Swayamidam – Idamvadami – VadamiJushtam – JushtamdevebhiH – devebhiruta – UtamaanushebhiH

Thus, if we represent a verse with nine words as 123456789 in the samhita patha, the pada patha will consist of breaking the sentence into individual words 1,2,3,4,5,6,7,8, and 9. The Krama Patha will link these words two at a time as 12, 23, 34, 45, 56, 67, 78, and 89.

This technique can also be referred to as forward chaining as each word is chained with the subsequent word in the sentence. The forward chaining would strengthen the connections from one word to the next. The potential problem with such a linear/sequential chaining representation could be that all words ocurring before a particular word will have to be retrieved for its successful recall. A break in the linear chain would render all subsequent elements inaccessible. A variant of Vedic chanting techniques use the backward chaining in addition to the forward chaining mentioned above. The simplest extension of the Krama Patha is the Jataa Patha, which proceeds as follows: 12 21 12 23 32 23 34 43 34 and so on. The name Jataa comes from the forward-reverse-forward arrangement of words that resembles the way ladies braid their hair. The Jataa patha, thus provides multiple strengthening of the links between the successive words in both the forward and reverse directions. A popular method of chanting is Ghana patha. The figure below illustrates the bell shape of the sequence of words recited in time (left to right in the figure), where each numbered box denotes a word. The Ghana patha chunks three words together within its recitation chain. A recitation chain consists of one forward and reverse links of first two words followed by a forward-reverse-forward linking of the three words. After the recitation of words 1-2-3, the next chain starts with words 2-3-4.

						3	3					3
	2	2			2			2			2	
1			1	1					1	1		

Figure 1: The Ghana (Bell) recitation chain for three words 1-2-3 (shown as boxes in vertical direction). Time is from left to right.

The reverse recitation provides a unique challenge for preserving the meaning of sentence. For example if we take three words as Rama killed Ravana, the reverse form would be Ravana killed Rama, thus changing the meaning of the sentence.

Fortunately, for Sanskrit being an order-free language, the Vedic mantras could be recited in any order without altering its meaning.

Though there are several variations of Vedic chanting, the above illustrated methods give a glimpse of these techniques from the perspective of chunking and chaining as a memory technique. With the advent of printed and electronic media, there is no longer a need for expert memory to safe-guard any texts or knowledge base. Vedic chanting incorporated several other methods such as intonation, metre etc for error-free preservation of the texts. In the present article, an emphasis has been given on the abstract structure underlying the chanting methods. However, this technique can be a useful methodology for learning large lists for example vocabulary. Learning is an indispensable repertoire of humans. We learn by instruction and by experience throughout our lives. I envisage that the generic technique of forward-reverse-forward chaining can be used as a tool for learning-impaired people by using a step by step approach for teaching any skill of sequential nature.

Suggested Reading:
[1] Chunking (psychology), *Wikipedia, the free encyclopedia*
http://en.wikipedia.org/wiki/Chunking_(psychology))

[2] S. Yegnasubramanian, Vedic Chanting – a Perfectly Formulated Oral Tradition, *Eternal Truth, Journal of Sringeri Vidya Bharati Foundation*, Vol.1, No.2, 1999. http://www.svbf.org/sringeri/journal/vol1no2/chanting.html

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