

The SP theory of intelligence

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24 March 2023

Dr Gerry Wolff, the Director of CognitionResearch.org, looks at the SP theory of intelligence and the way we ‘store’ information in our brains

Although compression of information is normally associated with rather boring tasks like making a file smaller, the idea that information compression (IC) might be important in the workings of our brains has been the subject of research since the 1950s. There is now a wealth of evidence for the importance of IC in human intelligence, some of which is described in the first reference ⁽¹⁾. In view of the importance of that evidence, IC is central in the SP Theory of Intelligence (SPTI) and its realisation in the SP Computer Model, the products of a lengthy period of research.

What is the SP Theory of Intelligence?

In broad terms, the SP Theory of Intelligence is a brain-like system that takes in ‘New’ information through the system’s senses, compresses it, and stores the compressed information in a repository of ‘Old’ information. This is shown schematically in Figure 1.

A key idea in the SPTI is the concept of SP-multiple-alignment (SPMA), developed from the concept of ‘multiple sequence alignment’ in biochemistry.

The SPMA concept is a sophisticated application of the idea that IC may be achieved by searching for patterns that match each other and the merging or ‘unification’ of patterns that are the same.

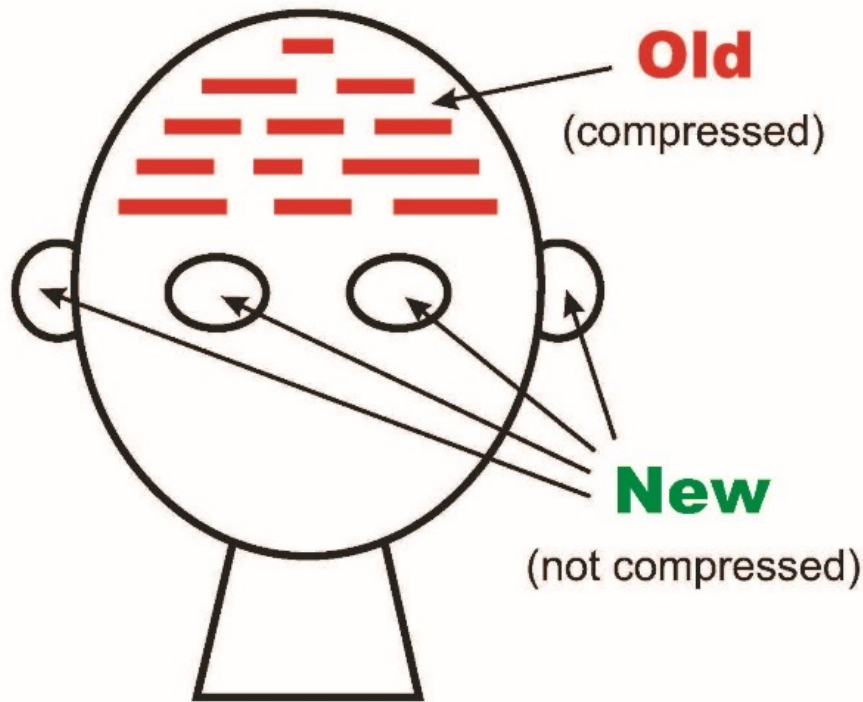


Figure 1. An abstract view of the SP Theory of Intelligence

The importance of the SPMA concept is two-fold

Firstly, it provides a powerful means of compressing varied kinds of information; and it is the key to the versatility of the SPTI in diverse aspects of intelligence, and beyond.

The concept of SP-multiple-alignment has the potential to be as significant for an understanding of intelligence as is the concept of DNA for an understanding of biology. It may prove to be the double helix of intelligence!

An example of an SPMA is shown in Figure 2. It represents a parsing of the sentence “t w o k i t t e n s p l a y”. It has been created by a process that searches for a means of compressing the sentence in terms of patterns like those shown in rows 1 to 8 in a repository of many such patterns. The details of how an SPMA is created and how the IC is measured are described in Chapter 3 of the book ⁽³⁾.

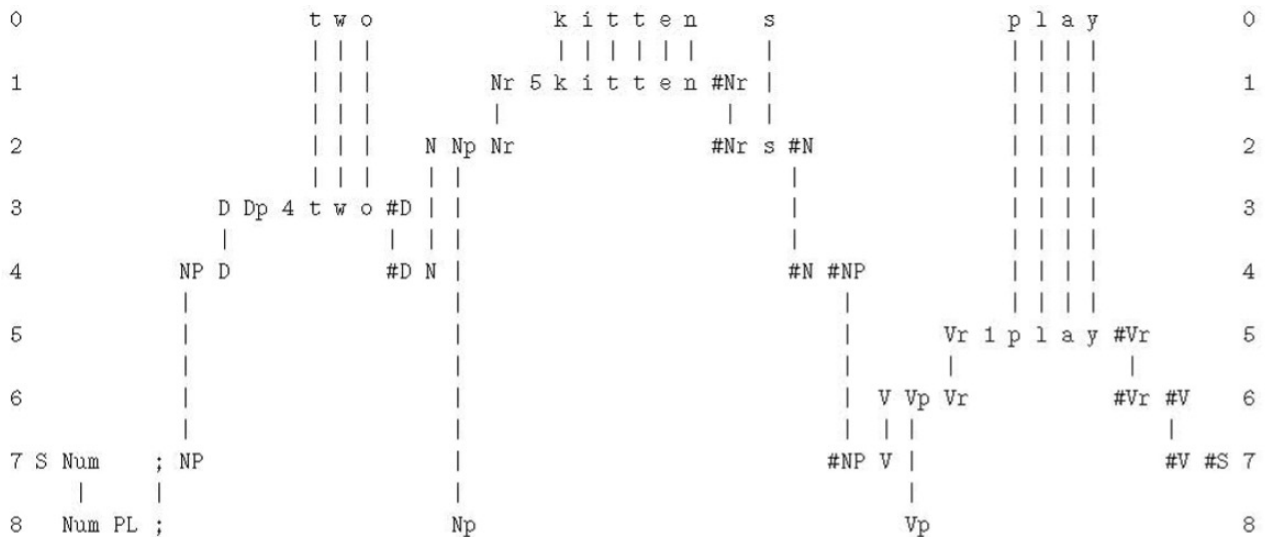


Figure 2. An example of an SPMA showing a parsing of the sentence “two kittens play”

There is much more to the SPMA concept than parsing sentences

In brief, its intelligence-related strengths include the modelling of several kinds of intelligent behaviour, including several kinds of probabilistic reasoning; the representation and processing of several kinds of intelligence-related knowledge; and the seamless integration of diverse aspects of intelligence, and diverse kinds of knowledge, in any combination.

There are many examples of the variety of things that can be done with SPMA's in the book *Unifying Computing and Cognition* ⁽³⁾, and in a shortened version of the book in ⁽²⁾.

There are several advantages of the SPTI compared with other approaches to AI. Some of those advantages are described in two recent papers, ⁽⁴⁾ and ⁽⁵⁾.

Questions and comments will be very welcome.

References

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