

Some thoughts about a threaded engram database structure

I was speaking with my daughter yesterday about our upcoming plans for Christmas. She then told me about a fellowship she wants to apply for. If “Christmas plans” and “fellowship” were stored in a relational database, it is highly unlikely that they would be connected in any way. But in her mind they were. It could be that she has an unusual mind, or it could be that our minds do not store information in a relational architecture.

I asked her how she jumped from one topic to the other and she explained that:

1. Our Christmas plans were about Italian foods
2. She had recently made an Italian dish for her friend, John
3. John was just finishing up a funded internship
4. She had been looking for funded internships
5. She had found an interesting fellowship to apply for.

There are two important aspects to this change of topic. First, there is the information (Italian food, John, funded internships, etc.). These are not isolated pieces of data. They are much larger concepts. When she thinks of one of them, many dimensions of information come to mind.

The second aspect is the connectivity. In some cases it is about “what”, in other cases it is about “who”.

If we take this further, we can think about chunks of information that are connected to one another. I am referring to the chunks as engrams. This is a term first coined by Richard Semon to refer to the trace, or impression, left by a memory. We can then connect these engrams. Rather than have relationships unique to a particular business model as we do with the ER model, we can use standard connectivities that relate the engrams in terms of how we experienced them. These standard connectivities, or threads, seem to be the famous questions: who, what, why, where, when, and how.

Neither the threads nor the engrams are static. With each new experience, new engrams are created and new threads built. In fact, sometimes new threads may be created for existing engrams. How often have you said to yourself, “Now I understand”, or “I didn’t realize that”. Your brain followed a path from engram A to engram B, to C, to D, and maybe then to E. That led you to see a connection between A and E that wasn’t there before. Your brain now creates a connection between engrams A and E and you have “learned” something.

This creates an interesting possibility, one that we have been unable to achieve in computer science and one upon which many science fiction stories are based: self-learning machines.

Capturing and storing experiences as engrams is clearly the most daunting task. Our first task is to think about what an engram is. But before we can do that, we need to understand the landscape of memory and cognitive science.