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CSC-366

Reading Assignment - The Unconscious Juggling of Mental Objects

The main topical theme of Preface 2 is a background process that happens in the mind, relating to the creation, shuffling, and destruction of "mental" or "virtual" objects. This is significant because there is some sort of transitional period between conscious thought, when virtual objects are being created, and a more automated, unconscious process in which these objects have been created and are now juggled around in the mind.

One of the main subjects Hofstadter talks about in Preface 2 is the “glom”. A glom is a group of 2 or more mental objects that have been "stuck" together for one reason or another. A glom is not a permanent combination of mental objects - objects can be stuck and unstuck at any time.

Glomming is the process of creating and destroying gloms. There are two distinct phases of glomming. There is the conscious phase of glomming, where you are actively referencing long-term memory in an effort to create the virtual objects necessary for the task. During this phase, specifically when the virtual objects are being built, the process of glomming cannot be completely and abstractly explained. It is much easier to explain the unconscious phase of glomming; where the virtual objects are fully solid and created, and are now being unconsciously juggled in the mind and glomming is happening autonomously. The talk of virtual objects warrants a description of what they actually are. Hofstadter likes to describe virtual objects like they are "balls in a video game". They are most definitely not physical objects, nor are they fixed groups of virtual hardware. They more or less float on the fixed virtual hardware, in space.

Glomming may seem like a random and frivolous cognitive task, however it has some very significant implications. This type of cognitive activity is very important because it happens autonomously in a well-trained mind. There is also reason to believe that it happens in more of a parallel fashion in well-trained minds, and more of a serial fashion in the less-adept mind. Modelling exactly how a specific activity such as glomming in Jumble can lead to a more abstract description of how glomming can be applied in the context of other domains. This leads to a greater understanding of how the human mind works in general.

When attempting to model cognitive processes computationally, it is important to remember a few points about the algorithms used. Algorithms that are created with performance and solely performance in mind are most of the time not very interesting in terms of cognitive modeling. Cognitive modeling is concerned with replicating the process which happens within the mind, which is not always the most efficient algorithm.

Hofstadter had claimed that a certain project, called Hearsay 2, had a profound effect on speech understanding in his work. The Hearsay 2 project essentially was based on the idea that a central data structure (in this case called the "blackboard") can trigger various "knowledge

sources" into execution based on a variety of pre-conditions. These pre-conditions can also have pre-conditions however, leading to more efficient detection of whether a knowledge source should be executed. There can be an arbitrary number of links in the chain of pre-conditions for a knowledge source. The key is that the last link in the chain of each knowledge source is executed in parallel, and only when it is valid, the execution is propagated up the chain.

Although the most impactful passage Hofstadter read on Hearsay 2 was just a footnote, he had a very significant relationship with it. It became very clear to him that the footnote should be regarded as a "lesson on how to deal with parallel computations that have different degrees of computational specificity and expensiveness". Once he merged the ideas of the footnote with his own ideas, he came up with the concept of the "parallel terraced scan". A parallel terraced scan is essentially a two-level, parallel computation, where both levels process increasingly specific and stringent criteria, ultimately leading to a certain output based on the decisions from both levels.

The process of finding a mate in life is an example of a parallel terraced scan. The stages of an intimate relationship include increasingly stringent criteria in order to be achieved. For example, the transition from acquaintance to friend, to significant other, to fiance and spouse (if marriage is preferred), to life-partner each require conditions that build upon one another. These conditions are evaluated by both individuals involved in the relationship in parallel. If one side fails to meet the criteria, the output may be an end to the relationship. If both sides meet the criteria, the relationship may continue, and potentially transition to the next stage.

Hofstadter had some comments on word perception in relation to his work on Jumbo. Essentially he said that multi-level glomming is executed in the mind when perceiving words. Words can be broken down into chunks in a hierarchical manner. Here are a few examples of how my mind perceives certain words on first glance:

football: ((f(oo)t)(b(a(ll))))
ternary: (t((er)n))(a(ry))