The Architecture of Jumbo Part 1

The theme of this section of the book is about one of the many of Hofstadter's research projects which is called Jumbo. This program tries to imitate and replicate human skills when it comes to solving newspaper Jumble anagrams. Solving Jumbles exemplifies an important facet of human intelligence, the way that we mentally juggle many little pieces and come up with something meaningful is something magical.

Hofstadter is obsessed with how the human mind works and many of his research projects represent this sentiment. Jumbo is not an exception to this sentiment, but rather it uses perception to construct structures to simulate the human mind on the task of solving Jumbles.

Herb Simon's is one of the most influential advocates of the antethical viewpoint. It states that everything of interest in cognition is accomplished above the 100-millisecond level, which he implies is the time that it takes a human to recognize its mother. Hence, it is a waste of time for cognitive scientists to replicate the millions of microscopic parallel events that make up recognition and perception. This means that deep perception is an unsolved topic in AI and Jumbo is just an introduction to a more ambitious project in learning how the mind works.

Hofstadter claims that the core mystery of all intelligence is the construction of larger structures out of smaller ones where perception is required. The concrete purpose of Jumbo is to simulate human mental processes. Demystifying the underlying mystery of the unconscious juggling of mental objects. The program Jumbo is a building program in the sense that is not based on a dictionary but rather it makes its decisions purely by referring to some knowledge base which defines in English how the structures will be formed. Therefore, it begins with atomic units and out of them constructs gloms.

The serious purpose of Jumbo is not to find English words but rather to model the mental processes of assembly and transformation of mental objects. If the purpose was to find English words, a dictionary could be easily added to the knowledge base but that's not the intent.

The significance of Jumbo's task domain is that the abstract processes performed could be exported to more complex domains in the AI world. Perception implies back-and-forth motion because it requires trial and error. Good guesses may result in correct larger structures and by guessing well at each stage the system could succeed at putting together the larger structure that is being aimed for. Hofstadter describes this process as "an intimate mixture of construction, deconstruction, regrouping, and rearrangement of tentative structures".

The first analogy that Hofstadter uses is the one where he describes human anatomy. The atoms are compared to letters, the molecules such as water compare to consonant clusters, structures at the amino acid level could be compared to higher level clusters such as "thr", then linear chains of amino acids could be compared to syllables, and finally as many proteins consist of an agglomeration of several polypeptide chains, many words are multisyllabic. The second analogy is with regards to social and romantic life. He starts by stating that the first stage is location specific meaning that the two individuals need to come to together in some form to notice each other to spark the feeling of desire for further exploration to start. If the next stage of flirtation goes well, it is a mutual infatuation not yet resulting in a bond. The next stage is dating which allows them to check their compatibility but if they survive this stage a romance is formed and

the last stage is called marriage. Many relationships end up in breakups which is compare to the deconstruction and construction of words.

Jumbos is a parallel system that runs on a sequential computer and its parallelism is virtual rather than actual. Its parallelism is modeled from a cell since multiple metabolic activities take place simultaneously at different spatial locations which build larger pieces from smaller ones. Jumbo also builds high-level structures from smaller ones such as letters.

When Hofstadter mentions “sparks” he is referring to how letters come together to form a glom. Sparks happened randomly in Jumbo which is the same as in the social world. What determines if the letters go together or there is some chemistry is called an “affinity”. An example of this is “s” and “h” which are attracted to each other but in the order “sh”. However, if we were to position them as “hs” there is no attraction between them. The affinity between letters or glomming is akin to the attraction between people, some are strongly attracted to each other.