Computational Cognitive Modeling Reading Assignment The Unconscious Juggling of Mental Objects

> Will Schell COG/CSC 366

The main theme of Preface 2 is the idea of the unconscious juggling of mental objects. This is of significance because we as humans are able to pick up on small details, but a lot of the time we are only able to do so when our minds are able to move and rearrange those objects. This unconscious act happen when we look at scrambled words, math problems, and other such things that occur in our everyday lives. A glom is a a set of letters, that are arranged in a way that is pronounceable and wordlike. The two states of glomming are 1) processing in a conscious state and 2) subsequent processing that occurs in the unconscious or automatic domain. These phases work off of one another. Once you start looking at a bunch of scrambled letter your unconscious mind is going through all the different possibilities there are, looking at words that exist in these scrambles and trying again and again to make them work. Your conscious state, during this process, is where you end up making a lot of mistakes, where you add in a letter that isn't in the set or you forget about another letter that should be there. When talking about virtual object, Hofstadter uses the analogy of memory, specifically working memory and long term memory. When referring to glomming, long term memory would be the platonic letters, a-z. These letters, however are not designed for glomming. They are there as a reference for the short term tokens, created using your working memory, where you build these mental objects. Hofstadter proposes the question "Why work so hard to model such a frivolous and atypical cognitive activity?". He then goes on to answer this question saying that working so hard allows us to go into an over driven state of mind. In this state we are no longer dealing with simple anagrams, or anagram like situations, but we are instead looking at some thing much deeper, such as a very complex anagram, where we are forcing ourselves to use that unconscious mind that is automatized and very rapid. This has commonality with deep processes of reorganization and reinterpretation. These deep processes occur usually in the most creative of thought. So, we are opening our minds up to this completely creative and, sometimes, underutilized part of our minds.

The most significant idea in the "Jumbo versus Brute Force" section is the idea there are many ways to get to an outcome. Hofstadter discusses the use of "brute-force anagram programs" which use dictionaries that are searched when given a scramble of letters. These programs can do very complex problems and find every single possibility in almost no time at all. But doing this, Hofstadter says that these brute-force programs are the "antithesis of cognitive models". By this he means that even though Jumbo cannot produce all those terms as fast as possible when dealing with a large set of letters, Jumbo takes the letters it is given and get you to a solution through a cognitive model instead of "cheating" using dictionaries and programming techniques that work around these cognitive functions simulated by the Jumbo program.

Hofstadter learned about the Hearsay II project in the mid to late 1970's. Due to the parallel structure of the project, where top-down and bottom-up processes could coexist, it was able to perform highly specific actions. The system would take these actions and run them only if the conditions for the set were fulfilled. The system would run a set of preconditions to check if the conditions were fulfilled. The preconditions used also have preconditions of their own as well. Once the preconditions were fully satisfied the test will run successfully. The Hearsay II project was so fascinating to Hofstadter that he used the concepts and ideas from it to create the "parallel terraced scan". The Hearsay II project was so fascinating to Hofstadter that he used the concepts and ideas from it to create the "parallel terraced scan". The Hearsay II project was so fascinating to Hofstadter that he used the concepts and ideas from it to create the "parallel terraced scan".

The parallel terraced scan is an investigation mechanism that looks at a large amount of varying states at different levels of depth within a system. Once this is done then it allows the system to cut out information as time goes on until it gets to the correct or final outcome. This is present in his example of the sororities. When wanting to be in a sorority you have to go to events and parties. There are so many of them they need to

attend at different times. When this starts the are something close to 1700 students according to Hofstadter, but by the end over half of them do not make it into a sorority. College is a good example of a parallel terraced scan. In college you enter as a freshman, then you have to go through, most likely, four years of schooling to get a degree. At some time or another, you will take all your general education classes, then you have to do classes for your major(s) and/or minor(s). But during this process a lot of students decide to change their major(s) and/minor(s) based on a class that they like more than what they are doing. I know from experience, since I have changed my major three times and have added two minors over time. But through this we all, unless we drop out, go through this process and end up at the end goal of graduating with a certain degree.

Word perception is keeping letters in a certain order, which is the original order, and figure out how they fit together. Hofstadter states that we are completely unaware of the chunking that we do when we are reading. Consider a word such as 'modeling'. Modeling can be chunked in to 'mode-l-ing' or 'model-ing'. Taking these words we can even do sub groups of the words in the original chunk and break them down even further where we then have multiple chunks, or a hierarchical chunking process. Prefixes and suffixes are very easy words to chunk because people go straight for those prefixes and suffixes, like the example presented above. But we can also chunk words like 'shower shoes'. This can be broken down into so many different combinations of chunking. Unfortunately he was never able to finish his work on this project with Jumbo and another student as the student left and the project never came to fruition.