Artificial Intelligence Response #4

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I am lost. Floating in a sea of pucks and parentheses, logic functions and hierarchical control structures, search algorithms and knowledge trees, I reach for the rapidly fading light of understanding.

My pucks are useless. Despite my best efforts they remain unable to navigate the most basic of obstacles, rendering any higher level behaviors inconsequential. My well of ideas for how to improve this situation has run dry.

So I ask myself, adrift as I am, what can I do? How can I continue to pursue artificial intelligence? Perhaps it is time to set pucks aside, though it pains me. Perhaps it is time to take up a new mantle, to select a different direction in this sea of concepts in which I find myself and begin to swim.

The heart of my study here at Hampshire is the intersection of programming and language. It makes sense, then, to set off in pursuit of language-using artificial intelligence. Of course this is hardly a feasible goal in the time allowed (and maybe not at all). Tackling even a small chunk of such a massive problem will be more than sufficient for this context.

The first thought that comes to mind is the challenge of determining whether or not something is a valid sentence of English. At one point we mentioned in class how logic programming can be used to do this. For example, you can make a function that knows it needs a noun followed by a verb followed by a noun to be true, and give it various word combinations to analyze. Extending this idea to much more complex sentence patterns might produce a fairly sophisticated ability to judge the structural validity of a sentence.

However, this is a piece of the puzzle so small as to be insignificant (though still worth doing, if only for the coding practice). More interesting questions arise when we ask "Does this sentence *make sense*?" Answering this question requires an even more sophisticated analysis. Just knowing whether or not the grammatical categories are in the right order is not enough – for example a sentence like "Blue went to the hospital" would pass our basic test. It is a valid structure of [noun]-[verb]-[preposition]-[noun]. Despite this, it is not a sentence we would classify as sensical.

What we have hit now is a semantic wall. How can we get a program to understand the *meaning* of words? Is it even possible? You could have a computer program run through a massive English corpus and analyze the frequency of word relations. For example, such an analysis might rule out sentences like "Blue went to the hospital" on the grounds that the noun "blue" almost never appears preceding the verb "went."

But to my mind at least, such an extension of our criteria is still greatly lacking. While it might even be able to successfully predict whether or not a sentence is a valid sentence of English, and while it *might* even be able to *produce* arbitrary sentences of English that appear to be sensical, it will never be able to do anything beyond this. It will never be able to understand why "Blue went to the hospital" makes sense because "Blue" is a person's name, or because this sentence occurs in the context of a children's show which personifies colors.

Moreover, if we take this a step further and try to make an actual AI that can talk to people, it would be unable to relate sentences to one another. It could read a sentence like "Hello, how are you?" and determine that it was a valid sentence, but it would be unable to determine what response is appropriate. One way to solve this difficulty is to extend our frequency analysis of English. This is a strategy already widely used in the world of chatbots. Maybe our program discovers that people most frequently respond to "How are you?" with "Fine, how are you?" and so uses this as a response.

As the conversation continues, though, this strategy will quickly prove untenable. This may successfuly produce pairs of sensical sentences, but in the long term, situations that require reference to previous points in the conversation will stump such a system. Moreover, this strategy will ultimately be defeated by the fact that there are an infinite number of possible English sentences.

My goal is to pursue this line of questioning using Clojure, probably core.logic and potentially search and other AI ideas as well. I think I will be lucky to make it even to the first stage of my above rambling. Perhaps I could even extend this into a Division III project – make a chatbot!