Use of Analogy in Cognitive Systems

Analogy is a powerful cognitive mechanism that people use to make inferences and learn new abstractions (Gentner 1997). Many areas of cognitive systems use analogy to assist with conceptual understanding. Use of dynamical systems theory, hill climbing method and thought experiments are some of the examples of use of analogy in cognitive systems.

According to Hogan (1992), “The body of mathematical concepts, techniques, and results known as “dynamical systems theory,” which long played a central role in physics, is beginning to figure importantly in cognitive science and neural science”. This excerpt illustrates that, although one might think there is a weak connection between physics and cognitive science, a lot of cognitive scientist have found good analogies using physics to explain cognitive processes. Graphically, dynamical systems theory uses peaks, valleys and a simple set of rules to represent abstract concepts, allowing us to convert complicated processes into sub-problems that are easier to understand.

While dynamical systems theory uses peaks and valleys to make understanding cognitive sciences concepts easier, we can find a similar use of peaks and valleys by studying problem solving techniques. One class of search problems can be solved using the “hill climbing search” approach. Hill climbing is an algorithm about making adjustments a step at a time to aim for a locally optimal solution. This algorithm is very similar to the practical situation where we want to reach the peak while in darkness. Instead of being another search algorithm students have to remember, the hill climbing analogy allows this algorithm more intuitive and memorable.

In addition to practical applications of understanding concepts and solving problems, analogy is also a powerful tool probing at philosophical problems. For example, Searle's Chinese room thought experiment allows the readers to vividly think about the scenario, without being an expert at intelligent systems. Searle replaced a complex component of a system with a human being where a reader can relate to. Although Searle's Chinese room argument stirred much debate, the thought experiment is a success in a sense that it simplified the complexity of the cognitive system, while creating a simple framework where other people can improve on.

In summary, we have discussed examples of use of analogies in cognitive systems in dynamical systems theory, hill climbing method and thought experiments. These analogies, like light houses, make students' lives easier by pointing us to the right direction in the process of understanding cognitive theories.

References
