Can computers teach humans how to think?

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Abstract

Symbolic logic was originally developed as a tool to improve human reasoning. In the first half of the twentieth century, it made important contributions to the foundations of mathematics. In the second half of the century, it was further developed for computing applications, including databases, programs, program specifications and artificial intelligence. In this talk, I will argue that the resulting, enhanced computational logic can also be used directly by humans to improve their own communication and reasoning abilities.

Computational logic extends classical symbolic logic in a number of important ways. It incorporates default reasoning, which allows general rules to be defeated by evidence to the contrary, as in the case of the rule that a person is innocent unless proven guilty. It incorporates meta-level reasoning, which allows rules that reason about rules, as in the case of acquisition of citizenship by adoption, which states of itself that it continues to apply even if the adoption order later ceases to have effect. It also incorporates techniques for weighing up arguments for and against competing conclusions, as in the principle that a complete argument must not only « prove » its conclusion, but it must also defeat all arguments to the contrary.

The tools and techniques of computational logic can be described and applied informally, and do not need to be expressed in symbolic, mathematical or computer-oriented form. In my talk, I will illustrate some of the applications of informal computational logic in such areas as legal reasoning and human-to-human communication. I will argue, in particular, that people can use the principles of computational logic to express themselves more clearly, more coherently and more effectively in natural languages such as English. In doing so, because human language is intimately associated with human thought, they can not only improve their ability to communicate, but can also improve their ability to think.