Is Logic Really Dead or Only Just Sleeping?

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There was a time when Logic was the dominant paradigm for human reasoning. As George Boole put it around one hundred and fifty years ago, Logic was synonymous with the "Laws of Thought". Later, for most of the latter half of the twentieth century, it was the mainstream of Artificial Intelligence. But then it all went wrong. Artificial Intelligence researchers, frustrated by the lack of progress, blamed many of their problems on the logic-based approach. They argued that humans do not reason logically, and therefore machines should not be designed to reason logically either. Other approaches began to make progress where Logic was judged to have failed - approaches that were designed to simulate directly the neurological mechanisms of animal and human intelligence. Insect-like robots began to appear, and the beginning of a new Machine Intelligence was born. Logic seemed to be dieing - and to be taking Logic Programming (LP) with it.

The possible death of Logic has important implications for LP, because arguably the main argument for LP is:

- that LP is based on Logic,
- that Logic is the foundation of human reasoning, and
- that, therefore, LP is more human-oriented and user-friendly than computer languages developed mainly for machines.

It is possible to quarrel with both premises of the argument. In particular, the first premise that LP is based on Logic has been attacked by some LP researchers themselves, arguing that Logic Programs are better understood as inductive definitions. This alternative view of the foundations of LP has much technical merit, but it potentially undermines the main argument for LP. I will consider one way of rescuing the argument, by outlining how inductive definitions can be incorporated in a more general Logic of thinking, as part of a more comprehensive observation- thought-action agent cycle. However, my main concern here is with attacks against the second premise of the argument: that Logic is fundamental to human thinking. These attacks include the old, familiar ones advocating alternative symbolic approaches, most notably condition-action rules. They also include more recent ones advocating non-symbolic connectionist and situated intelligence approaches. I will examine some of these attacks and try to distinguish between those that are justified and those that are simply wrong.

I will argue that, to address these attacks and to be in a better position to fight back, Logic and LP need to be put into place: Logic within the thinking

component of the observation-thought-action cycle of a single agent, and LP within the belief component of thought. In addition to LP, a complete model of Computation and Human Reasoning also needs: a logical goal component (which includes condition-action rules), other kinds of non-symbolic thinking, and a framework that includes other agents.

I will argue that the observation-thought-action cycle provides a more realistic framework, not only for Logic as a descriptive theory of how humans actually think, but also for Logic as a prescriptive theory of how humans and computers can reason more effectively. With such a more realistic framework, even if Logic and LP might be only half awake today, they can at worst be only sleeping, to come back with renewed and more lasting vigour in the near future.