

Cognitive architectures make it possible to make a step forward

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In 1973, Allan Newell¹ criticized the way research is done in cognitive science. He described the current research style of explaining phenomena by constructing oppositions, followed by experiments which should verify one of both oppositions. He argued that if he and his colleagues would continue this way for the following thirty years, they would not give a significant larger insight in the working of human psychology. The relations between these findings, an overview on top of the narrow results found by experiments missed.

In 1995, more than twenty years later, Hornof and Kieras² use the EPIC cognitive architecture to investigate the phenomenon that selection time in menu search rises about 100msec per item for each menu length, excluding position 1, where the selection time is slightly higher than position 2. Like Newell and his colleagues, they still constructed binary oppositions. A small difference is that they constructed two couples of binary oppositions. Serial versus parallel processing of menu items were considered together with random versus semantic search. Another small difference is that the oppositions were not regarded strictly binary, but also something in between was possible as already becomes clear in the title of their paper.

The big difference however in the Hornof and Kieras situation compared with Newell's critics, is that Hornof and Kieras did their research using a cognitive model. This model though not perfect, does hold theories verified earlier and therefore automatically puts a new theory in perspective of these earlier findings. The new found science automatically is a part of an artificial cognitive model, part of larger theory, in this case EPIC.

Newell did not have any problems with binary research. He even described it as the 'proper' way scientific research should be done. This 'proper' approach still exists in the nineties with Hornof and Kieras. But the cognitive architectures like EPIC, SOAR³ and ACT-R⁴ tackled the problem that no overview existed over the small findings. They give scientists the possibility to make a step forward by getting an improved model of human cognition with each new finding instead of only enlarging the pool with binaries sorted out.

¹ You can't play 20 questions with nature and win: projective comments on the papers of this symposium, A.Newell, Carnegie Mellon University, 1973

² Cognitive Modeling Reveals Menu Search is Both Random and Systematic, A.J.Hornof,D.E.Kieras, University of Michigan, 1995

³ Cognitive Theory, Soar, R.L.Lewis, Ohio State University, 1999

⁴ An Integrated Theory of Mind, J.R.Anderson,D.Bothell,M.D.Byrne, Carnegie Mellon University, 2001