

Logic in a neuroscience lab

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Abstract

A major problem of psycholinguistics is to understand the nature of the cognitive processes that enable language comprehension and production. The purpose of this talk is to show that logic, in particular logic programming, can play a pivotal role in such investigations. This is because language comprehension can be viewed as the construction of a model of the given piece of discourse; and such models generally contain much more information (e.g. about causal relationships) than is made explicit in the discourse. It turns out that negation as failure (NAF) is crucial in constructing models which thus 'go beyond the information given'. NAF makes model construction non-monotonic, especially when the construction involves temporal notions. This non-monotonicity leaves a trace as an E(vent-)R(elated) P(otential), a form of electro-encephalogram, especially useful for studying the time-course of linguistic processing. In a series of experiments, Baggio, van Lambalgen and Hagoort (2008) derived predictions about ERPs from the theory of tense and aspect formulated in logic programming (the "event calculus"), proposed in van Lambalgen and Hamm (2004), concerning temporal prepositions, tense violations and the progressive. These experiments yielded ERPs which gave evidence of non-monotonic recomputations.

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