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A Model-Based Theory for Déjà Vu and Related Psychological Phenomena

Nicholas V. Findler

Arizona State University

Abstract — *An explanatory mechanism is discussed that leads to a so-called sufficiency theory of certain psychological phenomena, such as standard recognition as opposed to déjà vu, imagined novel experience, jamais vu, disturbed recognition, incorrect recognition, and hallucination—experiences that have not been explained before in a satisfactory scientific manner. Sufficiency theory, in general, means that a proposed structure of plausible mechanisms is sufficient but may not be uniquely necessary to explain, understand, and predict the behavior of the phenomenon under study.* © *1998 Elsevier Science Ltd. All rights reserved*

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At the two ends of the spectrum of artificial intelligence research are (a) the more usual engineering-oriented approach with its pragmatic objectives and disregard of how humans handle the problem at hand, and (b) the psychology-oriented approach that aims at understanding and explaining human cognitive activity. With the psychology-oriented approach, the theories obtained are embedded in and tested through complex computer programs.

Requests for reprints should be addressed to Nicholas V. Findler, Department of Computer Science and Artificial Intelligence Laboratory, Arizona State University, Tempe, AZ 85287-5406, USA. E-mail: nicholas.findler@asu.edu

The psychology-oriented approach is often referenced as *simulation of cognitive behavior*. It represents an intersection between the interests in artificial intelligence and cognitive psychology. The investigator observes the behavior of one or several humans in a particular task environment and makes a record of the major manifested aspects of behavior, such as spoken and written utterances. The corresponding record is called the *protocol* of the experiment. This phase of the study is followed by writing a program that, once put to the same task, acts in a manner similar or identical to the human. In other words, the trace of the program should reproduce in a reasonable manner the experimental protocol. (It must be emphasized, though, that the research objective is to reproduce the *right behavior* motivated by the *right reason*; i.e., the underlying assumptions about the participating information structures and processes should not only be plausible and in harmony with the accepted theories of other behavioral phenomena but also have a *predictive power* for as wide a range of phenomena as possible.) Unsatisfactory model behavior can be corrected by modifying assumed causal relations and other model constituents. Having completed this activity, the researcher obtains a so-called *sufficiency theory* that is a collection of mechanisms which is sufficient (but may not be uniquely necessary) to explain, understand, and predict certain selected aspects of human thought processes under a variety of conditions (Findler, 1990). Such processes can be involved in problem solving, decision making, verbal learning, concept formation, and so on. Two exemplary studies are Feigenbaum's EPAM project Feigenbaum (1963) and the comprehensive book by Newell and Simon on human problem solving (Newell & Simon, 1972). There are many books on artificial intelligence that also deal with this area of study (Cohen & Feigenbaum, 1982).

Current research in the area of simulation of cognitive behavior has extended the scope of investigations already noted. Studies are performed on the problems of (first and subsequent) language acquisition, language comprehension, cognitive developmental phases of children, memory processes, pattern recognition, procedural learning and other cognitive activities, the role of and interaction between declarative and procedural knowledge, how data-driven and goal-oriented processes coexist, etc.

Finally, it may be of interest here to quote Anderson (1983, p. 12) about the distinction between frameworks, theories, and models:

> A framework is a general pool of constructs for understanding a domain, but it is not tightly enough organized to constitute a predictive theory. However, it is possible to sample from this pool, tie the constructs together with additional details, and come up with a predictive theory. One might regard 'information-processing psychology' as such a framework. … One cannot evaluate a framework according to the standard verificational logic associated with scientific theories. That is, the production system framework makes no unique empirical prediction that distinguishes it from, say, a schema system framework. Rather, one judges a framework in terms of the success, or