Ritter, F. E. (2007). The rise of cognitive architectures. [Editor's note for the first book in the Oxford Series on Cognitive Models and Architectures.] Integrated Models of Cognitive Systems (IMoCS), Wayne Gray (ed.). v-vi. New York, NY: Oxford University Press.

The Rise of Cognitive Architectures

Frank E. Ritter

One way forward in studying human behavior is to create computer simulations that perform the tasks that humans perform by simulating the way humans process information. These simulations of behavior, called *cognitive models*, are theories of the knowledge and the mechanisms that give rise to behavior. The sets of mechanisms are assumed to be fixed across tasks, which allow them to be realized as a reusable computer program that corresponds to the architecture of cognition, or cognitive architecture. (More complete explanations are provided by Newell's [1990] *Unified Theories of Cognition*, by Anderson's ACT-R work [Anderson et al., 2004], and by ongoing work with connectionist and neural architectures.)

Because cognitive models increasingly allow us to predict behavior and explain the mechanisms behind behavior, they have many applications. They can support design activities, and they serve in many roles where intelligence is needed. As a result, interest in cognitive models and architectures can be found in several areas: Researchers in psychology and cognitive science are interested in them as theories. Researchers in human factors, in synthetic environments, and in intelligent systems are interested in them for applications and design. Researchers in applied domains such as video games and technical applications such as trainers are interested in them as simulated colleagues and opponents.

Although some earlier precursors can be found, the main work on cognitive models began in about 1960 (Newell, Shaw, & Simon, 1960). These models have now reached a new level of maturity. For example, a review commissioned by the National Research Council (Pew & Mavor, 1998) found that cognitive models had been developed to a level that made them useful in synthetic environments. A later review (Ritter et al., 2003) examined cognitive architectures created outside the United States and found similar results. Both reviews recommended a list of future projects, which are being undertaken by individual researchers. These and similar projects have been increasingly seen in requests for proposals put out by funding agencies around the world. Results and interest in cognitive models and architectures are rising.

A Series on Cognitive Models and Architectures

It would be useful to have access to larger sets of materials on cognitive models and cognitive architectures, including full explanations of the design, rationale, and use of a single architecture; comparisons of several architectures; and full explanations of a single model. A book series provides access to these larger sets of materials and allows readers to identify them more easily.

Topics for volumes in the series will be chosen to highlight the variety of advances in the field, to provide

an outlet for advanced books (edited volumes and monographs), architecture descriptions, and reports on methodologies, as well as summaries of work in particular areas (e.g., memory) or of particular architectures (e.g., ACT-R, Soar). Each volume will be designed to for broad multidisciplinary appeal and will interest researchers and graduate students working with cognitive models and, as appropriate, related groups.

So, it is with great pleasure that we start this series with a book on control mechanisms in architectures edited by Wayne Gray. This book summarizes current work by leading researchers on how cognitive architectures control their information processing, the interaction between their mechanisms, and their interaction with the world. This book will be a valuable resource for those building and using architectures. It also serves as a repository of thinking on the mechanisms that control cognition.

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