Building Cognitive Models with the EPIC Architecture for Human Cognition and Performance

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Tutorial Overview

The EPIC (Executive Process-Interactive Control) cognitive architecture developed by Kieras and Meyer (1997) works especially well for modeling perceptual-motor intensive tasks, multiple tasks, and complex multimodal task environments with many objects and events. The underlying theory has inspired fundamental empirical work and influenced other cognitive architectures.

This tutorial presents an opportunity to become acquainted with EPIC. The goal is for attendees to learn enough about EPIC to decide whether it will be useful in their research, and if so, to get quickly started in the full use of it. Hands-on exercises will alternate with presentations of EPIC's mechanisms and facilities and how to use them. The exercises will cover two topics: Visual search, in which non-uniform visual acuity and eye movements play a critical role, and dual-task performance, in which different executive strategies for task coordination determine the overall level of performance.

The only programming involved is writing production rules, so fluency in a conventional programming language is not required. A laptop (Macintosh or Windows) will be necessary, individually or shared, for the hands-on exercises. The EPIC software will be provided. Useful readings and the software can be downloaded in advance at <ftp://www.eecs.umich.edu/people/kieras/EPICtutorial>.
Also, see <www.eecs.umich.edu/~kieras/epic.html> and <www.umich.edu/~bcalab/epic.html> for more about EPIC.

Why This Tutorial Is Needed

There are several reasons why the time is ripe for conducting the first tutorial on how to use EPIC:

Several of the basic concepts of EPIC have had strong impact on other cognitive architectures, and some of the applications of EPIC have opened new territory for modeling various tasks with other architectures. On the empirical front, some of the new experimental work inspired by EPIC has had a strong influence on other researchers. Thus EPIC has a well-established scientific position among the current family of cognitive architectures. It is time to make this system readily available in a public forum.

The new C++ version of the EPIC software now has a reasonably usable interface, implements the most critical parts of the old LISP version, and the code base has been quite stable. Hence, there is no software development reason to wait any longer.

The first graduate course in modeling with EPIC has was recently taught by Anthony Hornof, one of the co-presenters for this tutorial. The experience was that graduate students could use the architecture software well enough to learn cognitive modeling concepts, and apply it to their own research problems. This strongly suggests that EPIC and its software is ready to be presented to others as a useful research tool.

The Presenters

David Kieras is a Professor in the Electrical Engineering and Computer Science and Psychology Departments at the University of Michigan. His primary research field is computational cognitive modeling, with specific interests in human-computer interaction and human performance simulation. Together with David Meyer, of the University of Michigan Psychology Department, he developed the EPIC architecture for human cognitive and performance modeling, and has also developed simplified practical modeling methodologies based on GOMS for use in human-system design.

Anthony Hornof is an Assistant Professor in the Department of Computer and Information Science Department at the University of Oregon. His research is in human-computer *visual* interaction; that is, improving the throughput between the user and the machine using the visual perceptual and oculomotor processes. He develops cognitive models to explore the strategies that people use to find things on a computer screen, ultimately to put these models in a predictive tool that designers will use to evaluate visual layouts early in the design process.

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References

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