

About this Issue...

OUR SUMMER ISSUE departs from the usual format and is devoted to a single theme—applications of knowledge engineering in VLSI design.

One can hardly go through a day without encountering the fruits of microelectronics. Evidence of the electronic chip is ubiquitous—inside our watches, at the checkout counter, in calculators and video games. These are early products of the silicon revolution that is changing our daily lives. This revolution may well reshape AI in the next few years as we collectively explore the opportunities provided by substantially increased amounts of silicon computing power.

In the first article, Stefik and Conway observe that design methods occupy a central cognitive position for the engineer, much as systems of natural law hold for the physicist. The core of this article is a critical examination of the properties of design knowledge. The authors take the position that knowledge is a tangible product that can be designed to satisfy certain objectives. Measures are proposed of the cognitive advantages conveyed by candidate bodies of knowledge. Supporting examples are drawn from a body of design knowledge for a prototype expert system for assisting

designers of integrated circuits. The authors show how the “engineering of knowledge” can modulate the creation and diffusion of competing bodies of knowledge in a community. With these examples they expand the usual scope of the field of knowledge engineering and suggest that this field could play a more central future role in the creation and dissemination of knowledge.

The first article assumes the availability of a technological foundation of silicon devices. In the second article, Lenat, Sutherland, and Gibbons consider ways to extend this technology by automating the search for new integrated switching-device structures. From the perspective of applied AI and heuristic search, this application exploits opportunities provided by the rapid advances in fabrication technology. It is now possible to fabricate many new kinds of structures, but the space of possible structures is very large and essentially unexplored. This work seeks to automate the search for interesting structures and reports on some early finds. The article provides powerful experimental evidence of the utility of applying AI methods and technology during such searches.