



The World of Data Compression

by [Eric D. Scheirer](#)

Computer science researchers enjoy talking about the hidden applications of basic research. It is a common belief that the killer apps of the future will be based on the obscure, basic, technological, and mathematical research of today. Furthermore, the modern, internetworked world was created in part by decades of purely theoretical mathematics originated with no clear application.

Data compression, a fundamental aspect of today's digital world, is often cited as a triumph of basic research. Digital cellular telephones, open-source programming, Internet music, high-production video games, high-definition television, and Internet software distribution would be impossible without compression. In the future, new applications such as digital radio, TV-on-demand, interactive multimedia, and custom compact-disc kiosks will use advanced forms of compression.

The research behind digital compression is difficult and abstract. Text compression and other lossless compression techniques like "ZIP" rest on a foundation created in the study of the mathematics of information. Music and image compression use perceptually *lossy* techniques, which depend on subtle aspects of the human audiovisual perceptual system that can only be understood through tedious psychophysical experiments. Modern, "structured" compression techniques utilize sophisticated image and sound models from the world of computer graphics and sound synthesis. Exciting new compression algorithms are being derived from today's advanced mathematical techniques such as wavelets, neural networks, and information-theoretic signal processing. In addition, algorithms benefit from our advancing knowledge of the perception of sound, images, and moving pictures.

This issue of *Crossroads* will introduce you to the world of data compression. The fine

contributions will help you begin to understand the wide variety of approaches to compressing images, sounds, and textual data. In these articles we see the history of past research, the present body of algorithms and applications, and the future promise of multimedia. I hope this issue will inspire some of you to become our future leaders in compression research.

Biography

Eric D. Scheirer is a student at the MIT Media Laboratory.