

Virtual Studios

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In this special issue on virtual studio systems, we look at recent developments in one of the earliest environments for multimedia processing—the video production studio. Even though television studios demand expensive equipment and special-purpose hardware, many factors make the video studio relevant to the design of low-cost general-purpose programmable multimedia systems.

First, the studio has for some time served as a metaphor for the organization of multimedia processing systems. From the Digital Production Studio Model, used by DVI's Audio/Video Kernel (AVK), to Microsoft's recent DirectShow API, it's easy to find examples of multimedia software structured using studio-like concepts of video sources, sinks, filters, and connections.

Second, video studios deal with many of the same problems associated with desktop multimedia applications. Techniques for synchronization, video encoding, video editing, storage, retrieval, and transmission are essential to studio operation. Designers of desktop applications might find it instructive to compare their techniques to those used in a studio context.

Third, looking at the studio today tells us what functions may reach the desktop tomorrow. A good example is how disk-based digital video editing has moved from dedicated studio equipment to general-purpose PCs. Another example is how "video mixing" capabilities such as layering and real-time special effects have begun to appear on PC hardware.

Finally, consider perhaps the most important reason for multimedia software designers to look at studio systems: The transition from analog to digital technologies now taking place within the broadcast industry is bringing the studio into much closer contact with the home. To see this, look at the broadcast chain. Currently the initial steps of capture by camera, routing within the studio, editing, mixing, and postproduction can be performed digitally. Only for the final step, transmission "to air," must the signal be converted to

analog. With the new digital broadcast systems, such as ATSC (Advanced Television Systems Committee) in the United States and Digital Video Broadcasting (DVB) in Europe, the conversion to analog can be left until the last possible moment—just prior to display on the receiving device. But digital broadcast implies more than pushing this conversion to the receiver, it opens the way to transmitting arbitrary data in parallel with the audio/video content. Given a data path from broadcasters to the home, a new set of enhanced television and interactive television applications become possible. As a result, broadcast content and software referring to or manipulating the content become more intertwined and interrelated.

Exemplifying this trend, this special issue of *IEEE MultiMedia* focuses on virtual studios, a new form of video production that tightly couples studio equipment and computational activity. The article "Virtual Studios: An Overview" surveys existing virtual studio systems and technologies. It also gives a short historical introduction to the subject. Hayashi's "Image Compositing Systems Based on Virtual Cameras" describes both the early virtual studio work done by NHK in Japan and some of their recent work in combining video and graphics. Wojdala's "Challenges of Virtual Set Technology" discusses the difficulties facing users of virtual studio systems and points out user requirements and areas for further development. Collectively, these articles will help you understand the current state of virtual studio systems. I hope you find the articles stimulating and useful, and that they give insight into some of the new applications made possible by digital broadcast systems. **MM**

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