Programming environments must adapt to the challenges of new application domains. As digital production techniques diffuse through the media industry, we expect to see increasing demands for applications in such areas as content creation and management (e.g., authoring tools and multimedia databases); broadband group communication (e.g., tele-learning and telepresence); and media-rich virtual worlds (e.g., virtual museums). To build these applications we need highly extensible programming environments for distributed and interoperable components. Object-oriented technology appears to offer the needed flexibility. This talk will look at what object-oriented technology can contribute to multimedia programming — we discuss the notion of “media objects” and introduce an object-oriented framework for media processing hardware and software components.

Multimedia Programming

Multimedia programming is likely to go through a period of maturation similar to that of graphics programming during the 80’s. At the moment we are at the state where key concepts are being identified. Software abstractions such as “media objects” and “media streams” are emerging and finding their way into programming environments. To highlight these concepts, we will discuss two applications — one taken from the broadcast industry and one from telecommunications.

Video Production: 3DK

Our first example is a virtual studio system called 3DK. Virtual studios originate in attempts to overcome the constraints of traditional chroma-keying where there is the problem that camera motion is uncorrelated with the background imagery. In other words, if a pan or zoom takes place it may not be matched with changes in the background. In traditional chroma-keying situations, such as a weather announcer and map, the above problem is overcome by “locking off” the camera and using a static background. This of course is very limiting and a number of techniques have been developed which extend the usefulness of chroma-keying. With a virtual studio, the static background is replaced by a dynamic, computer-generated, three-dimensional background. The foreground camera is then free to move but must be “tracked” so that the background can be generated with the proper perspective.
Teleconferencing: TELEPORT

The second application, TELEPORT, is a prototype teleconferencing environment where small groups of people, although geographically separated, can meet as if face-to-face. Novel features include the use of full-wall display surfaces, viewer tracking, and real-time compositing of live video with synthetic backgrounds. The TELEPORT environment can be imagined as a room where one wall is a "window" into a virtual meeting area. The geometry, surface characteristics, and lighting of the virtual meeting area are designed to closely match the real meeting room to which it is attached. When a teleconferencing connection is established, video imagery of the remote participant is compositied with a rendered view of the virtual meeting area. The viewing position of the local participant is tracked, allowing imagery appearing on the wall display to be rendered from the participant's perspective. The combination of viewer tracking, a wall-sized display, and real-time rendering and compositing, give the illusion of the virtual meeting area being an extension in space of the real room. The result is a natural and "immersive" teleconferencing environment where real and virtual environments are combined without the need for head-mounted displays and "leaving" the real world.