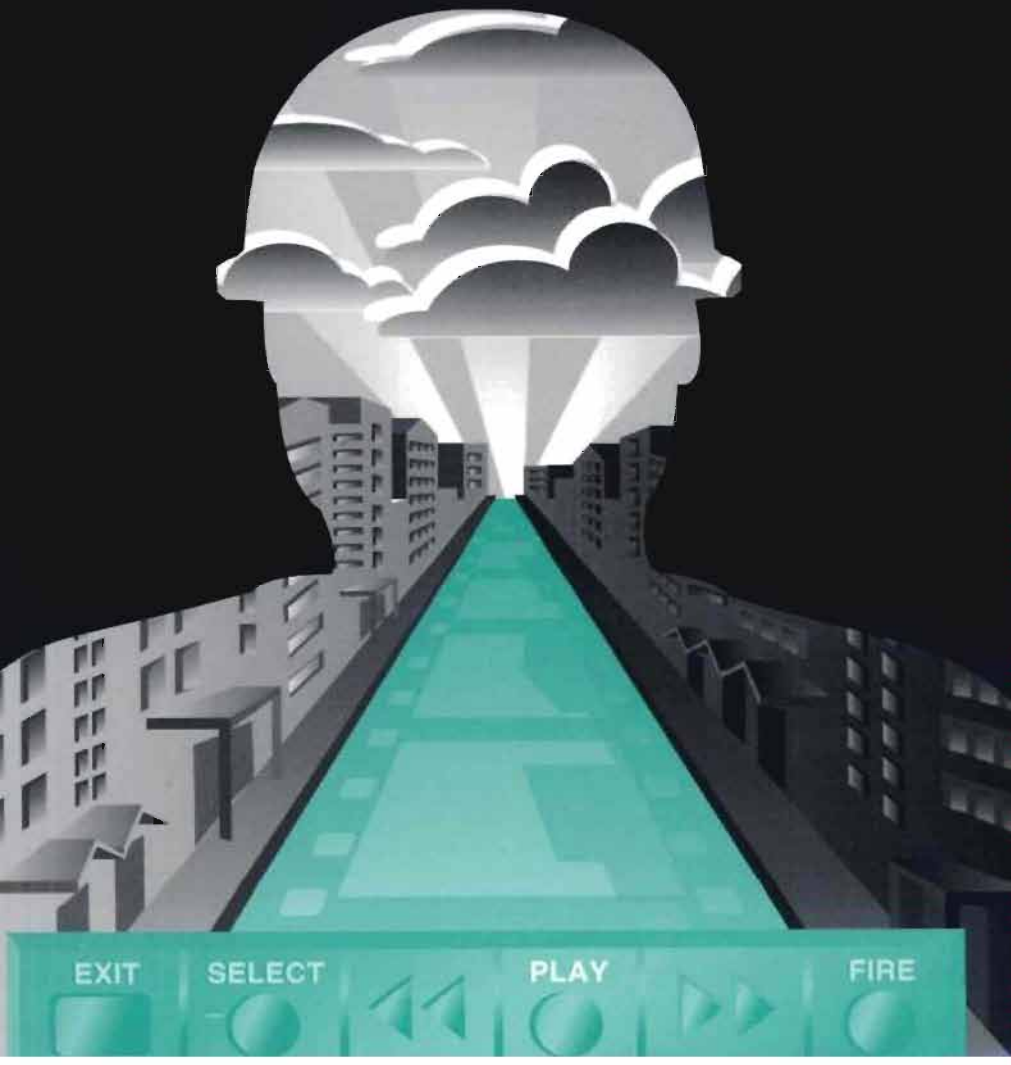
Modeling and Simulation

Linking Entertainment and Defense

COMPUTER SCIENCE AND TELECOMMUNICATIONS BOARD
NATIONAL RESEARCH COUNCIL



Computer Science and Telecommunications Board, National Research Council. Washington, D.C.: National Academy Press, pp. 120-121, 1997.

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INTRODUCTION

If the National Aeronautics and Space Administration's VIEW laboratory marks the beginning of the virtual reality (VR) industry, the industry is just about to pass its 10-year mark. There is a rule of thumb stating that it takes about 20 years for a new technology to find its way into the mainstream economy. Applied here, this means 10 years before VR is in the mainstream economy. This prediction seems completely reasonable, or even pessimistic. Consumers can currently purchase VR headsets with integrated tracking for less than $800. A handful of automotive manufacturers and aerospace contractors use VR on an ongoing basis to solve design and engineering problems. However, early adopters are incorporating the technology into their work and lives. They face all of the frustrations and challenges typically associated with being on the cutting edge. The next 10 years will see the VR industry evolve in a straightforward and boring fashion—early adopters will have paved the way for easy use by the mainstream.

This evolution will require a fundamental shift in the way VR technology is viewed and used. The technology must cease to stand apart; it needs to become an invisible part of a user's lifestyle and work habits. This requires progress on two basic fronts: First, the technology must be integrated into the user's physical environment. Second, it must be integrated into the user's software environment.

EVOLUTION

For mainstream users to benefit from VR technologies, the technologies must become pervasive. They must extend throughout our industries and lives. They must diligently work for their users and quietly become part of their lifestyle. The facsimile machine is an example of a technology that has accomplished this.

Walkmen, dishwashers, televisions—All these have become pervasive by thoroughly changing the way people do things. A person does not talk about using a walkman, or a dishwasher, or a television. If anything, a person discusses the content or end result as opposed to the

NOTE: The industry segment described here is defined as industries that benefit from immersive human-computer interfaces. The term virtual reality is intended to include this definition.

actual device. "I heard a good song," "The dishes are clean," "Did you see that stupid show last night?"

There is little question that three-dimensional (3D) graphics and simulation are on the way to becoming pervasive. In industry the design process is being transformed to demand 3D models and simulations. This Christmas consumers will be choosing between the Sony or Nintendo platforms with 3D graphics capability being assumed.

However, the VR industry must evolve to provide such 3D systems with immersive interfaces that multiply the utility and effect of the 3D graphics. Currently, most 3D graphics are shown on a 2D screen and manipulated via a 2D mouse. These interfaces effectively remove much of the value present in the 3D environments. The VR industry must maintain the utility and comfort present in a user's natural ability to perceive and manipulate 3D environments and objects.

ADVANCES

For VR to become a pervasive tool, it must become integrated into both the user's physical and software environments. Seamless integration with a user's physical environment is not simple because immersive interfaces tend to immerse—that is, they surround and envelop the user. This can easily intrude on a user's physical and mental environment. The VR industry needs to minimize this intrusion to the point where immersive interfaces are as natural to use as a telephone or mouse. It is interesting to note that both these examples are not inherently natural, but both have been integrated into users' workspaces and lifestyles.

To achieve a natural interface, paradigms that transcend the standard goggles-and-gloves paradigm need to be pursued. The fact that people collaborate, multitask, and eat while they work are down-to-earth aspects that must be considered in the design of immersive tools.

Equally challenging is the integration of these new interfaces in the software environment. Application software packages have typically been written for 2D screens and interfaces. As a result, most immersive interfaces are poor retrofits onto existing packages that were never designed to incorporate them. This lack of integration severely cripples the utility of immersive interfaces.

This integration is probably best achieved by starting with a "top down/bottom up" design approach on a number of key applications. For example, the entertainment industry could use an immersive set design and preview system, while the Defense Department would benefit from a simulation-based design and modeling system that fully utilizes a human's ability to think, design, and manipulate 3D space.