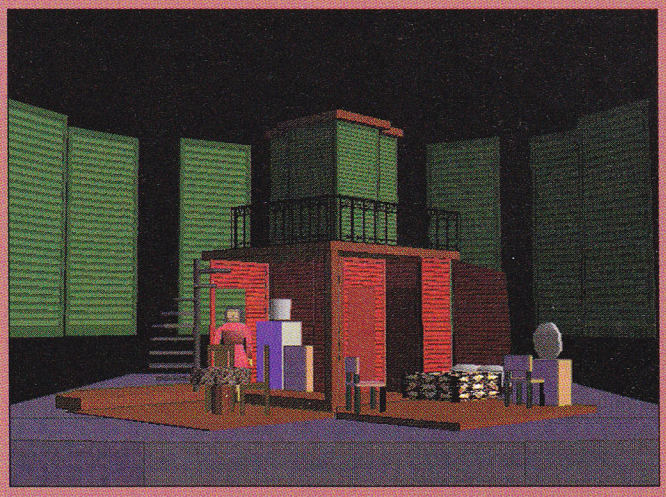
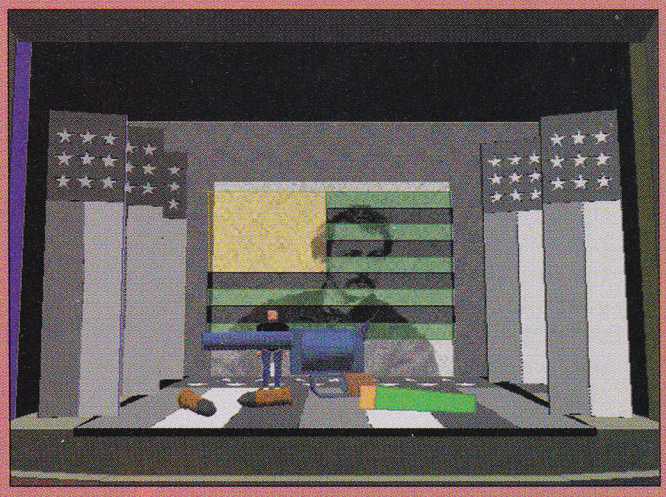




ENTERTAINMENT SPECIAL

# Virtual Reality On Stage

VR VALUABLE FOR DESIGN, PERFORMANCE, AND REMOTE VIEWING IN THE THEATRE | By Mark Reaney

Theatre is the original Virtual Reality (VR) machine. Accessing it, audiences visit imaginary worlds which are interactive and immersive. Noting that thespians used theatre to create virtual worlds when the most powerful CPU was an abacus does not disqualify it; it simply makes the comparison more remarkable. Theatre and computers functioning as VR generators have remarkable similarities. Both offer fleeting, metaphysical experiences. Both create fictive worlds in which intangible concepts can be given perceptible form.

These similarities alone make computer-based VR a valuable theatre ally—both in facilitating traditional theatre production and in inspiring innovative theatrical experiences. The range of possibilities cannot yet be numbered. But at the University of Kansas we have begun by exploring three applications of VR technology in the theatre: as a design tool, as a performance medium, and as a means for viewing live performance from a remote location.

## VR as a Scenographic Tool

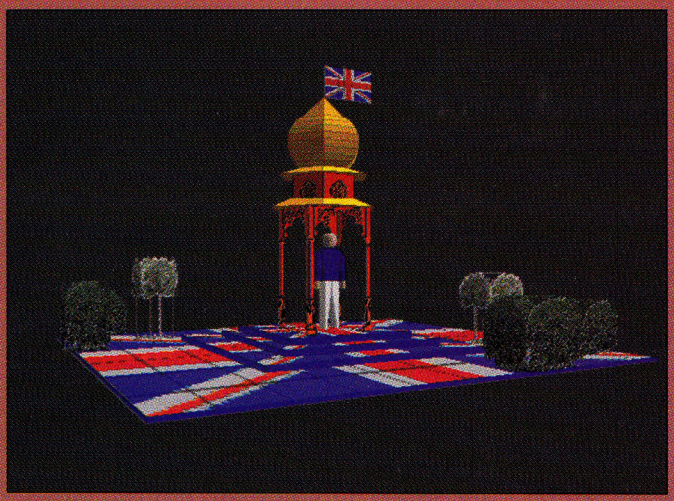
The traditional instruments used in the execution of a stage design are sketches, painted renderings, drafting, and scale models. While this overall approach has served the theatre well for centuries, it has several shortcomings. Perhaps most importantly, these instruments are labor intensive and require many hours of work. A scale model of a multiscene show by itself can devour over one hundred hours and many expensive materials. Unfortunately, modern theatres run on tight schedules and even tighter budgets. Stage designs typically have to be completed and sent to scenic studios for construction in a very short time, often only a few weeks. What stage designers need is a new instrument that will allow them to visualize a design quickly and more accurately. Ideally, it would also facilitate communication among theatre artists.

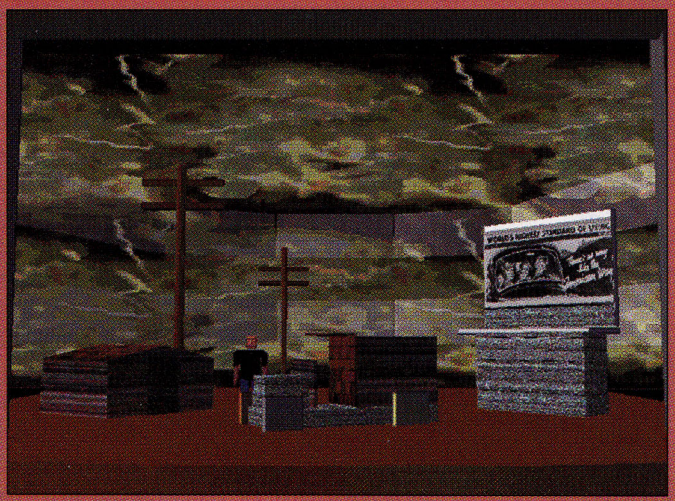
What stage designers need is VR.

To increase the efficiency of my own design process, I assembled a simple garage VR system. My VR scenic design studio is built around a Power Macintosh PC. VR peripheral hardware includes immersive interfaces such as a home-brew head-mounted display (HMD), shutter glasses, and a wide-angle field-of-view (FOV) monitor magnifier of my own design. Input devices include a mouse, joystick, and Mattel Powerglove.

My software of choice is Virtus WalkThrough Pro, a modeling application from Virtus Corporation of Cary, North Carolina. WalkThrough Pro serves stage designers well because it is relatively inexpensive, easy to use, renders with a high degree of realism, and uses standard graphics formats. In addition, models can be exported in a simple "walk-through-only" mode that can be shared with other theatre artists.

Using this system I can generate a virtual setting in a fraction of the time required for a traditional model. Most of my virtual settings are generated in three to four hours—when I have a relatively clear design concept before starting.





From left to right: a virtual setting for *A Streetcar Named Desire*, VR used to show unrealistic elements in a setting for *Assassins*, drafting used as texture maps in this VR setting for *Much Ado About Nothing*, and a virtual setting for *Grapes of Wrath*.

The process takes longer when I use VR to search for a strong idea. In those instances, computerized set modeling proves invaluable in other ways. A virtual world is a great conceptual playground. The license to create new virtual scenic units on a whim, move them about on a virtual stage, and effortlessly change their size, color, or texture, frees even the most stubborn design inspiration.

The Macintosh operating system speeds the multistepped design process even further because it allows easy transfer of data among applications. Sharing data means that all the various stage design instruments can be generated from a single data source. Consequently, I realize greater accuracy when translating the design from sketch to scale model to drafting. I also enjoy a greatly reduced workload in creating each of these necessary traditional design instruments.

For example, data from a completed virtual setting can be exported to a drafting program and used as templates to create the necessary blueprints. Conversely, if the drafting is completed first, it can be exported and used as a template in Virtus WalkThrough Pro, greatly simplifying the process of building virtual settings. Detailed drafting can also be added to virtual scenery in the form of texture maps, thereby lending enhanced realism and greater accuracy.

If a color rendering of the scene is called for, a screen capture of a favorable view of the virtual setting can be exported to a paint or photo enhancement application where a photo or color print can be made.

Occasionally, the production's style (or the director's predilections) make it preferable to downplay the computer graphic quality during a design presentation. In those instances, I initially generate a simple wire-frame drawing from the virtual setting. Later I draw and paint over the printout. Not only is this an efficient method of rendering a scene in what looks like a traditional format, but it also creates the flattering illusion that I always draw in perfect perspective and proportion. Illusion, even when self-serving, is a part of theatre after all!

**Virtual settings produce an accurate impression of size and proportion.**

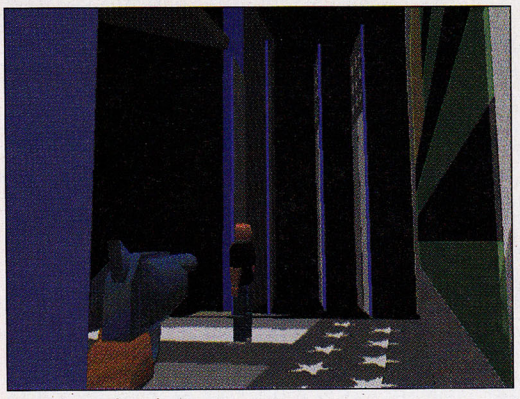
Another boon to designing in a virtual environment is the aspect of 3D. A staged drama occupies space and is viewed from a variety of angles. Stage designers must always monitor sightlines. Can the audience see the actors? What happens when the actors sit or lie down? How is the view from the back of the balcony? How about from under the balcony? Just as important, Can the audience see things they shouldn't? Whoops, there are some stagehands playing pinochle in the wings!

Unlike a designer's sketch, a virtual setting enables me to occupy any seat in the house, checking the sightlines. Moreover, I easily move from a seat on the right side of the orchestra to another in the left-side mezzanine. I even check the view an actor might have from the wings! Upon entering, will the actor be able to see the conductor in the orchestra pit? Even a traditional scale model does not depict sightlines as accurately or as easily as a virtual model. It is often just too difficult to get one's eyes into the proper position. Just consider that in ¼ inch scale, your eyes can be as far apart as 12 feet!

Virtual settings produce an accurate impression of size and proportion. This is very important in the theatre where objects are not always rendered realistically. In a traditional sketch or model it is difficult to convey the preciousness of undersized furniture or the monumental quality of towering scenery.

Immersive interfaces like an HMD, however, appropriately allow virtual scenery to loom over an observer or set pieces to charm with their daintiness. To heighten this effect, it is important that the designer place a human figure within each virtual setting to serve as a measurement standard.

Lighting is another production element greatly enhanced through the use of virtual settings. Traditionally, a lighting designer's concepts are communicated through a series of sketches, known as a lighting storyboard. This tedious method of rendering 3D lighting in a 2D medium is inexact at best. Virtual settings allow the designer to concentrate directly on lighting, without having to redraw the scenery over and over again. Light sources within virtual



An actor's view from the wings.

settings can be moved, colored, and focused with considerable accuracy and the effects are immediately evident within the virtual world. Each lighting effect can then be saved for future reference and shared with other members of the production team.

VR provides, understandably, excellent means for communicating. The accurate communication of a designer's concepts to others is particularly important in the theatre. Theatre is a collaborative art, created through the synergistic contributions of many creative people. Just as they strive to communicate their mutual artistic intent to an audience, so must they strive to communicate with each other in order that each production element can harmonize with the others. In the past, I shared my work with collaborators by showing sketches of proposed designs. Now, through VR technology, I invite my fellow artists to "walkthrough" the virtual stage set. The result is an astounding leap in effective communication.

### Moving Towards a VR Theatre

During the summer of 1993 I experimented with incorporating full-size virtual settings into my design process. By projecting a life-sized virtual setting onto a rear projection screen spanning the entire stage, I sought to demonstrate to a director exactly how a proposed setting would look. Although the idea worked quite well in principle, the method was too cumbersome to be of practical use, especially when compared to the relative ease of using an HMD for the same purpose.

The exercise did, however, give rise to another interesting idea! Could I use a projected virtual setting not merely as an envisioning device oriented toward building conventional scenery, but as a scenic medium in itself?

Can VR be integrated into a live theatre production? Why not? Successful theatre productions have already been produced using computer graphics as scenic elements. We have seen recent productions in which VR was central to the plot, even if it had to be simulated on stage through more traditional scenic devices.

*Guest Artist*, an original work recently produced at Redeemer College is a play about an author using VR to develop characters for a novel. The extremely inventive George Coates Performance Works developed *Invisible Site*, a play describing adventures in a VR store. The attraction for playwrights is obvious. VR contains many elements present also in live performance. In fact, those common constituents are the very things that define them and keep them distinct from related fields.

First, theatre and VR are interactive: both are created moment by moment in response to stimuli from human operators. Unlike movies, theatre takes place "live," in realtime. Live actors and live audiences share a span of time and a block of space in order to participate in a common, immediately generated, experience. Similarly, VR, unlike a prerecorded computer animation, is generated the moment it is experienced. Like theatrical performance, it exists only during that time in which human participants encounter its wondrous contents.

It is, in large part, because of its interactive nature that each experience in the theatre or VR is unique. Even in a carefully rehearsed show or a rigidly constructed virtual world each adventure is distinct and different. They are different because they are controlled by largely unpredictable, diverse human beings. The final participants, audience members, become the last in the chain of collaborators. At the moment of experience they share the act of creation with the designers of the production or the virtual world. Perhaps it is this, more than any other feature, which gives live theatre and VR their peculiar power.

Both theatre and VR are ephemeral constructs producing illusions designed for perception rather than physical objects which can be touched or held. They exist only for the duration of the experience. Before the curtain goes up or the program is booted they do not exist. While the show is playing or the simulation is running, they have the power to entertain, inform, enlighten, and transform.

After the curtain rings down or the computer is shut off, they once again cease to exist, except as memories or as potential means to enable everyone to do it all again. Certainly, there are physical artifacts traditionally identified with theatre and VR experiences. But they are merely a means to an end. A costume or a stage set is not a performance, nor is a computer or HMD, a VR experience.

Another element common to theatre and VR is that of virtual worlds—alternate realities created by, and responsive to, the shaping power of the imagination. These worlds are unnatural in that they do not evolve haphazardly and on their own, but are created by human agents responding to an underlying purpose, a mental itch.

Here again, VR proves itself a wonderfully suggestive medium. In theatre we create worlds that do not adhere to empirical standards of realism. In these worlds Peter Pan flies and a Nutcracker battles a Mouse King. VR is another theatre-like medium in which to encounter these marvels.

It is in this realm that we may see the fullest realization of VR's potential. When used in prosaic architecture or air pilot training, a virtual world must be

Checking *Streetcar*'s sightlines from the balcony.

confined to the physical laws of the universe or the results can be disastrous. In the poetic theatre, however, it is unfettered and can expand with the imagination of its creator.

### The Adding Machine

In spring 1995, the University Theatre at the University of Kansas put these ideas to the test when it premiered the use of VR in a fully mounted theatrical production. The VR production of ran April 18-30, 1995, in the Crafton-Preyer Theatre, located at the University's Lawrence, Kansas, campus.

The script chosen for this experimental production was Elmer Rice's *The Adding Machine.* Ironically, this classic American expressionist play focuses on the plight of Mr. Zero as he tries to find happiness in a dehumanized and mechanized society.

First produced in 1923, before the dawn of electronic computers, the play contains uncanny and dire predictions of the current information age. However, by using these foretold computers not as a dehumanizing force, but as an interpretive artistic medium, the production company illuminated Rice's story even as it embraced another, more sympathetic, view of technology.

Audiences were invited into virtual environments within which the drama unfolded. The paths taken within these virtual worlds were prerecorded. They were improvised as the play progressed in order to take advantage of the interactive nature of the medium.

Virtual settings were created by using computers to drive theatre-quality stereo projection equipment. The audience interfaced with the virtual environment by wearing polarized glasses. In order to preserve the spontaneous and human dimension of live theatre, most of the acting was handled by live actors working in front of the projection screens.

This production of *The Adding Machine* demonstrated ways in which VR technology can be used to illuminate an existing dramatic text. Used not merely as a spectacle for its own sake, but as a new and exciting scenographic medium in the service of an established script, VR becomes another component of the collaborative theatre art.

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