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Virtual Characters in Theatre Production:
Actors and Avatars.

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Abstract: At the University of Kansas, A series of experimental theatre productions have been produced over the past 7 years. During those productions virtual reality technology has been found to be very effective as a scenic device. During the past two VR/Theatre productions of A Midsummer Night's Dream and Dinosaurus, we had the opportunity to expand our use of virtual reality technology to include virtual characters. This essay discusses the creation and effectiveness of virtual dinosaurs in the 2001 production of Dinosaurus. It further discusses the quality of "presence" in live performance and how it is effected by computer generated images.

1. Indroduction

This presentation will focus on a recent theatrical production of *Dinosaurus* at the University of Kansas. In this production, virtual reality technology was used to create one dozen dinosaur characters. The challenge of the production was to incorporate the new techniques while maintaining the connection between live action and audience that is the hallmark of theatrical performance.

2. Virtual Characters

Dinosaurus was the latest in a series of experimental productions at KU that explored the uses of VR technology as a scenic medium. In earlier productions of *The Adding Machine, Wings, Tesla Electric,* and *Machinal*, the use of VR was limited to simulating scenic environments in which to stage the dramas. In the 2000 VR/theatre production of *A Midsummer Nights Dream* at the University of Kent at Canterbury, a virtual characterization of a robotic ass head was briefly used to augment the character of Bottom and underscore his transformation as he changes not only to an ass, but to a denizen of the computer generated fairy world particular to our production. This brief experiment with a virtual character, while somewhat crude, played an important role in the production and assured us that more virtual characters, after further refinement, could play larger and more central roles in future productions.

Bottom's robotic ass head from A Midsummer Night's Dream

In many ways, the virtual scenic environments of our previous experiments where not far removed from the use of virtual characters. Rather than depicting static, realistic environments, most of our explorations were reflected an expressionistic approach. Scenery was active and reflected the mental inner-workings of the play's characters. Virtual scenic elements have the unique ability to move and transform as the dramatic action of the play progresses. If the scenery has the ability to move interactively during the play, and if it is used to convey the same emotions and thoughts as the actor driven characters, then it could be said to be a character in itself. This idea may have been illustrated most pointedly in *A Midsummer Night's Dream* when the character of Oberon hides himself in the forest (in our production, a maze of internet web pages) to spy upon the fleeing lovers and his face appears on the walls.

(At this point a video clip from *Midsummer* is shown)

The cyberspace maze "forest" from A Midsummer Night's Dream

3. Dinosaurus

Dinosaurus was a logical choice for furthering experiments in creating virtual characters. The 12 dinosaurs that appear in this children's theatre piece have been rendered in many ways in its many stagings. In the original production the dinosaurs were created as large shadow puppets on a rear-projection screen. A narrator positioned in front of the screen provided the intelligent voices of the creatures. In another version, puppeteers moved life-size puppets around the stage while giving them voice. Our computer-generated projections served as a high-tech version of shadow puppets.

Attempting real-time human characters would perhaps have been too ambitious for this early experiment. This would have been a particularly difficult problem given the short development time we had for *Dinosaurus*; about two months. In order to replicate human action and behaviors, incredibly complex and subtle movements would be

required as well as equally complex controls. But the large, ponderous, heavily armored dinosaurs can be animated in real time more easily. Larger, less precise movements can be employed without appearing inexpert. In a similar vein, the first motion pictures starring computer generated characters, focused on toys or insects rather than human beings.

The virtual dinosaur "Spike", the triceratops.

However, far from being dumb beasts or even simple animated characters, the dinosaurs of *Dinosaurus* are highly personified, embodied with human emotions and the ability of speech. They communicate with each other and directly with the audience through several "asides". They convey a wide range of emotions from hope to despair.

Virtual dinosaurs were needed that could be created in a short time and operated with relatively simple controls. They also needed to communicate emotionally and linguistically. Also, in order to facilitate the plot, it was essential that our young audience be able to easily distinguish each of the 12 dinosaurs from its fellows.

Another important consideration is the question of how virtual characters affect the unique nature of live performance. In all of our VR/Theatre experiments, we have always carefully examined how the new technologies we employ enhance or impair the spontaneity and energy of the live performance. To this end we have usually opted for real-time virtual reality technologies over pre-recorded animations. VR provides the spontaneity required of live theatre and even allows for the same elements of risk inherent in traditional theatre. It many ways scenic elements created through VR and controlled by backstage operators are even more "live" than traditional wood and canvas scenery that sits, unchanging throughout the play. However, one element that cannot be provided by current VR technology is that of "presence" or actually occupying the dramatic space with the actors and audience.

The importance of presence in any given production may be debated. Certainly, projected scenic images have been used in the theatre for centuries and in many theatrical styles. Virtual characters, however, may present different criteria than does virtual scenery. As the motivators of the drama, the focus of the action, it is crucial that these virtual characters maintain the standards of live performance. Many theatre theorists have remarked on the importance of the physical presence of the actor and the audience and the shared experience of a dramatic presentation. The concept of presence states that actor and audience work together to shape any given performance. Actors get a wide range of input from the audience and consciously or unconsciously shape the performance according to that input. This is why each live performance is unique and cannot be duplicated exactly. This phenomenon is particularly evident in productions of theatre written for children, as young audiences are delightfully emotional and verbal in their response to a performance.

If our characters were created and controlled wholly with the computer, they would be fixed in nature, unable to respond to the participation of the audience. Our production would have become more closely aligned with cinema than live theatre. If our method of presentation moves beyond that of live theatre and into related fields of video, computer games or film then we would have moved outside our immediate goals. Using VR technologies in these related fields is an interesting and worthwhile study, but does not advance our chosen field of inquiry.

In order to create a sense presence in VR creations we usually attempt to enhance the realism of the rendering of the virtual objects. By carefully modeling the objects, recreating the quality of the stage lighting within the virtual environments we have attempted to create the illusion that the virtual objects were actually present on stage. In

many of our experiments we furthered that illusion through the use of 3D stereoscopic images so that the audience could perceive the objects in seeming 3D. Even with all these elements of illusion at work, we still rely on the audience's willing participation in maintaining the illusion. This is a common factor in theatrical production generally referred to as "the willing suspension of disbelief".

For *Dinosaurus* we decided it would be impractical to use stereoscopic images, as it would have meant providing thousands of 6 through 8 year-old audience members with 3D glasses. But in any case, with our new standard of presence for virtual characters, these illusions would not suffice. The projected CGI dinosaurs simply do not have the physical presence necessary to play leading roles in live performance.

We were determined then, to have our dinosaurs motivated in real-time to preserve the "live" quality of the performance. We also needed virtual dinosaurs that were simple enough to be created quickly but still we capable of conveying complex emotions. Furthermore we needed to find a way to lend our dinosaurs the attribute of presence required of our lead characters.

Our solution was to combine traditional actors with virtual avatars. Our dinosaurs would be comprised of both human and virtual elements. But, rather than having 3 actors portray the physical dinosaurs while a fourth narrates the as in the original shadow puppet production, four actors would play all twelve dinosaurs. Each actor was assigned to play 3 or 4 dinosaurs, delivering their lines, reinforcing their actions and playing the more detailed emotions that were beyond the range of the CGI dinosaurs. In order to help maintain the individual identity of the creatures, each dinosaur was textured with a bright color that coincided with the color of the costume worn by its actor-alter ego. The colors were chosen to for the purpose of this ready identification and to underscore the personalities of the individual dinosaurs rather than in any attempt to recreate the possible coloration of actual dinosaurs.

On the entrance of a dinosaur character, an actor entered the stage from an upstage entrance near the projection screen and a projected virtual dinosaur would appear on the screen simultaneously. Through the scene, the actor and dinosaur worked together as a team. After much rehearsal, the computer operators were able to move the dinosaurs in close unison with the live actors. Actors learned to modify their movements to accommodate the slow moving dinosaur models and the computer operators learned to move the dinosaurs in ways that were very expressive despite limited mobility. The dinosaur movement was limited to walking, running, and moving the head and neck. Some dinosaurs had special capabilities that were required by the script. Jaw movements, lying down and rising were incorporated into several characters, but most had the basic functionality of hand puppets.

Actors and virtual dinosaurs work together to create hybrid characters.

4. Conclusion

The synthesis of the live actor and the virtual character was as effective as we had hoped. The actor contributed the information crucial to the development of the story while the CGI dinosaurs transformed the characters into huge, exotic and exciting beasts. The addition of sound effects, growling, snarling, and thunderous footsteps, added tremendously to the sense of the enormous scale of dinosaurs.

This synthesis of the live with the artificial also created a sense of presence that might have otherwise been lost without the use of human actors. Under different circumstances we would have been able to create dinosaur characters with a greater range of movement, facial expressions and speech capabilities. However with such a configuration much of the play would have taken place on the projection screen alone, with no live, three-dimensional, breathing humans on stage. The enormous virtual dinosaurs would have largely dominated even those scenes that included the play's two human characters.

The response from our young audiences was overwhelmingly positive. The 6-9 year-olds were not a bit shy about reinforcing the concept of presence. They laughed and screamed. They yelled warnings to the actors on stage and shouted directions to dinosaurs who seemed lost or confused.

In later interviews with the children, it was revealed that they had no trouble identifying the individual dinosaurs and were able to describe the personality of each one. Interestingly, when they were introduced to the actors away from the production, they were not so adept at matching the human actor with the dinosaur counter-part. It seems that the children fused the personality presented by the actor with the physical appearance of the virtual dinosaur into a single entity that could not later be separated in their minds.

We will continue to experiment with virtual characters in future productions, each production serving as a building block for those to follow. We will attempt to add greater and greater functionality to our virtual characters and explore methods of increasing their presence on stage. At the same time we will continue to be very careful to maintain the definitive qualities of live performance.