

# Shakespearean Karaoke

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## 1 Motivation and Introduction

Traditionally, students study plays by reading from a book. However, reading dialogue on paper does not always communicate the various emotions and actions that help people understand the significance of the person-to-person interactions that are represented.

We have designed and implemented an interactive system that allows a participant to experience a play by acting in a scene of Shakespeare's *Much Ado About Nothing* opposite a virtual co-actor. The human participant reads his or her dialogue from the bottom of the screen, and the virtual co-actor responds with each of her lines while using appropriate gestures and emotions.

Our hypothesis is that interacting with the virtual co-actor will lead to a better understanding of the scene and will be more enjoyable to participants than the traditional text approach. In order to evaluate this hypothesis, we performed a study where we compared acting out the scene opposite a virtual co-actor to reading a printed copy of the scene. Participants in both conditions then answered questions about the content of the scene.

## 2 Previous Work

Virtual humans have been used for teaching and training in various fields. Babu et al. [2007] used immersive virtual humans to teach south Indian social conversational protocols, and found that participants who trained interactively with the virtual human performed significantly better when tested on the material than participants who studied from a written study guide with illustrations. Other applications include Ziemkiewicz et al.'s [2005] use of virtual humans for nurse triage training, and Hill et al.'s [2003] use of virtual humans in their Mission Rehearsal Exercise system that teaches decision-making skills to leaders in the United States Army.

Researchers have also investigated the use of virtual reality in interactive theater. Slater et al. [2000] built a system that let actors rehearse a short play in virtual reality. The researchers found that virtual rehearsals led up to a successful live play rehearsal in front of an audience. Geigel and Schweppe [2004] produced an entire theatrical experience where participants were able to control actors, scenery, orchestra, and audience in a virtual environment.

In this work, we have created an interactive system, Shakespearean Karaoke (SK!), that provides a human actor with their lines, a virtual stage, and a virtual co-actor for a scene from Shakespeare's *Much Ado About Nothing*.

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## 3 System Overview

Shakespearean Karaoke projects a life-sized virtual co-actor (Beatrice) in a virtual chapel setting on a single large screen opposite the human participant. SK! was built using Babu et al.'s [2005] Virtual Human Interface Framework (VHIF). An interactive 3D character from Haptek Corp. was used to create and animate the virtual actor, and the Simple Virtual Environments framework (SVE) [Kessler 2000] was used to control the virtual stage environment.



Figure 1: A participant using SK!

SK! presents a scene from Shakespeare's *Much Ado About Nothing*, act four, scene one. At the beginning of the scene, the participant is presented with the character Beatrice standing in a chapel. The scene is overlaid by a translucent introduction screen that explains background information for the scene (the prologue). After reading the prologue information, the participant presses a key on a numerical keypad. The prologue screen disappears, and Benedick's first line appears at the bottom of the screen. The participant plays the part of Benedick, reading the line out loud. The participant presses a key to advance the script. The line disappears from the bottom of the screen, and Beatrice responds with her line. When she finishes, the participant's next line is displayed. This process repeats until the end of the scene, when an exit screen appears.

## 4 Experiment Design

The purpose of this study was to investigate the relative understanding of an excerpt of Shakespeare's *Much Ado About Nothing* by acting out the scene opposite a virtual actor as compared to reading the text of the scene. We used a between subjects design. Participants were randomly assigned one of two conditions: Virtual Reality (VR), where they acted out the scene with Beatrice, or Reading, where they studied a printed copy of the text of the scene. A total of 41 participants from the University of North Carolina at Charlotte completed the study.

After studying the play, participants answered a questionnaire that consisted of 24 questions about the scene measuring learning on the lower two levels of Crooks' condensation of Bloom's taxonomy: knowledge and application [Crooks 1988]. Sixteen of the questions measured learning on a knowledge level in a multiple choice format. The remaining eight questions measured learning on the application level by asking participants to put lines and events in the correct order and by asking open-ended questions about the content of the scene.

Participants also went through a short interview session., answering questions about their method of study and, in the VR condition, about their opinions of the application.

## 5 Results

Each of the twenty-four questions measuring learning about the play was worth one point. The only significant difference of scores between conditions was in the prologue category. In all other categories, there was no significant difference between the groups. However, means were slightly higher in the Reading condition than they were in VR for each category. (See Table 1.)

Table 1: Mean scores for each category of questions by condition

Learning level	Category	Condition	Mean	Std. Dev	N	P
Knowledge	Prologue	VR	5.25	1.943	20	0.032
		R	6.57	1.859	21	
	Scene	VR	6.60	1.142	20	0.388
		R	6.90	1.091	21	
Application	VR	3.80	1.119	20	0.403	
	R	4.15	1.527	21		

During the interview, several participants in the reading condition indicated that they had read over the scene multiple times during the allotted time, and that that helped them answer the questions correctly. Several participants in the VR condition commented that they would have answered more questions correctly if they had more than one chance to act out the scene with the virtual co-actor.

## 6 Discussion

In two out of the three categories of questions about the scene, there was no significant difference in the scores of participants between conditions. This suggests that participants in condition VR were able to learn about the scene as well as participants in the Reading condition.

However, in every category of questions about the scene, the mean score for participants who read the scene was higher than the mean score for participants who acted it out in virtual reality. One contributing factor to this might have been the repetition of the material that was allowed in the reading condition but not in the virtual reality condition. Participants in VR were restricted to acting out the scene only once with the virtual co-actor while the time allotted gave participants in the Reading condition enough time to read the scene several times. Comments from participants during the interview support this.

The only category of questions that had a significant difference of scores between conditions was the set of questions about the prologue of the scene. The difference in the presentations of the

prologue material may have been a factor in the scores. For participants in the reading condition, the prologue was presented as a short paragraph just before the lines of the scene began on the paper. In the VR condition, the prologue paragraph was displayed on a translucent screen with Beatrice and her setting visible behind it before acting out the scene began. Beatrice's movements may have distracted participants from the content of the prologue. When asked if there was anything that kept them from answering questions correctly about the play, two participants in the VR condition said that they read the prologue screen too quickly.

## 7 Acknowledgments

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## 8 References

- BABU, S., SCHMUGGE, S., INUGALA, R., RAO, S., BARNES, T., AND HODGES, L. F. 2005. Marve: a prototype virtual human interface framework for studying human-virtual human interaction. In *Lecture Notes in Computer Science*, T. Panayiotopoulos, J. Gratch, R. Aylett, D. Ballin, P. Olivier, and T. Rist, Eds. Springer-Verlag, London, 120-133.
- BABU, S., SUMA, E., BARNES, T., HODGES, L.F. 2007. Can immersive virtual humans teach social conversational protocols? *Proceedings of the IEEE International Conference on Virtual Reality 2007* (Charlotte, North Carolina, USA, March 10-14, 2007). 215-218.
- CROOKS, T. J. 1988. The impact on classroom evaluation practices on students. *Review of Educational Research* 58, 4, 438-481.
- GEIGEL, J. AND SCHWEPPE, M. 2004. Theatrical storytelling in a virtual space. In *Proceedings of the 1st ACM Workshop on Story Representation, Mechanism and Context* (New York, NY, USA, October 15 - 15, 2004). SRMC '04. ACM Press, New York, NY, 39-46.
- HILL, R. W. JR., GRATCH, J., MARSELLA, S., RICKEL, J., SWARTOUT, W., & TRAUM, D. 2003. Virtual humans in the Mission Rehearsal Exercise system. *Kynstliche Intelligenz* 17, 47-48.
- KESSLER, G.D., BOWMAN, D. A., HODGES, L.F. 2000. The Simple Virtual Environment library—an extensible framework for building VE applications. *Presence: Teleoperators and Virtual Environments* 9, 2, 187-208.
- SHAKESPEARE, WILLIAM. *Much Ado About Nothing*. <http://opensource-shakespeare.org/views/plays/playmenu.php?workID=muchado>
- SLATER, M., HOWELL, J., STEED, A., PERTAUB, D., AND GARAU, M. 2000. Acting in virtual reality. In *Proceedings of the Third international Conference on Collaborative Virtual Environments* (San Francisco, California, United States). E. Churchill and M. Reddy, Eds. CVE '00. ACM Press, New York, NY, 103-110.
- ZIEMKIEWICZ, C., ULINSKI, A., ZANBAKA, C., HARDIN, S., AND HODGES, L.F. 2005. Digital patient for triage nurse training. *Proceedings of HCI International 2005* (Las Vegas, Nevada).