

Giving New Power To An Old Story

Western Michigan University Puts On A High-Tech Production Of *Doctor Faustus*
By Kevin Abbot

Christopher Marlowe's *Doctor Faustus* is a difficult text with large passages of thick, dated language and supernatural characters whose powers are usually inferred rather than shown on stage. It might be considered a good training exercise for college theatre students but not necessarily a rousing night at the theatre. At Western Michigan University (WMU), we decided to use *Doctor Faustus* as the platform to combine the latest in digital media technology with an experienced design team and a risk-taking guest director. We hoped, in the process, to give new power

to an old story.

In November 2005, in an effort to jump-start new initiatives, the WMU administration announced that an internal Innovation Grant totaling \$2 million would be available to fund a select number of proposals. As we already had a great team of creative collaborators in place—we have been integrating digital media into productions since 1998 with a new opera, *The Nightingale*, followed by other successful productions including *Return to the Forbidden Planet*, *Space*, and *Metamorphoses*—we saw this as a perfect opportunity to

explore new technologies.

Scenic designer and head of design Greg Roehrick was interested in using stereoscopic 3D to break the plane of the traditional projection screen. Lighting designer Matt Knewtson had a strong interest in using MIDI. Dance faculty member David Curwen wanted to explore telematic video, and everyone wanted the chance to work with motion capture. I led the team, which also included chairperson Joan Herrington, and wrote feverishly to complete the grant application on a short deadline. Out of 80 entries, our proposal was one of seven that received



awards, with ours totaling \$289,448.

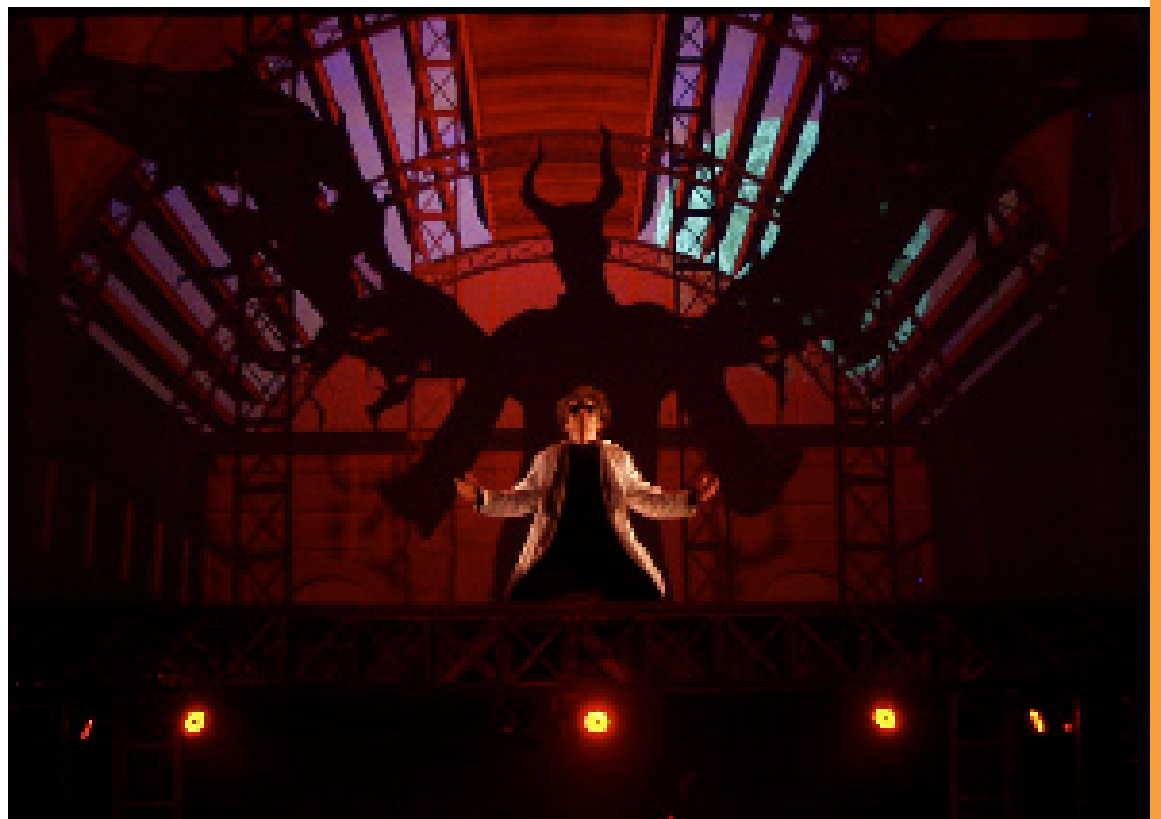
Working as the grant's project director, I prepared orders for computers, software, projectors, and other equipment as fast as I could write them. Through a very fortuitous bit of timing, we were able to acquire a pre-owned, 12-camera motion-capture system from Vicon. Interestingly, these cameras had once been part of the capture rig for the animated film *The Polar Express*, and we happened to contact Vicon at the exact time when they were trying to move several pre-owned systems. Just a couple of years ago, this would have literally cost us a quarter-of-a-million dollars, but we were able to get ours for less than a third of that price. It was an absolute coup for us to get a system of this quality.

In late August 2006, guest director Leon Ingulsrud, who had previously directed twice at WMU, flew in for a series of meetings to learn what could be done with the new technology. He immediately gravitated toward the "mocap" (motion-capture) system and wanted to use it live on stage in full view of the audience. Because I couldn't see us putting Faust or Mephistopheles into a Lycra® suit covered with reflective dots for the whole show, Leon

and I happened upon the idea of casting one actor to be our "digital puppeteer" to do the motion-capture performances for all of the digital characters. The extensive list of virtual characters included a 30-person chorus, Mephistopheles, Lucifer, Helen of Troy, the Good Angel and Evil Angel, Alexander, his Par amour, and a "Devil in Drag." Presenting them all in a live setting posed a serious challenge.

The choice to do live motion capture required us to be creative in other areas. Most importantly, a set had to be designed to house the 12-camera Vicon system. Because the theatre in which the show was to perform has traps and an orchestra pit, Greg designed an Elizabethan-inspired set incorporating the equivalent of an inner-below and inner-above. A main central platform was created, under which the cameras were hung. Floor traps were removed under that platform, creating what we called the "mocap pit," a 12'x12' space in the center of the stage, which was barely enough room to accommodate our performers' movements.

Although I think no one had ever attempted it before, Leon and I wanted our live characters to be projected not only in realtime, but also in stereoscopic 3D. Autodesk's MotionBuilder, which was



Projections for *Doctor Faustus* were handled by Panasonic D5000U projectors outfitted with 0.8 aspect ratio lenses.



For playback, MotionBuilder ran on two dual-core Windows XPs outfitted with 7900 series NVIDIA gaming cards. A quad core Dell Precision workstation ran Vicon IQ realtime motion capture processing software.

the only choice for handling live motion capture, is also capable of realtime rendering in the same style as a 3D videogame. The characters I designed and modeled in 3DS Max were imported into MotionBuilder, and the live motion-capture data being piped in could then be used to “drive” the characters. MotionBuilder can render virtual characters, as well as virtual scenery, lighting, and special effects. Through a combination of research, intuition, and luck, I was able to set up two virtual cameras in MotionBuilder and send the data to two projectors simultaneously, allowing everything to project in stereo 3D. The quality of the stereo was superb because it’s essentially a straight dump from the video card. We achieved quality equivalent to stereoscopic video, and it hardly took any more horsepower to create the two stereo images than to create a single-camera “mono” image.

MotionBuilder was not made for live performances. However, it does have a full-screen mode that allowed us to project a complete 3D scene without interface elements. Fortunately, MotionBuilder has MIDI inputs that allowed us to control myriad events within the 3D scene. Each playback



Scenic designer Greg Roehrick had to design the set to accommodate a 12-camera Vicon system.



Characters were designed and modeled in 3DS Max, imported into MotionBuilder, and the live motion capture data was used to “drive” the characters.

machine had a MIDI keyboard attached, and the keys and sliders were used to make objects visible or hidden and to make them move. We came up with some very low-tech solutions from a software perspective, such as using a MIDI slider to fade the texture on a black 3D plane so that we could fade the 3D scenes to black.

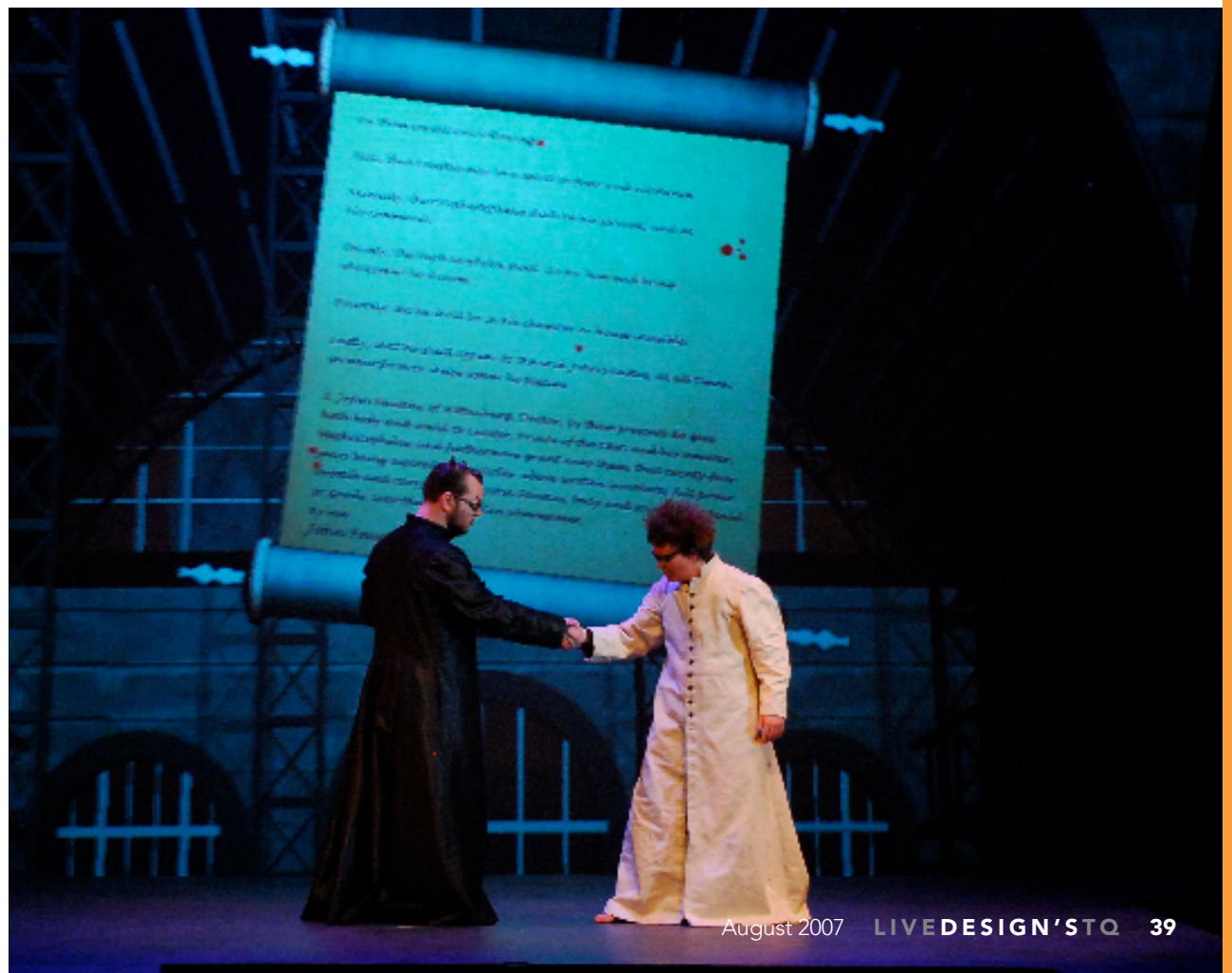
One of the more impressive uses of MotionBuilder’s MIDI inputs was for the appearance of the solar system in Scene 6. We structured the controls so that the location of each planet, its orbit around the sun, and the speed of its rotation were individually controllable. The ability to make the imagery react immediately to the action on stage was a huge boon for the production and created an undeniable sense of immediacy. All of our previous productions used imagery rendered into video and therefore bound to a timeline. Using realtime 3D completely changed our ability to make the visuals interact with the actions of the live performers.

Next, I designed the system needed to make it all happen and hired two assistants, Ben Stickels and Micah Steiglitz, to assist with everything from equipment setup to 3D modeling. For playback, we had MotionBuilder run-

ning on two dual-core Windows XP machines with 2GB of RAM outfitted with high-end 7900 Series NVIDIA gaming cards. A quad-core Dell Precision workstation ran the realtime motion capture-processing software, Vicon IQ.

Projections were handled by four 5,000-lumen Panasonic D5000U projectors outfitted with 0.8-aspect ratio lenses. A pair of the projectors, fitted with polarizing stereo filters, was hung over mid-stage in a custom-built rig to produce 3D imagery on a 16'x27' Harkness Hall Spectra3D screen. The other two projectors were placed upstage of the set and used to project animated images of Alexander the Great, his Paramour, and Helen of Troy onto a pair of 6'x20' Rosco clear screens, which tracked in from offstage. Like many other production elements, we

had never worked with clear screens before and weren’t sure what to expect. We quickly discovered that, for the clear screens to be effective, it was essential that no light other than the projected images hit their surfaces. Knewt-





The Elizabethan-inspired set includes a main central platform under which floor traps were removed and cameras were hung, creating the “mocap pit.”

son was tasked with solving this challenge, made more difficult because we had actors walking right up to the clear screens and interacting with the projected characters. The mocap performer, Shannon McFee, could see the action via a video monitor, which allowed her to react immediately when one of the real actors reached out to touch the projected image. This effect created some of the most magical moments of the entire production.

While solving the technical issues was certainly a challenge, choosing how to apply technology to *Doctor Faustus* was equally difficult as it opened up so many avenues not normally available to live theatre. First and foremost, the entire team was committed to the goal of bringing the world of the live performer and the world of the screen together.

The realtime nature of the virtual characters and the depth created via the stereoscopic 3D created stunning interactions between the live performer and the virtual world. For example, in the prologue, the audience saw 30 virtual cho-

rus members being manipulated by the mocap performer, behind an 18-member chorus of live actors moving in counterpoint choreography. Additionally, the depth of the physical scenery could be extended upstage through the virtual portal of the 3D projection screen.

The team also wanted to use the new technology to reinforce the play’s supernatural elements. This was clearly achieved during the conjuring of Mephistopheles, who appeared in virtual form as a demon with 25’ articulated wings that were fully controlled by the mocap performer, making him feel undeniably alive. The supernatural was also clearly present in the form of Lucifer, who towered over Faust as a giant, Oz-like flaming head and chastised him for looking to God for salvation. The ending successfully combined traditional and virtual elements, with virtual clouds and hellfire, billowing stage smoke, and writhing bodies—both real and virtual—accompanying Faust as he was flown and lowered into the mocap pit.

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Another intriguing theme we explored was puppetry, which I don't think any of us would have found if not for the influence of the motion-capture system. Once we happened upon the idea of the motion-capture performer as a digital puppeteer, we began to see it quite clearly in the text. We expressed this idea by presenting the Good Angel and Evil Angel as talking puppet heads extending out over the audience in their efforts to sway Faust. Later, our virtual Lucifer commanded the performance of a real puppet show, which created an intriguing relationship "loop" from live performer



MotionBuilder's MIDI inputs were used for the solar system, structured so each planet's location, orbit, and rotational speed were individually controllable.

to virtual character and back again. It also led to one of my favorite moments in the production, where the character Envy is represented as nothing more than an index finger while Lucifer's huge head overlooks the action. The contrast of tiny versus huge, simple versus complex, and analog versus digital was incredibly dynamic to see live and in the moment.

Bringing this much technology together was a daunting task, but in the end, it was definitely worth the effort. It's not often that you get to do something completely new in the theatre, but we had the great fortune to do so on this production. As far as we know, we're the first theatre production to use motion capture on stage to create characters in stereoscopic 3D who interact with the live actors. Talks are already underway for the next production, with director Leon Ingulsrud leading the charge. Now that we've learned how to use them, we're all excited to see what we can create next with these spectacular tools. **LD**

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