At ASU's Institute for Studies in the Arts, theatres themselves are being transformed into multi-media performers.

by Michael Grady
The stage throws a warm morning downlight on a lone woman as she rises from a bed of crushed boxes and crates. Behind her—in a memory tableau—three train passengers bounce imperceptibly to the rhythm of the rails as the lush European countryside sails past projected cabin windows. Surrounded by memories, the woman dances centerstage. Her morning light pursues her, wrapping tightly upon her shoulders and slipping into a frigid blue. With a sudden, synthesized key change, her memories turn a deadly edge. Characters on either side grab prison bars, trapping the woman in the center. A red laser light throws a series of rings around the woman, which circle her menacingly while the boxes behind her burst into flame...

Montreal-based Montanaro Dance’s *Time in the Eye of the Needle* is a vivid, free-flowing piece about the patterns of human migration and social change. Developed last spring at ASU’s Institute for Studies in the Arts, *Time* featured a wide variety of performers, including Montanaro’s talented ensemble, several outstanding students from ASU Dance, and a computer-generated, free-thinking stage that reads the performers’ movements and spins the appropriate environment around them.

Since when does a stage facility “think” and “perform?” Welcome to the future of the arts.
We're trying to create a means for the computer to interact with the artists in a humane way,” says Intelligent Stage creator Robb Lovell.

“We want to be able to give control of the physical stage to the computer, in a way that allows the computer to understand and respond.”

Historically, the physical space of a theatrical, dance, or musical performance has been an unwieldy and peripheral artistic concern. The performance is observed by a stage manager, who signals one of several technicians to change the lighting, music, or staging as the event progresses.

The steady emergence of The Intelligent Stage suggests that the day is not far off when the entire physical event literally will be at the performers’ fingertips. The very surroundings will respond in synch to the performer’s smallest nuance—subtleties can be added in the moment of creation, allowing unprecedented artistic freedom and a unique identity to each performance.

The technology is blossoming under the steady hands of Lovell and Resident Artist John Mitchell.

“My role is to keep an eye on the practical possibilities for The Intelligent Stage,” Mitchell says. “As a composer, I enjoy the tremendous opportunities it offers for interactive art, but this is also a breakthrough on a purely technological level as well.”

The Intelligent Stage’s roots go back almost a decade, with Mitchell and Lovell working on hybrid ideas that fused together at the isa. What began with a series of performance pieces that incorporated pressure sensors has grown to a technology seeking to read and codify the meanings of human movement.

“We’re coming along steadily,” Lovell says. “At the isa, we’ve tried a number of performance applications for The Intelligent Stage over the last few years, and with each experience, we learn to develop more triggers and more sophisticated ways of using them.”

“Triggers” are the building blocks of The Intelligent Stage—a series of sensor beams laid out by computers across a three-dimensional performance area. A performer in motion will trip a trigger that sets off a light or sound change.

“Our first triggers were just presence triggers. The trigger read whether you’re physically there or not,” Lovell explains. “In Eyes (1988), our collaboration with the Dance Department, a dancer walking across stage would pass in front of a trigger and set off a series of musical notes. We gradually got more sophisticated. We developed a more sensitized trigger that would touch off sound in response to a performer’s facial expressions.

“By the time we produced Anamorphic Ambassador (1992), I had begun working with John Mitchell. John has a very sophisticated sense of integrating and controlling various media, be they slides, computer animation, or video clips,” Lovell says.

“We developed a more sensitive trigger,” Mitchell adds, “one that would read not only motion, but a particular frequency of motion. For Time in the Eye of the Needle, we had developed the tracking trigger, which can follow a performer in three-dimensional space.”

Lovell explains the refugee sequence from Time:

“We recorded the dancer’s height, and set triggers to respond to variations. When she moves, we hear the theme music; when she squats, she brings on the circles—which vary speed and tightness based on how low she is vertically. The pressure she exerts on the prison bars sets off a number of sound cues, and she can change the whole environment to silence simply by being still.”

But Lovell and Mitchell are not content to be still.

“We’re exploring a non-performance application now,” Mitchell says. “We have Glenna Batson, a dance education teacher in from North Carolina. We want to see if we can program The Intelligent Stage to read physical movement with enough precision for dancers to use it as a movement tool.

“It would be a valuable way for dancers to observe and modify their own physical mechanics to reduce stress and injuries,” he adds.

Batson, a dance teacher and physical therapist, agrees.

“This system could become a valuable learning tool. Most motion detecting equipment charts movement in the abstract,” she says. “What The Intelligent Stage gives a dancer is the ability to examine how they move in the context of their whole bodies, and in relationship to a physical environment. A person can observe their body’s behavior in three dimensional space, and make adjustments in the context of their whole body and how it characteristicly moves.”

Though pleased with The Intelligent Stage’s remarkable progress, Lovell and Mitchell are on an endless quest to advance and diversify. Mitchell, the composer, is ever anxious to find a collaborator and explore more of The Intelligent Stage’s artistic side.

“I’m beating the bushes looking for someone to work with,” he says. “As yet, it isn’t always easy for an artist to embrace The Intelligent Stage. You have to rethink the rules of what you can and can’t do—and get used to the many levels of artistic choices it offers you. It challenges the preconceptions you have about your art form. That’s an exciting, and sometimes scary, situation.”

Lovell’s current frontier is developing a method for getting the computer to “understand” the concept of human gesture.

“We’re trying to get the computer to recognize ‘gesture’ as an independent trigger,” he says. “For example, think about a coded series of moves such as my hand reaching behind my back. I’d like to have the computer collectively read that series of moves as one discrete signal that will prompt a consistent response.

“That’s where the most ground has to be gained technologically,” Lovell explains. “We have a fairly advanced capacity to gather information. And the computer can integrate and respond to data very quickly—once it knows what to respond to.”
Lovell wants to teach the computer to understand. Computer scientists around the world have similar goals. The entire realm of artificial intelligence research might come into play. A truly intelligent stage will have to develop sifting capacities similar to those of the human brain: grabbing a vast amount of incoming data, judging and discarding the non-essential, and then responding where appropriate.

Lovell turns to the bank of Intelligent Stage monitors that glow patiently around him.

“That’s what we’re looking at. That’s our next stage.”

The Intelligent Stage is one of many ongoing projects at the Institute for Studies in the Arts. For more information about this work, contact Robb E. Lovell or John D. Mitchell, ISA, College of Fine Arts, 602.965.9438. Visit the ISA’s site on the World Wide Web: http://www.asu.edu/cfa/isa/main.html

Performers using the Intelligent Stage directly manipulate lighting and sound effects by entering trigger zones defined in the stage space. Their locations are tracked by three video cameras. Each camera sees the scene in a separate color (below). The computer system combines the images to calculate the location of the performer in space. At left, a representation of the camera locations and one set of trigger points. These points can be relocated for different performances. Todd Green’s photographs from Montanaro Dance’s Time in the Eye of the Needle (above) give a glimpse of some of the effects achieved with the system.