



TYZX | systems that see

Turning Foot Traffic into Interactive Art at a Busy International Airport

Indianapolis' new, state-of-the-art International Airport boasts a cutting-edge electronic light and sound environment designed to surprise and delight travelers.

This new interactive artwork fills the Pedestrian Bridge connecting the new Colonel H. Weir Cook Terminal to the airport's immense parking structure. The new state-of-the-art, green-tech airport, which opened in November, 2008, will serve 8.5 million travelers this year. Most of those travelers, either on their way to the terminal or the garage, will pass through this long, narrow, glass-sided passageway and encounter this dynamic, electronic installation.



Electroland's "Connection" installation in the Pedestrian Bridge brings color and sound to a conventional airport walkway.

CHALLENGE:

- Track the real-time locations of millions of pedestrians moving through an airport.
- Track locations reliably 24 hours a day, even in changing lighting conditions.
- Keep technology unobtrusive.

SOLUTION:

TYZX 3D Embedded Vision Systems

And here's what they will find: colored lights, ambient sound, and an environment that instantly responds to the movement of pedestrians. Circular lights in the ceiling change color as people walk underneath. If two pedestrians line up or pass each other, orthogonal lines suddenly appear on the floor, creating a visual connection between people who would otherwise simply be strangers. Then, at 60 to 90 second intervals, the entire space erupts in a dazzling light show—a 15-to-30 second long burst of sound and color sure to entertain even the most jet-lagged passerby.

The Pedestrian Bridge artwork—an interactive installation called "Connection"—is the brainchild of Electroland, a Los Angeles-based design studio run by Cameron McNall, an award-winning architect and designer and former professor at UCLA, and Damon Seeley, a designer and project leader who has created interactive art installations in the U.S. and Europe. With "Connection," McNall and Seeley sought to make a space where ephemeral connections between strangers would alter their experience of a public space. When connected—even momentarily—by the lights and sounds of the interactive environment, pedestrians in the walkway often acknowledge each other in a way that they would never normally do as strangers in an airport. Through "Connection," they have become fellow participants, sharing in an unexpected and pleasurable experience.

Electroland received the commission for “Connection” in 2004, four years before the opening of the airport, as part of a well-known arts program in Indiana. Immediately upon receiving the commission, McNall and Seeley began grappling with the technical challenges of the project.

The biggest technical challenge turned out to involve discovering and tracking the locations of pedestrians. To do more than simply flash lights and play music, “Connection” needs continuous real-time information about people: tall people, short people, people toting bags, people pushing strollers, and so on. Only with accurate person-tracking data could the system give travelers that uncanny experience of seeing their own location directly elicit changes in the environment. Discovering that the room recognizes you as an individual and is interacting with you—“gadget-free,” as Seeley says—is part of what makes the “Connection” experience so marvelous. How could the system automatically track the ever-changing locations of all the people passing through the Pedestrian Bridge, without requiring a tangle of intrusive cameras and tracking devices that would clutter the walkway?

To solve the problem of person-tracking, Electroland turned to TYZX, Inc., creators of the most accurate and versatile 3D vision systems for entertainment, robotics, and security. TYZX 3D Embedded Vision Systems are compact, reliable, and affordable solutions for tracking people and objects continuously, even in challenging environments like airport concourses where lighting can vary dramatically. About the size of a hardback book, a TYZX 3D EVS features a pair of stereo cameras integrated with hardware and software for processing visual data at 30 fps—providing continuous real-time person-tracking data to applications such as Electroland’s custom software.

The Solution: TYZX 3D Vision Systems

“We’ve spent years researching vision systems and finding new and better ways to sense people in pedestrian spaces,” says Seeley. “We rely on vendors like TYZX to do things an order of magnitude better than any generic solution. We’ve haven’t found anything that works as well as TYZX for tracking people in a space. TYZX is simply the best.”



TYZX 3D Embedded Vision Systems are compact enough to fit in even small spaces unobtrusively.

Seeley identifies three major advantages of the TYZX system over other vision systems for projects like “Connection.”

First, the TYZX system is the best solution for maintaining the persistent individuality of a person moving through a space. Other 2D and 3D vision systems lose track of people when they pass through shadows or when the lighting changes in some other way. Or they fall prey to occlusion: when one person steps in front of another, their identities get swapped in the software. “This doesn’t happen with TYZX,” says Seeley. “TYZX does an excellent job keeping track of people, even when they pass behind other people.”

Second, TYZX delivers high performance person-tracking even in challenging lighting conditions.

Seeley explains, “We used TYZX systems at an installation of the Cooper-Hewitt Museum, for example, where they were mounted in a very dark lobby which we were occasionally illuminating with very bright lights. Despite the high contrast of the darkness and light, the TYZX system was able to track people moving through the museum lobby and ascending or descending the main staircase. The lighting conditions also vary in the Pedestrian Bridge, not only because of the colored lights, but because of the variable light coming in through the windows, and the shadows created by pedestrians themselves.”

Third, a few TYZX cameras unobtrusively mounted along the upper sides of the bridge could cover the entire area of the installation. Other computer vision systems rely on having a coplanar view of all the people they are tracking; they typically need to be mounted on a ceiling looking directly down on pedestrians. But the ceiling of the Pedestrian Bridge is only eight feet high. Mounting cameras—lots and lots of cameras—directly overhead would be physically awkward and prohibitively expensive. “In the bridge, the trackable area is 160 feet long and 26 feet wide,” Seeley explains. “We’re able to cover the entire area with only ten TYZX systems, which are mounted seven and half feet high and painted to blend in with the ceiling. As long as the system is above people’s heads, it can track them by skimming along the surface of an area—more or less detecting their heads—without requiring a full coplanar view.”

An additional benefit of the TYZX system is its ease of installation and use. All communications with the EVS use conventional Ethernet. These same network cables deliver power to the system using Power over Ethernet (PoE) technology. In the Pedestrian Bridge, PoE eliminated the need for running extra power cables to all ten TYZX systems.

Electroland installed and tested their artwork—which, in addition to the TYZX vision system, included a 24-channel sound system and 1U rack-mount controller—in September, 2008, and tested it in October. After installation, bringing the TYZX system up and tracking took only a few hours. The airport opened to great fanfare in November, 2008, and passengers got the chance to experience Electroland’s interactive artwork firsthand.



On bright days, cloudy days, or at night, TYZX 3D vision systems in the Electroland installation reliably track the locations of pedestrians as they pass through the bridge.

“The result is a highly engaging experience,” Seeley says. “Participants notice that the room is tracking them. They step in and out of line to see how the room will respond. People seem to really enjoy it.”

Electroland expects the TYZX systems to continue performing well, tracking passengers 24/7, week after week, month after month. Seeley points out that at another installation—the Breezeway at Rockefeller Center—TYZX systems have been running continuously for over three years, processing over 4 billion frames of video, without requiring a reset. “That’s the kind of performance we can trust TYZX to deliver,” he says.



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